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ESTIMATING THE ECONOMIC VALUE OF COASTAL AND OCEAN RESOURCES: THE CASE OF NOVA SCOTIA

Prepared for the
Oceans Institute of Canada
and the
Atlantic Coastal Zone Information Steering Committee

on behalf of the
Department of Fisheries and Oceans
Environment Canada
Nova Scotia Department of Economic Development and Tourism
Nova Scotia Department of the Environment
Nova Scotia Department of Fisheries and Aquaculture

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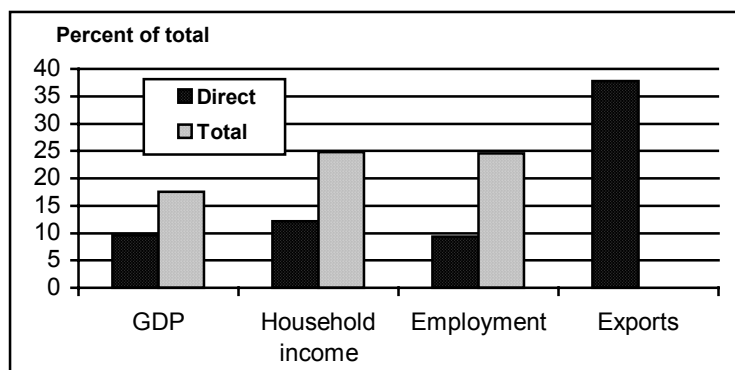
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SYNOPSIS OF THE REPORT

The principal aims of this project were to estimate how important coastal- and oceans-related industries are to Nova Scotia's economy, and to develop a methodology by which this could be done more easily in future, whether for Nova Scotia or for other jurisdictions.

The economic importance of oceans industries can be shown in several ways, such as their direct and indirect contributions to Gross Domestic Product (GDP); how many people they employ; how much these people take home in wages and salaries; and where the output of coastal industries is sold. The **net impact of coastal industries** for a benchmark year (1994) by each of these measures is summarized in the following table and chart:

	Direct Impact		Total Impact	
	Impact	% of total	Impact	% of total
GDP	\$1.5 billion	9.6	\$2.8 billion	17.5
Household income	\$1.3 billion	12.2	\$2.6 billion	24.8
Employment	34,800 jobs	9.4	93,507 jobs	24.8
Exports	\$2.7 billion	37.8	Not Appl.	Not Appl.



These are net direct and total (direct + indirect + induced) impacts as calculated by means of the Nova Scotia Input-Output tables for a series of private sector industries and

government departments that have activities, to a greater or lesser extent, related to the oceans. **The list of industries and agencies does not include all coastal-related activities.** It contains only those for which data could be readily obtained or estimated, but which allowed a demonstration of their impacts. Even within this list, the research team estimated conservatively, so the calculated impacts should be regarded as on the low side.

The impact data summarized earlier were obtained by netting out double-counting from the gross data (the purchases of intermediate inputs by one industry from another). Running these data through the IO tables allows an assessment of the total (direct + indirect + induced) impact, or how much a dollar earned in any of the oceans industries means as it is spent and respent throughout the economy of Nova Scotia.

Gross direct data for private and public sector ocean industries were collected or estimated. Private sector industries are dominated by fish processing, primary fishing, ports, and tourism, but oil and gas, shipbuilding, boatbuilding, aquaculture, and ocean technologies were also important. Public sector oceans-related activity is dominated by the Department of National Defence, with important contributions also from the Department of Fisheries and Oceans; Environment Canada; and the Nova Scotia departments of Fisheries and Aquaculture, and the Environment; and the Canada-Nova Scotia Offshore Petroleum Board.

Although at first blush, **the 9.6% of Nova Scotia's GDP directly attributable to coastal industries appears modest, once indirect and induced effects are calculated this almost doubles to 17.5%.** As a comparison in Nova Scotia, the combined primary output of agriculture, fishing, logging and mining is equivalent to 4.4% of GDP, manufacturing (including food processing) is about 10.5%, and the biggest grouping of service sectors (community, business and personal services) is about 11%.

Coastal industries also account for 12.2% of direct wages and salaries (household incomes) in Nova Scotia, and 24.8% of total wages and salaries. This makes ocean industries important contributors to family spending and retail sales.

The employment impacts of coastal industries are 9.4% of all jobs directly, and 24.6% of all jobs in total. This means that almost one out of every four jobs in Nova Scotia can trace its existence to economic activities involving the ocean. This proportion rises to a much higher value in the many coastal communities that ring the province.

The export impact is particularly important as it shows how coastal and ocean industries earn money for Nova Scotia outside the province. Ocean industries brought in \$2.7 billion in export earnings to Nova Scotia in 1994 (both from other parts of Canada, and from around the world), and these export industries alone contributed \$2.3 billion to household incomes. Fish products have consistently been the biggest single source of private sector export earnings for the province.

Defence is the most important coastal industry in Nova Scotia, closely followed by fish processing. Taken together these two account for 63% of the GDP impact of all the ocean industries analyzed, 66% of household income, 63% of employment, and 73% of oceans-related exports. (For a note of what comprises an “export” see the Appendix on sources and methods.) Private sector activities account for about 60% of oceans-related total GDP, with public sector departments and agencies taking up about 40% and indicating how important the role of government remains in conserving, regulating, and managing the oceans and their uses.

Primary fishing is important as a supplier to fish processing plants, and as an exporter in its own right. **Ports and tourism** rank highly both as sources of employment, incomes, and export earnings. Ports activity should expand as global trade increases, and as more and more products are shipped by container. Oceans-related tourism is a key component of the emerging ecotourism or nature tourism niche.

Apart from the Department of National Defence, the biggest public sector presence in the coastal sector is the **Department of Fisheries and Oceans, whose work is complemented by other federal and provincial departments.**

Traditional oceans-related manufacturing, like **shipbuilding and boatbuilding**, remain significant industries. Shipbuilding should improve in line with increased offshore oil and gas production. Boatbuilding needs to get away from its traditional dependence on the fishery and align itself with the burgeoning worldwide demand for workboats and pleasure craft.

New ocean-related industries include oil and gas production, aquaculture, and ocean technologies. The first of these will increase in importance once the Sable Offshore Energy Project begins. The second has increased in terms of output from \$3 million to \$13 million since 1989, but could hold much more potential for growth.

Ocean technologies have already shown healthy signs of growth. It is a mix of high value-added manufacturing (instrumentation, navigation aids) and professional services (consulting especially) that has evolved from proximity to the ocean around Nova Scotia, and the particular conditions and opportunities this proximity represents. It is knowledge-based, and pays well. Much of its output is exported.

As much as this has been a project to gauge how important oceans industries are to Nova Scotia, it has also been a pilot, to test methods and estimation procedures to measure the impact of these industries as accurately as possible. The methods outlined are only as good as the data that underpin them. Further refinement of methods will improve the validity of the results, and will bring in industries that are currently omitted for reasons of lack of data.

The template developed in this work also should be tested in other jurisdictions, like Atlantic Canada or the Gulf of Maine. Ocean industries are significant in the economies of Nova Scotia’s Atlantic neighbours. A precise measurement of this importance will

help policy formulation that not only aids economic development, but also management of the ocean environment. On a very practical level, analysis of ocean industries for all of Canada would avoid many data collection and apportionment problems that attend a consideration of only one part of the country.

At some stage, **consideration of ocean industries should move beyond an economic accounting exercise, to begin investigating policy-related issues such as a potential industrial cluster centred on these industries.** This would not only involve the different private sector activities, but would also engage universities, governments, and research institutions.

Any future work should also give extensive consideration of the costs of economic growth, that are usually expressed in terms of depleted resources, pollution, and environmental degradation. Ultimately, the coastal environment involves management both for environmental as well as market-oriented uses, with due consideration for the welfare of a larger economic unit (like a province or nation) and for the many communities that are located on the coast of a place like Nova Scotia. Reconciling environment and economy effectively will require special skills to ensure that industries that depend on the oceans continue to contribute to Nova Scotia's economic progress. This kind of management could also be a significant economic opportunity for the province.

TABLE OF CONTENTS

Section	Page
SYNOPSIS OF THE REPORT	i
ACKNOWLEDGEMENTS	vii
1.0 INTRODUCTION: NOVA SCOTIA AND THE SEA	1
1.1 Defining the Coastal Zone and its Economy	1
1.2 This Report	2
1.3 Methods	3
1.3.1 Private Sector	3
1.3.2 Public Sector	3
1.3.3 Data Specifications	3
2.0 BACKGROUND: BASIC STRUCTURE OF THE NOVA SCOTIA ECONOMY	5
2.1 Assessing the Importance of Ocean Industries: The Experience of Other Countries	6
2.2 A Predecessor to the Current Project	7
3.0 NOVA SCOTIA'S COASTAL-RELATED ECONOMY: SECTOR BY SECTOR	9
3.1 Private Sector	9
3.1.1 Primary Fishing and Fish Processing	9
3.1.2 Aquaculture	13
3.1.3 Shipbuilding and Boatbuilding	14
3.1.4 Tourism	16
3.1.5 Oil and Gas	19
3.1.6 Ports	20
3.1.7 Ocean Technologies	23
3.1.8 Private Sector: Summary	24
3.2 Public Sector	25
3.2.1 Department of National Defence	26
3.2.2 Department of Fisheries and Oceans	27
3.2.3 Environment Canada	28
3.2.4 Nova Scotia Department of Fisheries and Aquaculture	28
3.2.5 Nova Scotia Department of the Environment	29
3.2.6 Canada-Nova Scotia Offshore Petroleum Board	29
3.2.7 Public Sector: Summary	30
3.3 Summary Data: Private and Public Sectors Combined	30
3.4 Other Industries: A Note	31
4.0 A BRIEF ANALYSIS AND SUMMARY OF DATA QUALITY	35

5.0	EXPLORING THE WIDER IMPACTS OF COASTAL INDUSTRIES: DIRECT, INDIRECT AND INDUCED EFFECTS	36
5.1	The Nova Scotia Input-Output (IO) Model	36
5.2	Economic Impact Results	37
5.2.1	GDP Impacts	38
5.2.2	Household Income Impacts	40
5.2.3	Employment Impacts	41
5.2.4	Export Impacts	43
5.3	Summary of the Impacts	44
6.0	FUTURE EFFORTS	47
	Appendix: Notes on Sources and Methods for Section 3	49

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Others not listed here may have contributed in some way to this project. The contents of this report remain the responsibility of the project team.

1.0 INTRODUCTION: NOVA SCOTIA AND THE SEA

Nova Scotia is only about 575 kilometres from end to end, and averages 130 kilometres wide, but has a coastline that is 7400 kilometres long. The province's coastline has for long attracted settlement. The sea has been a source of food for centuries. Harbours have been developed as military centres, trading ports, and centres of industry. Beaches have attracted tourists. More recently, wealth from under the sea, in the form of oil and natural gas, has attracted attention. Scientists and engineers have developed or adapted equipment and machinery for specialized marine applications around the world.

In short, the economy of Nova Scotia is tied in many ways to the ocean that surrounds it. It is a primary aim of this report to explore just how important coastal and oceans-related industries are in Nova Scotia. (The terms "coastal-", "oceans-" and "marine-related" industries are used interchangeably in this report.) The project also aims to assemble a database of socio-economic variables that measure marine industries; and to develop a procedure for assessing the impact of marine industries that can be applied in other coastal jurisdictions, whether in Canada or elsewhere.

1.1 DEFINING THE COASTAL ZONE AND ITS ECONOMY

A broad definition of "coastal" is adopted for this project, that not only includes inshore and nearshore waters (including bays and estuaries) but also extends to the edges of the Continental Shelf. More and more coastal states regard this as part of their "economic management zone" if not indeed part of their sovereign territory.

As well as being economic resources, coastal regions are also ecological systems. Mixing economy and ecology involves special management challenges, as the values of marine environments go far beyond what is measured in economic or market terms. Distinguishing between "market" or "economic" and other values can be complex, but for the purposes of this project it essentially encompasses those products from, or uses of, marine or ocean environments that enter the world of commerce; that is, they can be exchanged for money.

Many definitions go much further than this to account for the "non-market" values of natural functions that coastal and ocean resources provide. These are usually those attributes of natural systems that we commonly regard as being "free", in so far as no commercial market has yet developed for them. The non-market value of natural systems extends beyond the ability of even very sophisticated market mechanisms to deal with it¹. It should be noted, however, that commercial markets are constantly evolving for

¹ A detailed discussion of this is in R K Turner and W N Adger (lead authors), *Coastal Zone Resources Assessment Guidelines*, Land-Ocean Interactions in the Coastal Zone (LOICZ) Reports & Studies No. 4, 1996. See also D W Lipton *et al.*, *Economic Valuation of Natural Resources: A Handbook for Coastal Resource Policymakers*, National Oceanic and Atmospheric Administration, Coastal Ocean Program Decision Analysis Series No. 5, June 1995.

previously unpriced products and services; the development of “tradeable permits” for polluters is an example of this.

For the purposes of this project, defining coastal industries firstly involves a broad twofold split, between those economic sectors that use coastal zones *as a resource* and those that use coastal zones *as a medium of movement, operation, or innovation*. The first of these includes the commercial fishery, aquaculture, and (to a significant degree) recreation and tourism. There is some dispute whether other resources, like oil and gas, fall in this category or not. One distinguishing characteristic that sets resource-dependent industries apart is that they are sensitive to deterioration of marine environments, whereas other industries operating in the marine milieu are more likely to cause such deterioration.

The United Nations Industrial Development Organization (UNIDO) has segmented the second of these two broad groups into three further categories. Their definition is:

1. *Marine system design and construction*, including ship design, and offshore and coastal engineering.
2. *Marine operations and shipping*, including transportation systems.
3. *Marine-related equipment and service industries*, including manufacturing, engineering and consulting in marine electronics and instrumentation, telecoms, navigation systems, ocean research and exploration, environmental monitoring, and training and education.

This would also include industries that have become, and remain, important components of the economy of Nova Scotia, like defence, and fisheries or environmental regulation and management. This means coastal industries can reside in either the private or public sector, and can encompass goods production and services. Even when an industry or sector is put in the private sector, it can still involve a hefty measure of public spending. Much of the Canadian shipbuilding industry in the 1990s, for example, relies on government work for orders, whether for defence, Coast Guard vessels, or ferries.

Although the spirit of this research project aligns closely with these definitions of sectors and industries, lack of data means that not all of them are included in the analysis. For this reason alone, the estimates of the economic impact in this report should be considered conservative. Further, the research team purposely chose to estimate the data that are included in the analysis on the low side, to avoid overstating the impact of marine-related industries in the Nova Scotia economy. This means that where there is error and omission in this work, its correction would usually increase the relative importance of coastal-related industries in the provincial economy.

1.2 THIS REPORT

As a pilot, this project has been heavily involved with devising a template for future work as well as actually analyzing the contribution coastal industries make to the economy of Nova Scotia. The next section outlines methods used during the research, as well as some

rules of thumb adopted during the work. This will include some background information on the structure of Nova Scotia's economy.

Following this we begin the actual analysis of the coastal economy, on a sector by sector basis. This will include further details and explanations of how estimates were made.

The raw (or gross) data from the sector analysis are next aggregated and subjected to impact analysis to assess the wider effects of the coastal economy on Nova Scotia's economy. This is done using the Input-Output model of the Nova Scotia economy, which in turn requires its own explanation.

1.3 METHODS

Background to the project was assembled by means of literature search. This firstly involved investigation of what constitutes a marine activity, and separating out those for which markets have developed for further analysis. Sectors or industries chosen for detailed investigation are classified as either private sector or public (government) sector.

1.3.1 Private Sector

- Primary fishing
- Fish Processing
- Aquaculture
- Shipbuilding and Repair
- Boatbuilding and Repair
- Oil and gas
- Tourism and Recreation
- Ports
- Ocean technologies and services

1.3.2 Public Sector

- Department of National Defence
- Department of Fisheries and Oceans
- Environment Canada
- Nova Scotia Department of Fisheries and Aquaculture
- Nova Scotia Department of the Environment
- Canada-Nova Scotia Offshore Petroleum Board

1.3.3 Data Specifications

Four types of data were initially collected for each of these sectors:

1. Value of output or (for public sector agencies) spending;
2. Direct employment (full-time equivalent, or person-years);
3. Direct payroll; and
4. Markets for output (split between Nova Scotia, other provinces of Canada, and exports to the rest of the world).

These are basic data for use in the impact portion of this project, and generally refer to a baseline or benchmark year of 1994. Private sector data usually coincide with the calendar year. Public sector data usually refer to the fiscal year that ended on March 31, 1995. One exception to this is financial and employment data for the Department of Fisheries and Oceans, when the fiscal year that ended on March 31, 1996 is used. This is to take advantage of a “shortcut”, due to the fact that fiscal 1995/96 was the first year the Canadian Coast Guard was part of DFO. Choosing fiscal 1994/95 as a reference year in this case would have necessitated further research into public or internal accounts for not one, but two, important oceans-related departments. Another exception is Environment Canada, when data estimated for the 1997/98 fiscal year were considered the only reasonable approximations of that department’s activities in Nova Scotia.

Choosing a single benchmark year offers no more than a snapshot of coastal industries relative to the total economy of Nova Scotia, specifically that which prevailed in 1994. As the database assembled for this project is refined and updated over time, the accuracy of this assessment will improve. Failing this, and given adequate resources, the methods could also be improved to do an impact analysis based, for example, on a multi-year (at least three-year) average for each of the four sets of data noted above. The general analysis in this report serves to illustrate in large part how typical 1994 was in terms of marine-related industries, but it should be realized that both economies and industries vary over short periods of time, generally in line with markets for their output.

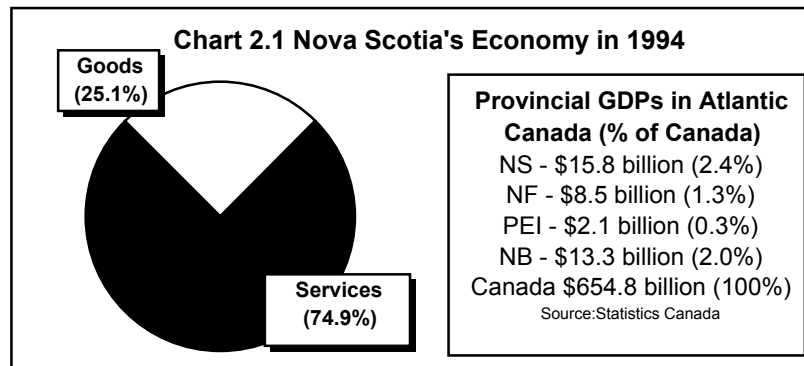
Trends for each industry are usually included in the general analysis by means of these and other data. All data are assembled from published secondary sources, or are estimates from published and unpublished sources. Where estimates have been made, this is noted and methods of estimation are explained in the Appendix. Occasionally (for federal public sector data especially) numbers were derived from internal accounting and payroll sources, and usually are not available to the public except by request. If, however, public accounts have been published (as is the case for provincial departments) or departmental or agency annual reports exist, these have been used to derive data whenever possible.

Some sectors can fairly be characterized as marine in nature, but data for them has proved elusive. Where this has happened, and where reasonable estimates could not be made, these sectors are noted and in some cases estimates provided of their size. This is one area where future projects can refine and improve the work begun here. Examples of such industries are marine insurance (for fishing boats and pleasure craft, for example); oceans-related research and development and education/training; some measure of the wider environmental values included in such sectors as tourism, or an estimate of the value of coastal-related tourism that is not necessarily currently captured by markets; and some government departments.

Section 4 contains an assessment of the quality and accessibility of data assembled for this project. This is to provide audit trails for the data, and move towards a periodic updating of the statistical information.

2.0 BACKGROUND: BASIC STRUCTURE OF THE NOVA SCOTIA ECONOMY

The most commonly used measure of an economy in Canada is Gross Domestic Product (GDP). This is simply the sum of the market values of an economy's goods and services in their final use. Nova Scotia's GDP in the mid-1990s was about \$16 billion². Chart 2.1 summarizes Nova Scotia's GDP in terms of its basic split between goods and services.



The province's economy is the largest in Atlantic Canada, and accounts for 2.4% of the Canadian economy. There is a 75:25 split between services and goods. (An irreverent definition of a service is something you can't drop on your foot, unlike a good or commodity.) Services encompass a huge array of enterprises, ranging from retail stores through haircuts, lawyers, transportation, and health care and education. Marine-related services would include shipping, ports, large parts of tourism, and professional consulting. Goods have physical substance, like fish products, oil and gas, ships and boats, or navigation instruments.

Although goods production is a relatively small one-quarter of Nova Scotia's economy, the importance of this share should not be underestimated, if only because it is the source of the lion's share of the province's exports. Exports are vital to the province and the people who live there, as they represent much larger markets than those contained within Nova Scotia itself, of only about 900,000 people. To generate reasonable advances in standards of living, therefore, the province must sell outside its borders. To date, these exports have mostly been goods.

² GDP essentially is an income statement. Some believe it is an imperfect measure of society's progress, as it does not account adequately for the costs of economic activity. An alternative measure being developed is Gross (or Genuine) Progress Indicator (GPI) that is more of a balance sheet, as it subtracts the negative effects of growth (like the costs of commuting, pollution, loss of habitat, resource depletion, social problems etc.). An accessible explanation of GPI is in Clifford Cobb, Ted Halstead, and Jonathan Rowe, *If the GDP is up, Why is America Down? The Atlantic Monthly*, October 1995, also at <http://www.theatlantic.com/atlantic/election/connection/ecbig/gdp.htm>. There is also a project to develop GPI for Nova Scotia; see Ronald Colman, *Measuring Sustainable Development: Application of the Genuine Progress Index to Nova Scotia. Progress Report and Future Directions*, co-sponsored by Statistics Canada, Nova Scotia Department of Economic Development and Tourism, Nova Scotia Department of the Environment, the Atlantic Canada Opportunities Agency, and GPI Atlantic, January 1998.

The goods sectors are important in the context of the present project, as well, in that all the private sectors defined except two and a bit (tourism and ports, plus a part of ocean technology) are goods-producers. As such, they are, or have the potential to be, export industries in the “traditional” sense, in so far as Nova Scotians have built an experience in exporting goods rather than services. This is not to say that the province’s exports are, or will remain, confined to goods; professional service exports are increasing in importance.

To put Nova Scotia’s economy in a little more context, Table 2.1 lists some better known sectors and the share they claim of provincial GDP.

Table 2.1: Selected Components of Nova Scotia’s GDP

Sector	Proportion of GDP (%)
Agriculture	1.1%
Mining	1.6%
Manufacturing	12.1%
<i>Food processing</i>	2.9%
<i>Forest products</i>	1.8%
Services	74.9%
<i>Wholesale/retail trade</i>	12.0%
<i>Finance, insurance and real estate</i>	16.5%
<i>Professional services</i>	2.8%
<i>Communications and utilities</i>	8.0%
<i>Public Administration</i>	11.3%
Source: Statistics Canada Catalogue 15-203	

2.1 ASSESSING THE IMPORTANCE OF OCEANS INDUSTRIES: THE EXPERIENCE OF OTHER COUNTRIES

Three estimates of the importance of marine industries have come to light as a result of this research. One is old, the other two are very recent (Table 2.2, page 7).

The American estimate is different from the other two not only because of its age, but also because of its method of calculation. It employed a national accounts approach to divide the economy into an oceans sector and a non-oceans sector. This is broadly along geographic lines rather than industry lines. The 2.6% of the US economy represented by oceans industries (about US\$30.6 billion in 1972, roughly equivalent to US\$112 billion at 1996 prices, or C\$154 billion) matched the size of such industries as agriculture, mining, transportation, and communications in 1972.

Table 2.2: Estimates of the Size of Ocean Industries in Three Countries

Country	Benchmark year	Estimate (% of national economy)
United States ⁽¹⁾	1972	2.6% (GNP)
United Kingdom ⁽²⁾	1994-95 (mostly)	4.8% (GDP)
Australia ⁽³⁾	1994 (mostly)	8.0% (GDP)
Sources (1) Giulio Pontecorvo <i>et al.</i> , <i>Contribution of the Ocean Sector to the United States Economy</i> , <u>Science</u> , 208 pp 1000-1006, May 1980. (2) David Pugh and Leonard Skinner, <u>An Analysis of Marine-Related Activities in the UK Economy and Supporting Science and Technology</u> , Inter-Agency Committee on Marine Science and Technology, Information Document No 5, December 1996. (3) Australian Marine Industries and Science Council, <u>Marine Industry Development Strategy</u> , Australian Department of Industry, Science and Tourism, January 1997.		

The British and Australian estimates have been calculated using methods that broadly correspond to those employed in the current study, but are confined to *direct* impacts only, and cover a rather different array of industries than the current study does. Measuring direct impacts is an important first step in any assessment of marine industries, but fails to capture the indirect and induced (“spin-off”) impacts that come with the spending and re-spending of incomes and profits earned in a sector throughout the larger economy. (This is explained in more detail in Section 5 of this report.)

British marine-related sectors had a net direct impact of 4.8% of the national economy in 1994-95, or £27.8 billion (C\$58.2 billion). The 17 sectors considered include familiar ones, like the fishery, oil and gas, tourism (leisure), defence, shipbuilding and ports, plus others like marine crossings (ferries and toll bridges), telecommunications (underwater cables), and aggregates (seabed mining). The estimate by Pugh and Skinner devoted more effort to oceans-related research and education, by means of a special survey conducted for their project.

The 8% of the Australian economy in 1994 accounted for by marine industries (that conform quite closely to the private sector industries identified for Nova Scotia) amounted to A\$30 billion (about the same in Canadian dollars). The Australian study also noted that marine industries grew by about 8% a year in real terms between 1987 and 1994, well over the rate for the total economy, and accounted for 7.7% of total exports from Australia in 1994.

2.2 A PREDECESSOR TO THE CURRENT PROJECT

Colgan and Plumstead addressed pressures on the coastal zone in the Gulf of Maine in 1995³. Encompassing the region bounded by Cape Cod and the western tip of Nova Scotia, the study included data on three states and two provinces. Population pressures

³ Charles Colgan and Janice Plumstead, Economic Prospects for the Gulf of Maine Region, prepared for the Gulf of Maine Council, 1995.

were analyzed using county census data roughly encompassing the 1980s. The authors noted these were allied to employment trends in certain areas (southern New England especially), which translated into construction of new workplaces in coastal areas.

The paper also contained assessments of tourism and recreation, fisheries, and transportation. Tourism and recreation were assuming increasing economic importance in the region, the fishery was still important but relatively less so as stocks had declined, aquaculture was gaining ground, and transportation links were undergoing rapid change to reflect both switches between modes for freight, and the gradual withdrawal of government involvement in some areas like ferries and airports.

This paper served to highlight the pressures facing the coastal zone and the people who have traditionally made a living from or on the sea. It also made an important conceptual link between an ecological and an economic approach to coastal or ocean resources, that the current study seeks to extend in the context of Nova Scotia.

3.0 NOVA SCOTIA'S COASTAL-RELATED ECONOMY: SECTOR BY SECTOR

This section summarizes each of the private and public sectors listed in Sections 1.3.1 and 1.3.2 on page 3 above. The report on each sector first gives an overview and recent trends, before presenting a table of the four sets of data specified in Section 1.3.3 on page 3 above. A brief explanation of sources and methods of estimation for these key data are in an Appendix that begins on page 49.

3.1 PRIVATE SECTOR

3.1.1 Primary Fishing and Fish Processing

This overview lumps primary fishing and processing together because of the close links between the two in Nova Scotia. The data assembled for the impact modelling separate the two sectors, first to give an idea of the importance of each, second because the two sectors have different impacts, and third because the processing sector has increasingly been importing fish to keep plants working rather than relying on fish caught in Nova Scotia waters.

Fishing is the essence of marine-based industry not only in Nova Scotia but throughout Atlantic Canada. It is an important primary industry, and it supports an equally important secondary (processing) sector. Fishing and fish processing combined are consistently Nova Scotia's single biggest source of export earnings, exceeding other well-known provincial products like forest products, Michelin tires, or Volvo motor cars.

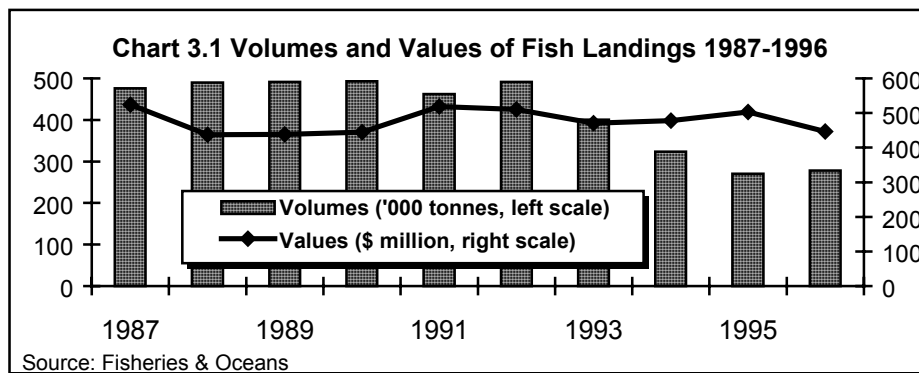
More than most industries, fishing has ups and downs. It is highly seasonal in nature throughout the year (usually dictated by necessary regulation to manage a common-property, renewable resource), and can vary widely over time because of the health of fish stocks and fickle markets. Nova Scotia's fishery in aggregate, however, is rather more diverse and stable than that of Newfoundland, for example, and has not suffered quite so much from the ups and downs that have characterized the latter province. Traditionally there have been at least three main species or groups of species caught in Nova Scotia waters, including groundfish (cod, haddock and pollock, for example); lobsters; and scallops. Crabs and shrimp have contributed significantly in recent years, and species like tuna, flatfish, herring, swordfish, and clams each had landed values higher than \$10 million in 1995⁴. Development of commercial markets for non-traditional species receives constant attention.

Lobster and scallops are especially important, being marketed either live or frozen, and generally commanding premium prices. Lobster landings were valued at \$201 million in 1996, and scallop landings were \$58 million. As an example of how the fishery can vary, however, in 1994 lobster landings were roughly the same as in 1995 in terms of volume

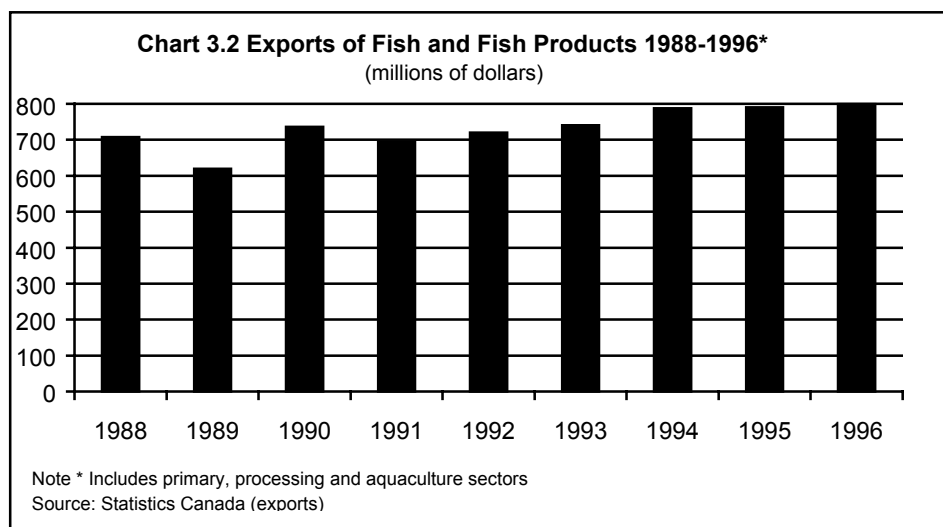
⁴ Many of the data in this section are compiled by the Department of Fisheries and Oceans or Statistics Canada, but are usefully summarized and complemented by the Marketing Division of the Nova Scotia Department of Fisheries and Aquaculture in its annual Nova Scotia Fishery Statistical Overview.

(about 18,500 tonnes) but better markets in 1995 made the catch almost \$30 million more valuable. Or, some 25,000 fewer tonnes of scallops were caught in 1995 than in 1994, contributing to about \$36 million drop in value in 1995, a result more of lower landings than fluctuating markets.

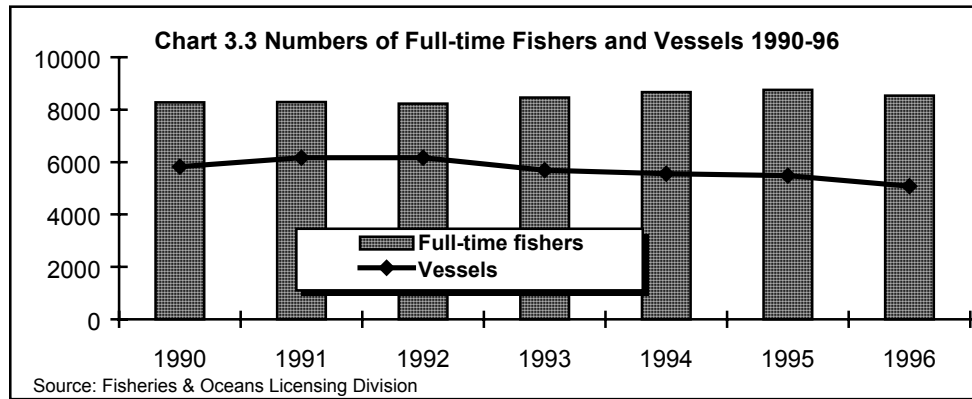
The primary fishery in Nova Scotia has become more valuable per unit of fish landed over the years. Total landings hit a series of peaks in the 1980s and early 1990s, of between roughly 400,000 and 500,000 tonnes each year. Landings (volumes) have dropped sharply in the 1990s, largely as a result of declines in groundfish stocks. Despite this drop, the value has stayed at relatively constant levels. When volumes landed were about 500,000 tonnes in 1991, for example, landed values were about \$500 million. With volumes sharply down to 271,000 tonnes in 1995, values were still at \$500 million (see Chart 3.1).



This performance has been made possible by a combination of good landings of higher value species (like lobster and scallops) and better marketing. It has also contributed to maintaining markets, including steadily rising exports, throughout the 1990s (see Chart 3.2).



Exports of fish and fish products accounted for about one-quarter of total provincial exports in 1996. Primary fishing also employed about 8500 people full-time in 1996, working on about 5100 boats (see Chart 3.3)⁵.



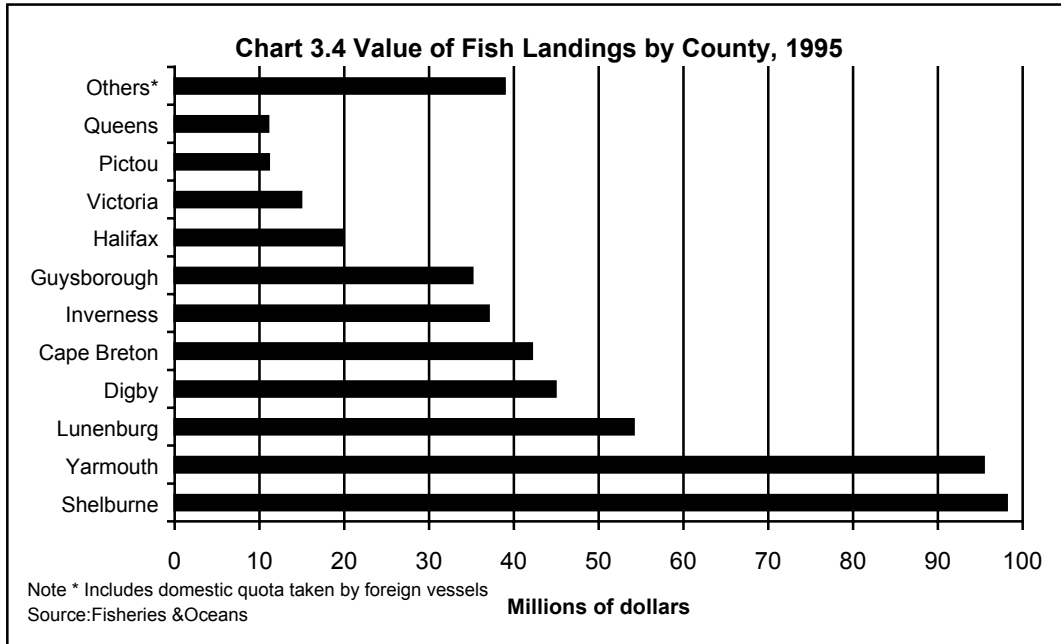
The definition of “full-time” varies from area to area. At the head of the Bay of Fundy it is reckoned to be fishing for four months, but is as high as eight months in Shelburne County. The average in many areas is six months fishing. As well as full-time fishers, there are also part-timers, almost 7,600 in 1993 and almost 6,000 in 1996. This can be characterized as a fairly opportunistic effort, perhaps exercised when other job opportunities are scarce, to keep a license active, or when stocks, quotas and markets allow⁶.

Fish processing is also an important source of jobs in Nova Scotia, employing about 5850 people in 1994, commanding a payroll of more than \$120 million. Employment in both primary and processing sectors have shown the strains of sharply lower groundfish stocks in the 1990s, however. Plant employment alone dipped from 7300 in 1989 to 4800 in 1996.

Primary fishing is the lifeblood of many small coastal communities, often where other sources of jobs and incomes are few and far between (see Chart 3.4, page 12). Counties at the extremities of Nova Scotia have especially important fishing industries, from Lunenburg around to Digby in the west, and Victoria, Inverness, Guysborough and Cape Breton counties in the east. But even Halifax County, which contains the biggest urban area in the province (one-third of the province’s people), had fish landings worth about \$20 million in 1995.

⁵ These are DFO data for the former Scotia-Fundy Region, which excluded the Northumberland Strait and southern Gulf shores of Nova Scotia, and included the Fundy shore of New Brunswick. For convenience in this report the number included for New Brunswick is assumed to be a reasonable proxy for the number excluded for Nova Scotia, to give a reasonable total for Nova Scotia alone.

⁶ There is some confusion over the numbers of full-time and part-time fishers. The Department of Fisheries and Oceans has not verified fisher status since 1994. This means that in years since then the numbers of full-time fishers may include those who have not actually fished.



Fishing, in sum, is not only an important industry in Nova Scotia still, but assumes extra importance in many rural areas and ties the province strongly to both its history and the ocean that surrounds it.

Primary Fishing: Key Data 1994

Value of output (value of landings)	\$500.3 million
Direct Employment	8700
Direct payroll	\$148.1 million
Markets (NS:RoC:RoW)*	70:3:27
Note* NS is Nova Scotia; RoC is the Rest of Canada; RoW is Rest of the World. The ratio in the data column add up to 100% in this and all subsequent tables in this section.	

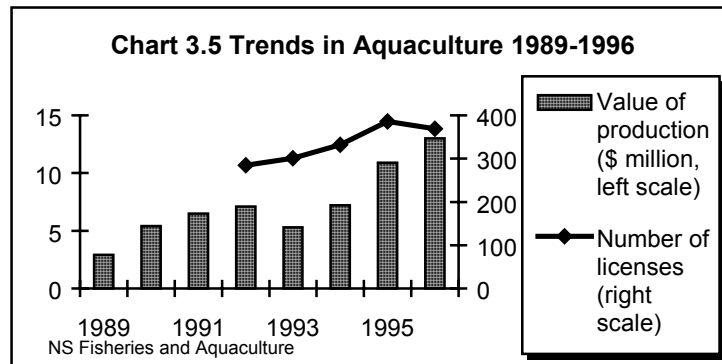
Fish Processing: Key Data

Value of output (shipments from plants)	\$954.8 million
Direct employment	5800
Direct payroll	\$122.2 million
Markets (NS:RoC:RoW)	4:8:88

3.1.2 Aquaculture

Although similar to the other fishing sectors in many obvious respects, aquaculture is treated separately here as it is a relatively new enterprise in Nova Scotia, and it remains quite small. It also demands different skills and experience, and has a different market structure.

Although small, the value of aquaculture has been growing in the province. Fish valued at less than \$3 million were shipped in 1989, but this had increased to \$13 million in 1996. The number of licenses has increased from 285 in 1992 to 369 in 1996 (see Chart 3.5).



Aquaculture in Nova Scotia has had a chequered history. There has often been resistance from traditional fishers, who see their fishing grounds being threatened by, and vulnerable to, any large-scale installation of fish cages. A relatively robust wild fishery (despite lower groundfish stocks) has also tended to push aquaculture into the background in the provincial fishery sector.

Many believe, however, that it is the fishery of the future and that Nova Scotia, with its hundreds of sheltered bays and inlets, offers exceptional opportunity. It has numerous spin-off benefits, such as feed, cages, and fish health products. These have already, it seems, given Nova Scotian manufacturers a good start in supplying aquaculture services and products in other areas. One Canadian directory lists about 2500 suppliers of aquaculture products and services in 1996. A quarter of these were in Quebec, 18% in British Columbia, 14% in Ontario, and 13% in Nova Scotia⁷. This proportion is far higher than the province's actual contribution to national aquaculture production, indicating many fish farms in the rest of Canada and elsewhere are sourcing services and products in Nova Scotia.

Aquaculture: Key Data in 1994

Value of output	\$7.2 million
Direct employment	394
Direct payroll	\$4.9 million
Markets (NS:RoC:RoW)	65:23:12

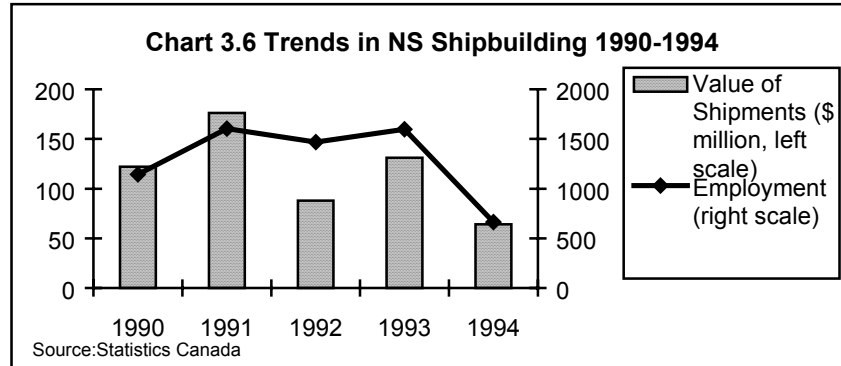
3.1.3 Shipbuilding and Boatbuilding

⁷ Contact Canada, Canadian Aquaculture 1997 Directory, by Fred Haynes. Available at <http://CanAqua.com>.

The Standard Industrial Classification distinguishes boatbuilding from shipbuilding at five tonnes displacement - above this it's a ship, below it's a boat⁸. Both are analyzed in a single overview here, then split to give key impact data for each.

Boatbuilding and shipbuilding have a long history in Nova Scotia, tied to the fishery, to coastal and marine safety and icebreaking in winter, to building ferries to link provinces together, to offshore hydrocarbon exploration and development, to defence, and to commercial shipping. Both industries have evolved particular dependencies. Shipbuilding now relies quite heavily on government contracts (defence or Coast Guard contracts mainly, or fisheries patrol vessels) but with latent demand for repair and service functions for a bigger market that includes commercial vessels that need fast repairs when passing by Nova Scotia (essentially an opportunistic market). More solid demand for repair and service functions should come from oil and gas production platforms as reserves on the Scotian Shelf are developed.

A major part of Nova Scotia's shipbuilding industry is oriented towards the Canadian Navy and Coast Guard, however. There are major yards in Halifax and Dartmouth, and others at Shelburne and Pictou, with smaller slips at places like North Sydney and Lunenburg. Shipbuilding is "lumpy" in nature, with work on a single vessel liable to take several years. Thus the value of output can vary widely from year to year, as can employment (see Chart 3.6).

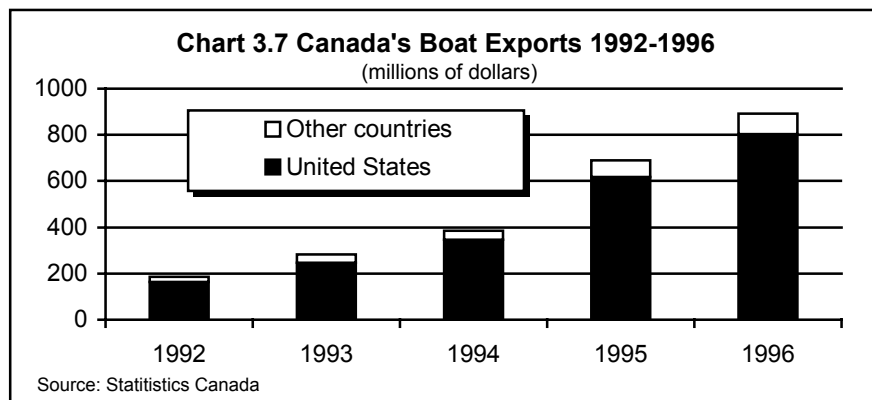


Boatbuilding is smaller than shipbuilding in Nova Scotia, with 27 yards generating about \$15 million in output in 1994 and employing 171 people directly. Its markets are almost entirely within the province, a sign of how it has come to depend on the fishery. Like shipbuilding, however, boatyards could anticipate improved markets in several ways. A study done for the Centre for Marine Vessel Research and Development (Technical University of Nova Scotia, now Daltech) in 1995 concluded that the industry's infrastructure is reasonably solid (the study addressed the industry within Atlantic Canada, not just in Nova Scotia), shellfisheries and pelagic fisheries (herring, tuna and so

⁸ See Industry Canada's *Strategis* website <http://strategis.ic.gc.ca/SSG/s132710e.html>.

on) were still robust, there is a growing demand for workboats in aquaculture, and some fishing vessels are being converted for tourism purposes⁹.

But the main demand for boats is in export markets, where the study says there is “... a vast international market for boats of modern design, materials, and construction.” Furthermore, the biggest share of this international market is right next door, in the United States, where Canada already trades under the preferred terms of the North American Free Trade Agreement. Other parts of Canada have already realized this potential, and exports of boats to American markets have increased from \$164 million in 1992 to an astonishing \$803 million in 1996 (see Chart 3.7).



America takes about 90% of total Canadian boat exports, with most of these shipments originating from central Canada and British Columbia. Other markets have also been growing in importance, such as Japan, Brazil, Holland, France, and Australia. In the face of this burgeoning international demand for boats, Nova Scotia's export performance can charitably be described as disappointing - the province exported boats worth only \$671,000 in 1996, although this has gone as high as \$777,000 in recent years (in 1994). With a lengthy tradition of boatbuilding, there is potential for improvement. According to the 1995 report, this will require mostly that “... the industry must build the products demanded by the markets ... [including] new designs and engineering, materials and construction methods”. Both the industry and governments are taking notice. There are pockets of innovative craft design and construction¹⁰. In November, 1997, federal and provincial governments, and the Nova Scotia Boatbuilders Association announced a \$6.5 million package to help boatbuilders increase the quality of their products to international ISO9000 standards, in an effort to enhance export readiness.

Both shipbuilding and boatbuilding fit well into Nova Scotia's oceans heritage, not only as industries in their own right, but as adjuncts to other sectors like fishing, recreation, and defence. Both have, however, come to depend on narrow markets, mostly within

⁹ Logtech Systems, *The Revitalization of the Boatbuilding Industry in Atlantic Canada: The Next Step*, 1995.

¹⁰ See, for example, *Dream-boat builders* (*Chronicle Herald-Mail Star* (Halifax), Aug 23, 1996 pB1); *Boatbuilding, Boat Repairs '97*, (a supplement to *The Sou'wester* February 15, 1997); and *Export or Expire*, (*Telegraph-Journal*, (Saint John), March 4, 1997 pB1).

Canada and often only within Nova Scotia. The potential for both to break out of these markets is quite promising, and should allow them to begin contributing again to the provincial economy and many coastal communities.

Shipbuilding: Key Data 1994

Value of shipments	\$64.1 million
Direct employment	665
Direct payroll	\$25.5 million
Markets (NS:RoC:RoW)	5:90:5

Boatbuilding: Key Data

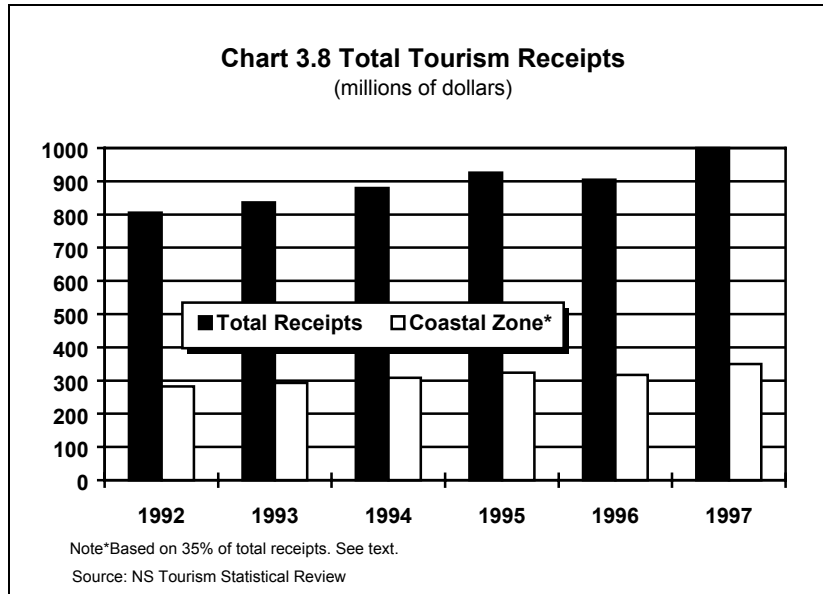
Value of output	\$15.4 million
Direct employment	171
Direct payroll	\$3.9 million
Markets (NS:RoC:RoW)	90:5:5

3.1.4 Tourism

License plates in Nova Scotia sport an image of the schooner *Bluenose* and the caption “Canada’s Ocean Playground”. These signify the importance of the ocean in the province’s history and its tourism industry. But not all of Nova Scotia’s tourism activity is directly related to the coastal zone. This overview will first briefly describe the overall importance of tourism to the provincial economy, followed by a discussion on nature and marine tourism and how they relate to the coastal zone. Additional information on the importance of the recreational fishery and recreational boating on the coastal zone will also be discussed.

Tourism is an important, if seasonal, industry in Nova Scotia, with most activity from late spring to early fall. Total receipts have increased steadily during the 1990s, and in 1997 reached \$1 billion for the first time, a target originally set for 2000 (Chart 3.8, page 17). In 1996, tourism also provided an estimated 28,600 full-time and part-time jobs. This was down 1.4% from 1995 levels.

Most tourists (71%) in the province are residents of Nova Scotia, but they spend less than tourists from elsewhere. Although American tourists are only about 5% of total visitation, for example, they account for 14% of total receipts, while Nova Scotians account for less than half of total receipts. Some 40% of tourists (regardless of place of origin) come to Nova Scotia for leisure purposes, 30% to visit family and friends, 23% come on business, and 3% come for other reasons. “Leisure” tourists spend the most money (43% of receipts). Leisure can encompass many things, including such oceans-related tourist experiences as lying on a beach, swimming, beachcombing, boating, and nature-related activities.



Tourists have become increasingly sophisticated in their demands for new vacation concepts. This has resulted in increased market segmentation of the sector world-wide. More effort is being made to attract “niche” tourists. One of these niches is environmental or nature vacations, or ecotourism, which has been growing rapidly. Marine-related tourism falls within eco-tourism, and includes whale watching, sea kayaking, other types of boating, and many kinds of wildlife-related tourism.

Actual definitions of ecotourism, and therefore the estimates of its importance, vary widely. The broadest definition is trips with some sort of nature or wilderness experience incorporated. A range of estimates runs from 5% to one-third of visitation and spending globally¹¹. Even the most conservative estimates involve considerable spending, but it remains difficult to analyze the nature travel industry because of the lack of a standard definition.

The Canadian Tourism Commission (CTC) has identified nature travel in its various forms as one of the fastest growing segments of the tourism industry, with a huge potential for market expansion¹². In the 1996 report, *Nova Scotia Nature Tourism*, nature tourism is defined as:

“ ... travel to a specific area to experience and learn about the natural environment of that area ... [including] ... related adventure and cultural components.”

¹¹ See a report on ecotourism in *The Economist*, August 30, 1997, which had figures both from the World Tourism Organization and the Ecotourism Society.

¹² *Domestic Tourism Market Research - Canada*, prepared by Coopers-Lybrand 1996.

Using the *1992 Exit Survey*, Tourism Nova Scotia determined that up to 35% of Nova Scotia tourists had some interest in participating in nature activities. In the absence of other firm figures, this proportion is used to approximate marine-related tourism in this research. Its accuracy would depend on how precisely or imprecisely marine tourism is defined.

Nature tourist parties spend substantially more than non-nature tourist parties (\$895.20 per visit compared with \$468.53, Table 3.1), and stay twice as long. Spending by place of residence reveals that nature tourism visitors from Atlantic Canada spend less (72%) than nature tourism visitors from other places.

Table 3.1 Different Types of Tourist Spending in Nova Scotia

Type of spending	Nature tourist parties	Non-Nature Tourist Parties
Accommodation	238.59	128.27
Restaurants	221.15	122.81
Entertainment	60.39	27.46
Taxi and car rental	56.25	27.32
Shopping	144.02	77.48
Gas and auto repair	102.16	48.88
Groceries and liquor	66.77	28.03
Total (inc. other)	895.20	468.53
Source: ARA Consulting Group Inc, <i>Nova Scotia Nature Tourism, Phase I Report</i> , prepared for Tourism Nova Scotia, October 1996.		

Two further aspects of coastal-related tourism deserve mention:

Recreational saltwater fishing is the responsibility of the Department of Fisheries and Oceans. Traditionally, the department's primary involvement has been to regulate fishing for marine species. In 1992, a \$600,000 federal-provincial Cooperation Agreement was signed to fund a series of studies to determine the challenges and opportunities for both inland and marine recreational fisheries. Under this agreement, a marine recreational fisheries study was completed which outlined how this sector could be developed further. This study, *Recreational Fishery Development Plan for Nova Scotia - Tidal and Marine*, determined that the marine recreational fishery is, "small, fragmented and poorly developed". The study suggested that there was considerable potential in sea angling.

Recreational Boating: Information on the number and uses of pleasure craft is quite limited. In 1994, a Statistics Canada Household Facilities and Equipment survey reported that 1.3 million Canadian households owned 1.75 million recreational craft¹³. The types of craft ranged from seadoos and sailboards to large yachts. This survey did not cover businesses that rent pleasure craft. Some 66,000 households from this total, or 3.8%,

¹³ This report is summarized on Industry Canada's *Strategis* Website <http://strategis.ic.gc.ca>

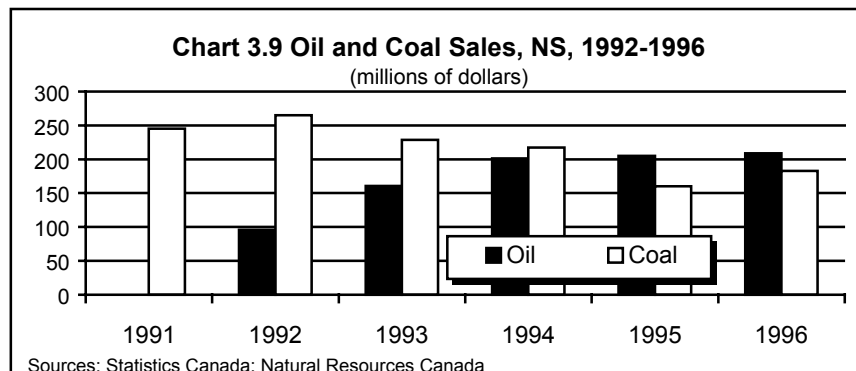
were in Nova Scotia. Trends since 1978 show that there has been a growth in pleasure craft ownership in Canada.

Tourism: Key Data 1994

Value of Output (tourism receipts)	\$308 million
Direct Employment (FTEs)	3369
Direct Payroll	\$86 million
Markets (NS:RoC:RoW)	46:37:17
Note: The market proportions refer to 1996. Similar data for 1994 are unavailable due to a change in methodology between 1994 and 1995.	

3.1.5 Oil and Gas

Recovery of hydrocarbons from beneath Canada’s East Coast offshore area is new, but comes after lengthy exploration stretching back to the 1960s. Production began from a series of small oil reserves near Sable Island in 1992, and these reserves are still pumping beyond their originally estimated life due to rapid advances in drilling and recovery technologies. The oil being produced is light crude, which commands a premium price. Value of production has increased steadily, to the point where it is Nova Scotia’s most valuable mineral export, even exceeding coal (Chart 3.9).



Oil now accounts for about 35% of Nova Scotia’s mineral output in terms of value (as well as coal, the province is also a major producer of gypsum, salt, and structural materials). The course of production from the Panuke, Cohasset, and Balmoral reserves has not been smooth; the original operators ran into major cost overruns in early years. But lessons have been learned, and may well help in future offshore oil production.

Oil will eventually be surpassed by natural gas, which exists in large amounts in the area around Sable Island. In October, 1997 a regulatory review panel recommended that a proposal proceed to develop six reserves, piping the gas to markets in Nova Scotia, New Brunswick and New England. Approval from the National Energy Board followed in

mid-December, and from the Canada-Nova Scotia Offshore Petroleum Board at the end of December. The project will cost \$2 billion to bring the gas ashore, and a further \$1 billion to pipe it to markets. The reserve contains an estimated 3 trillion cubic feet of recoverable gas, and prompt action on the panel's recommendation could result in the first flows in late 1999.

The Sable Offshore Energy Project has a planned production life of 25 years, and would involve \$2 billion in operating spending including \$500 million in wages and salaries. Employment would amount to 3840 person years (154 a year), the majority of these (3680 person years) in Nova Scotia¹⁴. Estimated production royalties for the Province of Nova Scotia will be \$3.5 billion, although this will be offset by loss of other transfer payments from Ottawa. The possibility of reopening Georges Bank to exploration in two years time could uncover further reserves of oil and gas beneath Nova Scotia's offshore area. These developments not only will enhance the value of the province's marine economy, but also demonstrate how dynamic this economy is.

Oil and gas: Key Data 1994

Value of output	\$201.2 million
Direct employment	293
Direct payroll	\$9.7 million
Markets (NS:RoC:RoW)	0:60:40

3.1.6 Ports

Ports are a mixture of private and public operations in Canada. Much of the physical plant is maintained by governments, although actual operations are private or quasi-private in nature. Ports are vital to Canada's overseas trade, and the many natural harbours around Nova Scotia have long made it an important stop for shipping. The most important port in terms of cargoes that move through it is Halifax, which is also a naval and a shipbuilding centre. In recent years, the Statia Terminals at Port Hawkesbury (Strait of Canso) have begun to handle significant volumes of trans-shipped crude oil (offloading big oceanic carriers onto smaller ones for delivery to eastern seaboard refineries on harbours that cannot accommodate the larger carriers). Halifax and Port Hawkesbury between them handle about 80% of cargo volumes moved through Nova Scotia ports in an average year.

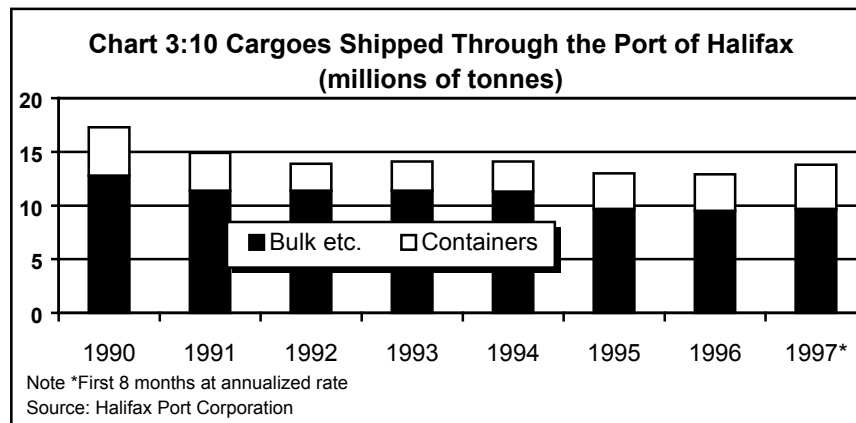
Halifax handles significant amounts of imported crude oil, and ships out refined petroleum products. Gypsum comes by rail to a loading wharf from quarries at Milford to be shipped to wallboard plants in central Canada and the United States. Autoport in Eastern Passage has handled 24 million vehicles from around the world since it opened in 1971, and has a capacity of 15,000 vehicles at any one time. Halifax is now an established stop on the schedules of several cruise ship lines (49 calls from 15 lines in

¹⁴ See the *Joint Public Review Panel Report: Sable Gas Projects*, October 1997.

1996) adding to the city’s tourist receipts. Behind the docks and wharves the infrastructure includes grain elevators.

Last but not least, two container terminals at Halifax have become vital links for importers and exporters both within Atlantic Canada and as far west as the North American heartland. Containers are a significantly higher value form of shipping than bulk cargoes, demanding constant attention to new technology for loading and unloading. Some 80% of the containers that move through Halifax come from outside Atlantic Canada, mostly Ontario and the American Midwest, taking advantage of the fact that Halifax’s ice-free port is a day’s steaming time closer to Europe than any other port on the North American mainland. In the time-sensitive business of container shipping, this is a vital advantage. It also means that exporters in Atlantic Canada have an advantage in gaining rapid access to markets around the world, an advantage that small economies do not normally possess. The port and its container terminals are at the Atlantic end of a continental network of railways, which are integral to shipping containers to and from markets.

Despite evident advantages, cargo volumes handled by the port have generally been flat or gone down in recent years, although they have perked up in 1997 (Chart 3.10).



As with most transportation services, the port is vulnerable to dips in the business cycle. It is also in intense competition with other east coast ports (including Montreal) some of which are the termini of land bridges to West Coast ports. Halifax must therefore compete, in the container business, with ports like Long Beach and San Diego in shipping to and from Asia. Among East Coast ports, Halifax has only gradually increased its market share from 5.7% of containers in 1980 to 7.7% in 1995. This compares favourably with New York/New Jersey and Baltimore, both of which lost significant market share, but unfavourably with Hampton Roads and Montreal (Table 3.2).

Table 3.2 Change in Container Market Share, Five East Coast Ports

Port	1980	1985	1990	1995
	Share of containers handled by Five Ports			
Halifax	5.7%	6.4%	10.7%	7.7%

New York/New Jersey	55.6%	57.5%	45.5%	45.5%
Hampton Roads	11.1%	7.3%	18.9%	21.6%
Montreal	8.7%	11.7%	13.6%	14.6%
Baltimore	18.9%	17.1%	11.2%	10.7%

Source: American Association of Port Authorities, quoted in Booz, Allen & Hamilton (see footnote)

According to consultants who prepared a report on the prospects for the Port in 1996, Halifax has immense potential but to date has not been able to capitalize on this. With new and bigger container ships being built, and with trade patterns shifting more to Asia and Pacific areas, Halifax must undertake significant investment to become *the* East Coast port in the early twenty-first century, including much greater integration with other modes (rail and air)¹⁵.

Halifax is so big it tends to dominate any discussion of Nova Scotia's ports. There are many others, of course, big and small, all with some importance. Some are shipping points for local products, like Pugwash and Liverpool. Some are key ferry ports, like Yarmouth, Digby, and North Sydney. Many more are integral to Nova Scotia's fishing fleet, or provide a place for pleasure craft to tie up.

Two specific aspects of these other port activities should be noted here. Firstly, Nova Scotia ports acted as termini for five ferry services in 1994. Marine Atlantic (a Crown corporation) alone carried 2,582,000 passengers, 896,000 passenger-related vehicles, and 280,000 commercial vehicles in 1994, in all four Atlantic provinces. For this it obtained \$84.5 million in revenues, was subsidized by the Government of Canada to the tune of \$109.2 million, and employed 2,110 people¹⁶. Partitioning and allotting these data between the provinces served would be difficult. (Subsequent privatization of some ferry services means only the Newfoundland service from North Sydney remains with Marine Atlantic.)

Secondly, the Department of Fisheries and Oceans, through its Small Craft Harbours Branch, has had responsibility for about 300 harbours in Nova Scotia. At a few, hundreds of vessels might tie up regularly, at many others only the occasional fishing boat or recreational craft might tie up. A process of divesting harbours to locally-based, non-profit Harbour Authorities has been under way for some years. Local groups can operate ports that are important for the fishing industry, shipping cargoes, or tourism and recreation. All of these small harbours need wharf and dock maintenance and some might need periodic dredging. Many are important to the fishing fleet, and even the smallest ones have an importance to passing seaborne tourists, looking for a place to spend the

¹⁵ Booz, Allen & Hamilton and ATi Consulting, The Greater Halifax Multi-Modal Transportation Study, prepared for the Greater Halifax Partnership, November 1996.

¹⁶ These data are from Marine Atlantic's Annual Report for 1994.

night or a refuge from bad weather. The local economic importance of each, while not included in this analysis, should not be discounted¹⁷.

Ports: Key Data 1994

Value of output	\$300 million
Direct employment	2520
Direct payroll	\$87.4 million
Markets (NS:RoC:RoW)	20:70:10

3.1.7 Ocean Technologies

Ocean technologies are generally a mixture of how manufacturing and service industries have adapted their products to a coastal or oceans milieu. The only recent survey of ocean tech in Canada was done in 1990 (data for 1989) and much of the data pertaining to the industries in the mid-1990s are extrapolations from this earlier survey¹⁸.

The 1990 survey identified about 440 firms in ocean tech, about one third each in western Canada, central Canada, and eastern Canada. Nova Scotia was the best represented of the eastern provinces, with 74 firms, second only to British Columbia's 150 firms. An update prepared in Nova Scotia in 1996 put the number of firms at 90, employing more than 1800 people and with \$80 million in revenues.

The industries involved are essentially high-value added, labour intensive, and demand high levels of knowledge and education. Incomes in ocean tech tend to be quite high. Most firms in Canada are small, usually no more than 20 employees and often ten is typical. Average revenues per employee are in the range of \$100,000 to \$120,000 range. Many firms are export-oriented. The range of products and services offered is wide:

- Ocean mapping and charting
- Cold water engineering
- Remote sensing
- Consulting
- Defence applications
- Underwater acoustics
- Instruments and communications
- Biotechnology
- Survival systems
- Training

¹⁷ Information on small craft harbours came from SCHB offices in Yarmouth and Antigonish; and the Small Craft Harbours Branch, Maritimes Region, Moncton.

¹⁸ Fisheries and Oceans Canada, 1990 Survey of Oceans Manufacturing and Services, prepared by Oceans Economy Division, Strategic Policy and Planning Directorate 1991.

Many of these areas of enterprise have involved extensive public spending and contracts, and this is one of the reasons ocean tech has changed in the past few years. Fiscal restraint has reduced the ability of many departments and government research facilities to spend. Public contracts for designing and building custom instruments, for example, were a useful source of work for small manufacturers, but much less of this now happens. One effect of this has been to weight ocean tech more towards the service end of the spectrum, away from manufacturing. Even where manufacturing still figures prominently, servicing high-value equipment is almost as important a part of the job as manufacturing it in the first place. For the industrial group “indicating and recording instruments” (SIC 3911) in Canada, for example, some 40% of employees in 1993 were in non-production positions, and these workers accounted for half of payroll.

If Nova Scotia and its Atlantic neighbours have a natural opportunity to help build a knowledge-based economy, then ocean tech figures prominently. It is an area that has benefited in the past from strong links between government departments and the private sector. It takes advantage of the fact that operating in the marine environment demands special skills, in which Nova Scotians have extensive experience and knowledge. The typical marine environment that surrounds Nova Scotia demands specific knowledge of cold-water applications and special tidal regimes. Growth in ocean tech could put Nova Scotia in a strong position to use an accumulated expertise and knowledge of the marine environment.

Ocean Technologies: Key Data

Value of output	\$80 million
Direct employment	1844
Direct Payroll	\$67 million
Markets (NS:RoC:RoW)	25:10:65

3.1.8 Private Sector: Summary

Private sector, coastal-related industries in 1994 had a combined value of over \$2.4 billion in output, employed almost 24,000 people directly, paid out more than \$550 million in wages and salaries, and exported more than 60% of their output to markets outside Canada (88% in total to markets outside Nova Scotia) (Table 3.3, page 25).

Table 3.3: Summary of Private Sector Ocean Industries Data for 1994

Sector	Value of Output (\$ million)	Direct Employment	Direct Payroll (\$ million)	Markets (NS:RoC:RoW)
Primary Fishing	500.3	8700	148.1	70:3:27
Fish Processing	954.8	5800	122.2	4:8:88
Aquaculture	7.2	394	4.9	65:23:12
Boatbuilding	15.4	171	3.9	90:5:5
Shipbuilding	64.1	665	25.5	5:90:5
Tourism	308.0	3369	86.0	46:37:17
Oil and Gas	201.2	293	9.7	0:60:40
Ports	300.0	2520	87.4	20:70:10
Ocean Technologies	80.0	1844	64.5	25:10:65
Total	2431.0	23,756	552.2	12:26:62⁽¹⁾
Note (1) Weighted				

Comparing these data with others gives further perspective:

- Value of output is 64% greater than the total of Equalization and Established Programs Financing transfers from the federal government to the provincial government in 1994 (\$2.4 billion compared with \$1.5 billion; Equalization and EPF are the two main ways that the Government of Canada helps provinces pay for essential services such as health care and education; EPF since 1994 has been folded into the new Canada Health and Social Transfer).
- Direct employment numbers account for almost one in ten (9.3%) of private sector employment in Nova Scotia.
- Direct payroll in coastal industries amounts to almost 70% of Unemployment Insurance benefits received by Nova Scotians in 1994.
- Exports to markets outside Canada were equivalent to about 60% of the province's merchandise exports in 1994.

3.2 PUBLIC SECTOR

A similar approach is adopted to describe oceans-related public sector departments and agencies as for private sector industries. A broad outline is followed by a summary table of key data, with further notes on data sources and methods in the Appendix to this report.

Two methodological items should be stressed at the outset for the public sector. Firstly, "markets" for all federal and provincial departments, other than National Defence, are assumed to be 100% within Nova Scotia. These are provincial offices, whose responsibilities and mandates are more or less confined to Nova Scotia, and data have

been collected to reflect this effort within Nova Scotia. “Markets” for National Defence, however, have been allocated according to population across Canada (3% Nova Scotia, 97% the rest of Canada), on the grounds that the “consumers” or “beneficiaries” of defence services are the people of Canada. This results in a significant “export” component for National Defence, that at first might confuse people. It is justified in that this important generator of jobs and incomes within Nova Scotia is paid for by all the people of Canada through their taxes, who benefit from its services more or less equally whether they live in Newfoundland or British Columbia.

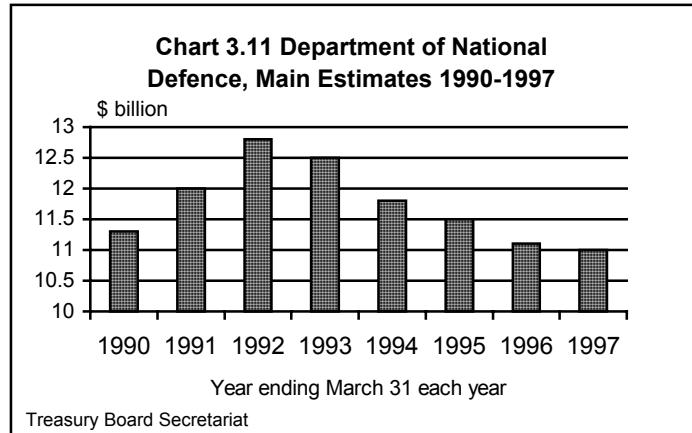
Secondly, instead of specifying these market ratios repeatedly in the following tables, an “oceans ratio” is shown. This is the estimated share of departmental spending, employment and payroll that is devoted to oceans-related activities in Nova Scotia. Where this ratio is less than 100%, the data shown are already scaled down by the appropriate amount.

3.2.1 Department of National Defence

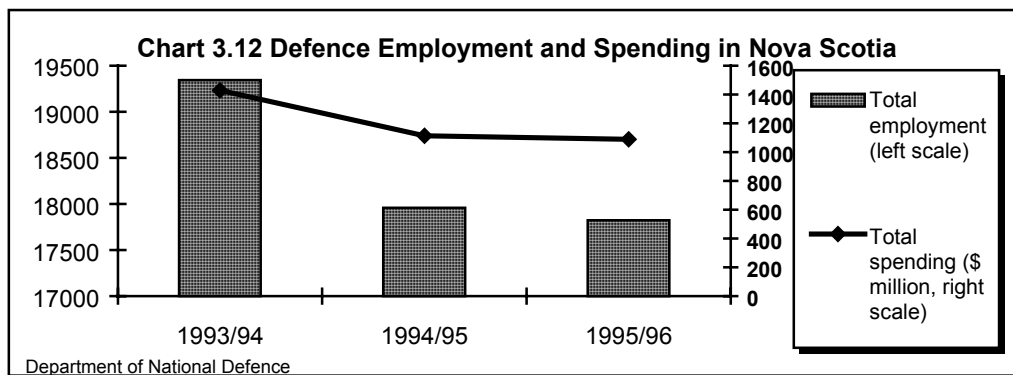
Defence has been an integral part of Nova Scotia’s economy almost since the earliest European settlement. The French began building Fortress Louisbourg on Cape Breton Island about 1720, to defend their maritime and fisheries interests in the New World. The British countered with a bastion at Halifax. During the eighteenth and nineteenth centuries, Nova Scotia played a role in the geopolitics surrounding an entire new continent. During the twentieth century, tens of thousands of Canadian soldiers, sailors and airmen shipped out of Halifax and other ports, bound for battlefields on the Atlantic and in Europe. Since the end of the Second World War, Canada has contributed significantly both to the North Atlantic Treaty Organization, to peacekeeping missions sponsored by international agencies, and has taken part in conflicts in Korea and the Persian Gulf.

The core of Nova Scotia’s defence establishment has been the harbour at Halifax, the main base for Canada’s navy. There are army and airforce presences in the province, as well. The former of these is small, and the latter devotes most of its efforts to marine-related missions like submarine patrol, search and rescue, and aiding civilian protection agencies like police in coastal patrols.

Fiscal restraint during the 1990s has reduced defence spending in Canada quite significantly (Chart 3.11, page 27). Since fiscal year 1991/92 the Department of National Defence has had \$1.8 billion lopped from its budget, and more is to come before 2000. The nature of the cuts have changed, though. In earlier years, entire bases were shut down, including several in Nova Scotia. In the future there will be more reductions in equipment purchases and personnel. These will eventually mean fewer jobs in defence in Nova Scotia, and lower levels of spending.



But defence is still a major part of the Nova Scotia economy, about 8% of provincial GDP and a major employer (Chart 3.12).



Of all government departments in Nova Scotia, the Department of National Defence is by far the biggest, and is one of those most closely tied to the ocean. Total employment is split between military, civilian and reservists, and most spending is either on salaries or on operations.

Department of National Defence: Key Data

Total spending	\$963.5 million
Direct employment	16161
Total payroll	\$764.3 million
Oceans ratio	90%

3.2.2 Department of Fisheries and Oceans

The Department of Fisheries and Oceans has prime responsibility for marine fisheries management and regulation in Canada. This includes scientific research, stock assessment, license issue, patrol and inspection, oceanographic research, hydrographic charting, and many small craft harbours. Since 1995, as well, the Canadian Coast Guard

has been a part of DFO, adding its responsibilities for navigational aids and icebreaking. Other Coast Guard responsibilities include search and rescue, environmental response, marine communications and traffic, and navigable waters protection. Given the size of Canada's offshore management zones, the area under DFO's jurisdiction is quite breathtaking, encompassing large parts of the oceans surrounding Canada.

DFO is the second largest federal department in Nova Scotia, employing more than 2200 people. Along with the Canada-Nova Scotia Offshore Petroleum Board, it is the only department with virtually its entire budget and staffing devoted to oceans-related activities. DFO has been going through extensive review of its operations for the past number of years that is scheduled to continue until 1998/99. This has affected program spending which in fiscal 1994/95 (with Coast Guard included) was \$1.3 billion but will go down to \$1.03 billion in 1998/99, for a decline of 21%.

Department of Fisheries and Oceans: Key Data

Total spending	\$187.6 million
Direct employment	2233
Direct payroll	\$81.5 million
Oceans ratio	100%

3.2.3 Environment Canada

Environment Canada has also witnessed sharp drops in its budgets both in Canada and in Nova Scotia. The department has a wide range of responsibilities, including protection of water, air and soil quality; meteorology; and international environmental agreements. Its budget dropped between 1992/93 and 1995/96 by more than \$500 million, or by about 45% across Canada. A further drop (to \$480 million) is scheduled by 1998/99. This means the department's spending in Nova Scotia has dropped accordingly, and is estimated at only \$15 million in 1997/98, with about 40% of this effort oceans-related.

Environment Canada: Key Data

Total spending	\$6 million
Direct employment	75
Direct payroll	\$3.7 million
Oceans ratio	40%

3.2.4 Nova Scotia Department of Fisheries and Aquaculture

The Nova Scotia Department of Fisheries and Aquaculture is the most important of the provincial departments identified as having an interest in coastal resources. The department has responsibility for expanding the fishing resource base, training, financial support, research and development, market development, aquaculture development and

inland fisheries. In a much wider sense, it is also concerned with ensuring sustainable and viable coastal communities through a balance of economic development interests and sound resource management. The department works closely with DFO in developing the marine sport fishery. Financial constraints have affected the department in the 1990s; its operating budget dropped from \$8.2 million in 1995/96 to \$6.3 million one year later.

Nova Scotia Department of Fisheries and Aquaculture: Key Data

Total spending	\$6.2 million
Direct employment	94
Direct payroll	\$4.0 million
Oceans ratio	88%

3.2.5 Nova Scotia Department of the Environment

This provincial department has an interest in the coastal zone, but it is quite small in budgetary terms. Its involvement in the Gulf of Maine Council on the Marine Environment is an example. The department’s involvement with municipal waste treatment studies in coastal areas, indeed all land-based sources of pollution (residential and industrial developments), have an obvious impact on the coastal zone, but quantifying these is difficult. The department may contract or require environmental assessments in marine areas.

Nova Scotia Department of the Environment: Key Data

Total spending	\$1.4 million
Direct employment	19
Direct payroll	\$0.8 million
Oceans ratio	7.5%

3.2.6 Canada-Nova Scotia Offshore Petroleum Board

This independent federal-provincial agency has a small impact in budgetary terms, but its area of interest is so sharply focused on an oceans resource that the data are included here. CNSOPB is responsible for regulating offshore petroleum resources, including working conditions offshore, protection of the offshore environment during petroleum-related activities, management of offshore oil and gas resources, issuance of exploration and development licenses, and review of offshore industrial benefits and employment opportunities.

Canada-Nova Scotia Offshore Petroleum Board: Key Data

Total spending	\$1.5 million
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Direct employment	13
Direct payroll	\$1.1 million
Oceans ratio	100%

3.2.7 Public Sector: Summary

Government departments and agencies with an identified interest in the coastal zone had a total budget of almost \$1.2 billion in 1994/95, and employed 18,595 people with a total payroll of \$855 million (Table 3.4).

Table 3.4: Summary of Public Sector Oceans-related Data for 1994

Department or Agency	Budget in Nova Scotia (\$ million)	Direct employment	Direct payroll (\$ million)	Oceans Ratio*
Department of National Defence	963.5	16161	764.3	90%
Department of Fisheries and Oceans	187.6	2233	81.5	100%
Environment Canada	6.0	75	3.7	40%
NS Department of Fisheries and Aquaculture	6.2	94	4.0	88%
NS Department of the Environment	1.4	19	0.8	7.5%
Canada-Nova Scotia Offshore Petroleum Board	1.5	13	1.1	100%
Total	1166.2	18595	855.4	90%⁽¹⁾
Note (1) Weighted by spending				

The great weight exercised by the Department of National Defence must be noted, along with the significant impacts of the Department of Fisheries and Oceans. Environment Canada, two provincial departments and the one federal-provincial agency all have significant interests in coastal zone resources.

3.3 SUMMARY DATA: PRIVATE AND PUBLIC SECTORS COMBINED

Combining gross data from both private and public sectors gives a total value of output or spending of \$3.6 billion, total employment of more than 42,000 people, and a total payroll of \$1.4 billion (Table 3.5, page 31). One notable comparison is between employment and payrolls of private and public sectors. Although employment in private sector is higher than public by about one-quarter, total private sector payroll is less than 65% of the public sector. Much of this is due to the weight of fishery sectors in private industry, and the relatively low incomes in these industries. But it also points out how important public sector wages are in Nova Scotia, the spending power they support, and

the critical role many public sector agencies play in oceans management, regulation, and safety.

Table 3.5: Summary of Combined Private and Public Sector Data

Sector	Value of Output/Total spending (\$ million)	Direct Employment	Total payroll (\$ million)
Private	2431.0	23756	552.2
Public	1166.2	18595	855.4
Total	3597.2	42351	1407.6

3.4 OTHER INDUSTRIES: A NOTE

As this research proceeded the project team realized that its coverage of coastal industries was not complete, and that several candidates had either escaped attention, or data were too difficult to find or estimate. This section provides a flag to these industries, and points to the extra effort required in future projects of this nature. In some cases there may be sources of data that have remained hidden, that would provide an indication, or allow a reasonable estimate, of the size of the industries flagged. In others, more extensive survey would have to be undertaken to obtain all four of the sets of key data that are necessary to allow full impact to be done.

Marine Insurance: In a province where fishing and boating in general are so important, vessel and liability insurance assumes an equal importance. Enquiries to both the Insurance Bureau of Canada (Halifax Office); and to the Canadian Board of Marine Underwriters (Etobicoke, Ontario) failed to reveal basic data that would allow estimate of the annual amount of marine-related premiums. An informal check of the Yellow Pages in the South Shore phone book (Lunenburg to Yarmouth counties) indicated that seven insurance agents specified “marine” or “pleasure craft” policies as part of their service, out of a total listed of 24. It is likely more would actually offer these kinds of policies.

R&D and Education: Nova Scotia has made a name for its oceans-related R&D in both government laboratories and in universities and colleges. To these must be added the education and training programs offered in post-secondary institutions. Much of the R&D spending might already be included in the public sector sections of this report, as departments such as National Defence and Fisheries and Oceans have been major sources of funding for such work, but the extent of this and where it went is next to impossible to track down. As an example, DFO in Nova Scotia in 1995/96 disbursed \$2.4 million it received from the Panel on Energy Research and Development, but this money could well have been spent anywhere in Canada¹⁹.

¹⁹ Personal communication from DFO Maritime Region, 1997.

The Bedford Institute of Oceanography (BIO) is only one of several important oceans-related centres of research in Nova Scotia. Dalhousie University's Oceanography Department is another, as is the National Research Council (which has the Halifax-based Institute for Marine Biosciences with an annual operating budget of \$7.2 million and staff of 78 doing research on aquaculture and marine bioproducts) and many other research departments and institutes (like the Oceans Institute of Canada, coordinator of this project, and the International Oceans Institute). Each has a more or less direct interest in oceans-related R&D. A telephone check of five universities and institutes (Dalhousie, InNOVAcorp, National Research Council, Daltech (formerly Technical University of Nova Scotia), and BIO) revealed an estimate of almost \$30 million in research spending. Dalhousie alone estimated about \$8 million a year in R&D²⁰. Other universities in Nova Scotia (including Saint Mary's, St Francis Xavier, and Acadia) also have active oceans-related R&D programs. Published statistics give little indication of the size of marine R&D in Nova Scotia. One imprecise indicator is R&D spending on natural sciences and engineering in institutions of higher education, which indicates totals ranging from \$70 million to \$82 million in each year during the 1990s²¹.

A further aspect of this is the name Nova Scotia has built for itself as organizing and hosting conferences, conventions and workshops on oceans-related topics (like Coastal Zone Canada '94, and the IIIE/MTS Convention held in Halifax in 1997). These bring in people from all over the world, who must be housed and fed while they are here, and who often extend their stay by a few days, or bring family members with them, to take in some of the sights. Some of this spending is captured in the tourism sector, but not all.

Attached to this spending is the higher education aspect. Some of these programs (the Canadian Coast Guard College in Cape Breton, for example) may well already be included in the data above as they form part of larger departments. Others (like university departments, the Nautical Institute at the Port Hawkesbury campus of the Nova Scotia Community College, and other community college programs) have probably escaped measurement.

Telecommunications: Pugh and Skinner have estimated the value of submarine communications in the United Kingdom to be a direct impact of £200 million (\$419 million) in 1994/95, mostly in the manufacture and laying of cables. Nova Scotia can lay claim to being the landfall for several international (Teleglobe Canada) and interprovincial cables, which both provide employment and generate incomes and investment.

Tidal Energy: Nova Scotia Power Inc's pilot tidal power plant at Annapolis Royal has been working for about ten years. One of its aims was to test technology that could be then incorporated in a much bigger tidal power barrage at any one of several places across the Bay of Fundy or its principal arms. Only one of these would have been exclusively Nova Scotian (across Minas Basin), and the others would have been jointly

²⁰ Personal communication from the Oceanography Department, 1997.

²¹ This is from Statistics Canada Catalogue 88-001.

shared with New Brunswick. Although the contribution to Nova Scotia's GDP from the Annapolis Royal plant is quite small (it has a rated capacity of 20MW, and generates about 30GWh a year with a market value of \$2.7 million) any move to build a bigger barrage would be a major commitment of capital, employment, and longer-term income flows, each of which would enhance the oceans' contribution to Nova Scotia's economy.

Environmental Valuations: Estimating these is a difficult aspect of the coastal economy, simply because markets have not yet emerged to any great extent. It is worth mentioning here because part of this project has to do with the interplay between economy and environmental health; because the field of environmental economics is developing rapidly to the extent that commercial markets for environmental attributes are no longer a distant theory; and because markets for these attributes are potentially immense. This can be illustrated by means of a couple of examples.

Firstly, tourism in this project is largely measured by the amount of money visitors spend on things like food, lodging, and buying souvenirs. There is no accounting in this scheme for the value people put on natural attributes that underpin much of Nova Scotia's tourist industry (although part of this would be captured in entry fees to national and provincial parks). It can be estimated by means of surveys, asking people, for example, how much they would be willing to pay to use a beach, taking into consideration such things as clean sand, water, and air.

Secondly, a somewhat similar concept is how much industries or municipalities would pay to use marine environments as a dump for their unwanted wastes. This would bring many thousands of households and much of Nova Scotia's industrial base into the orbit of "coastal industries". There is virtually no treatment of sewage dumped into Halifax Harbour, for example, but estimates of installing such infrastructure have ranged up to \$400 million over the past decade. Apart from the capital cost of this municipal project, there is the ongoing cost of maintaining it, and deciding how much households should be required to pay to use it.

Government Departments: Some public sector agencies, and their oceans-related activities, have been specified in this report. Others have been mentioned earlier in this section under the section of R&D. Still others deserve mention and further investigation. Federal agencies include the Parks Canada division of Heritage Canada, Natural Resources Canada, and Public Works and Government Services Canada. The Harbours and Ports Division of Transport Canada, as well, administered 24 ports in 1994/95, with a complement of 11 full-time staff (payroll of \$640,000) and a further 23 part-time harbour-masters and wharfingers. Revenues from these operations were \$1.2 million, and spending on operations and capital was \$1.7 million²².

An estimate of the role of the province in the oceans came to light late in this research, that not only included the departments of Fisheries and Aquaculture and Environment, but also Agriculture and Marketing; Natural Resources; Municipal Affairs; Justice;

²² Personal Communications from Ports and Harbours, Transport Canada.

Transportation and Public Works; and the Economic Renewal Agency (now Economic Development and Tourism). The combined oceans-related budget for all these provincial departments was about \$24 million in 1995/96, mostly accounted for by Fisheries and Aquaculture; Economic Renewal; Transportation and Public Works; and Environment.

4.0 A BRIEF ANALYSIS AND SUMMARY OF DATA QUALITY

The research team has tried to be as transparent as possible in this project, with respect to data and methods of estimation in particular. Where data have been judged to be less reliable or difficult to obtain than is desired, this has been noted. The following table is a summary of some of these misgivings, and points both to the integrity of audit trails and to the desirability of further research to improve data quality.

Data for each sector are assigned a rating of “A”, “B”, or “C”, which attempts to summarize the data’s quality in terms of accuracy and accessibility or availability. Combinations of ratings (“A/B”, “B/C”) have been used where necessary. Allocation of a lower rating should not reflect negatively on either the sources of the material or the people who provided them to the project team. More, it shows how difficult it sometimes is to gain an accurate picture of coastal industries. Ratings have been assigned by the project team based on their familiarity with the data, and have occasionally been changed on the recommendation of reviewers. Considerations when assigning ratings include the following:

- A rating of “A” refers to data that are easily available, and of high quality, in published form. Regular series of data are generally assigned this rating, collected and published frequently.
- A rating of “B” indicates some misgivings both as to data quality and its availability. Availability, for example, might be from a single survey, conducted sporadically or irregularly, and from which extrapolations may have to be made to characterize the benchmark year.
- A rating of “C” indicates more serious misgivings, for example where data can only be obtained by special request, where extra effort is required within assembling

Sector	Quality Rating
Primary fishing	A
Fish Processing	A
Aquaculture	B
Shipbuilding	A
Boatbuilding	A
Tourism	B/C
Oil and Gas	B
Ports	B/C
Ocean Technologies	B/C
DND	A
DFO	B
Environment Canada	C
NSDFA	B/C
NSDoE	C
CNSOPB	A

agencies to assemble the necessary information, or where estimation techniques involve quite strong assumptions in the absence of better knowledge or intelligence.

Ratings are assigned by sector and not by actual data series. A rating, therefore, refers to quality or availability for an entire sector, even though one or more of the four key series might be of better or worse quality or availability than the whole.

One of the intentions of doing these ratings is to begin to point out where efforts will be required in future projects of this nature.

5.0 EXPLORING THE WIDER IMPACTS OF COASTAL INDUSTRIES: DIRECT, INDIRECT AND INDUCED EFFECTS

The data used to describe coastal sectors so far in this report give a first impression of their importance in Nova Scotia's economy, but they can also be used to show much more. To do this we use the Input-Output (IO) model of the Nova Scotia economy. This section begins with a brief description of the IO model and how it works. (Readers familiar with IO analysis can skip this section and go right to the results of the economic impact modelling in Section 5.2, page 37).

5.1 THE NOVA SCOTIA INPUT-OUTPUT (IO) MODEL

Our approach to measuring the total direct, indirect and induced effects associated with the Nova Scotia coastal resource sector is to conduct simulations with the latest Nova Scotia IO model. IO or inter-industry analysis was developed by the economist Wassily Leontief during the 1930s. It is an empirical representation of a general theory of production based on the notion of economic interdependence. Leontief's original IO table showed how each sector of the economy depends upon every other sector (including households), either to supply its inputs or to purchase its outputs. This is still the basic characteristic of all IO models.

In an IO model each industry in the local economy depends, in principle, on every other industry for the supply of intermediate goods. The ultimate goal of the IO model is to trace the transmission of demand through the economy. The model's operations are somewhat restricted. Firstly, industry production functions are linear and inputs must be used in fixed proportions. In other words, economies and diseconomies of scale are not permitted, as they would require intricate calculation of non-linear functions representing complex and rapidly changing relationships between industries. Secondly, a generally strict assumption of IO models is that prices and wages are fixed and the supply of both intermediate goods and final goods is unlimited. Thirdly, IO models take a long time to construct, and may reflect economic relationships that are slightly out-of-date when they are applied.

Today, IO tables are available for about forty national economies and the number of regional and local IO tables is growing rapidly. The Regional Science Institute can provide IO tables for every American state and many smaller areas. The development of computers and efficient methods of calculation permits a great deal of industrial disaggregation, providing considerable detail on the economic transactions within an economy, and offering some understanding of how demand moves throughout the economy. This is often simulated as a "shock", say a 10% or 20% increase or drop in demand.

The IO model describes impacts in terms of direct, indirect and induced effects. In this impact exercise, the **direct effect** is defined as the total value of output for the specified coastal sectors. The **indirect effect** is defined as the total value of output from other industries in Nova Scotia's economy that supply coastal sectors. This supply includes 'suppliers of suppliers', that is the demand for goods and services includes both direct suppliers to coastal sectors, and to their suppliers. The **induced effect** refers to the additional

industry output that arises as households spend the incomes they earn at the direct and indirect stages, on other goods and services in the Nova Scotia economy. The **total economic value** of Nova Scotia's coastal sectors is measured as the sum of the direct, indirect and induced sales.

Nova Scotia has an enviable record in the use and production of regional IO models. The pioneering work of Kari Levitt resulted in Nova Scotia and the rest of the Atlantic region having one of the first regional IO models in Canada, indeed in North America. Nova Scotia's IO tables were updated in 1974, 1979 and again in 1989. (Updating such massive tables is a major undertaking.) The latest IO model is supported and actively used for policy analysis by the Nova Scotia Department of Finance.

5.2 ECONOMIC IMPACT RESULTS

The impact modelling exercise employed in this project went through extensive review and refinement before the results reported below were determined.

The direct impact stage treats coastal sectors as an aggregation of industries. Accordingly, the value of the output, employment, and payroll from each sector must be adjusted to remove double-counting, or inter-sector sales between and among each coastal industry. For example, some of the value of the output of primary fishing is bought by the fish processing sector. The value of the fish thus sold and bought appears twice in Table 3.3, page 25. We must "net out" this double-counting from primary fishing and all other coastal sectors to represent total sales accurately. The adjusted total sales, employment and payroll of the coastal resource sector are in Table 5.1, page 38, (with sectors ranked from biggest to smallest by output).

Eliminating double counting between and among coastal sectors can only be accommodated so far in the IO model, as it is not sensitive enough to show small amounts. Bigger amounts stand out, though, notably the reductions for primary fishing and boatbuilding (compare the data in Table 5.1, page 38 with those in Table 3.3, page 25). This makes sense, as other coastal sectors within Nova Scotia are the biggest customers of these two sectors (fish processing buys most of the output of primary fishing, and primary fishing in turn buys most of the output of boatbuilding). There are smaller reductions in shipbuilding (probably as the navy and Coast Guard buy the products of shipyards) and in ocean technologies (probably through the purchase of navigation aids and equipment by other coastal sectors).

It should be noted that reducing the size of sectors by eliminating double counting does not diminish the importance of an industry. Neither primary fishing nor boatbuilding, for example, are any less important as sources of incomes or jobs in Nova Scotia simply because they are primary suppliers to other oceans-related industries. As significant intermediate suppliers, their contribution to the capacity of other industries to produce output and make sales makes them key components of the provincial economy.

Table 5.1 Net Output, Employment and Payroll, Coastal Industries 1994

Sector	Net Output (\$ million)	Net Employment	Net Payroll (\$ million)
DND	963.50	16161	764.30

Fish processing	954.80	5800	122.20
Tourism	308.00	3369	86.00
Ports	300.00	2520	87.40
Oil and gas	201.20	293	9.70
DFO	187.60	2233	81.50
Primary fishing	103.47	1797	30.60
Shipbuilding	60.90	632	24.23
Ocean technologies	60.00	1383	48.38
Aquaculture	7.20	394	4.90
NS Fisheries	6.20	94	4.00
Environment Canada	6.00	75	3.70
Boatbuilding	1.54	17	0.39
CNSOPB	1.50	13	1.10
NS Environment	1.40	19	0.80
Total	3163.30	34800	1269.19
Note: The payroll and employment data from this table enter subsequent impact tables in this report as they appear here, equivalent to “direct” impacts. GDP data must be further “massaged” through the IO table to net out inter-sector sales between these and all other sectors.			

The next stage in the IO modelling is to eliminate double counting between coastal sectors and all other sectors in the Nova Scotia economy. This gives us direct and total impacts of coastal sectors using the net figures from Table 5.1 for GDP, household income and employment. A further simulation gives us the impact in terms of exports. It is at this stage of the simulation that the raw numbers presented for all sectors in Tables 3.3, page 25 and 3.4, page 30 are reduced to reflect the goods and services they buy from, and sell to, all other sectors.

5.2.1 GDP Impacts

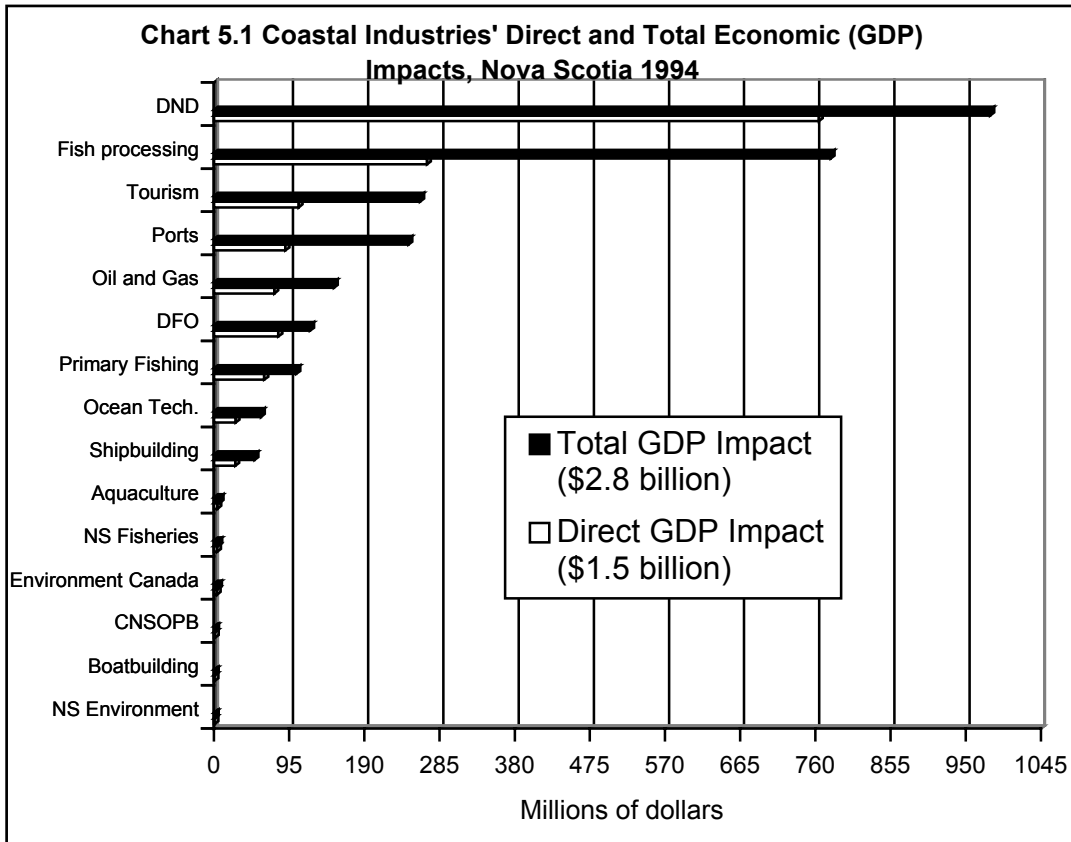
The direct GDP impact of coastal sectors was more than \$1.5 billion in 1994, or 9.6% of Nova Scotia’s total GDP (which, it will be recalled, was \$15.8 billion in 1994). Adding in indirect and induced impacts brings the total impact to almost \$2.8 billion, or 17.5% of total GDP. (All aggregate impacts are summarized in Table 5.6 and Chart 5.5, page 46). Put another way, the direct impact of marine industries in Nova Scotia accounted for about 10 cents of every \$1.00 generated by the provincial economy in 1994. The total impact was almost double this, or about 17.5 cents of every \$1.00 in the provincial economy (see Table 5.2 and Chart 5.1, page 39).

The most important direct and total impacts are in defence and fish processing. These two combine to account for almost two-thirds of total coastal-related GDP impacts. A second tier (tourism, ports, oil and gas, DFO, primary fishing, ocean technologies and shipbuilding) account for most of the rest. The dominance of defence and fish processing, though, should not be a surprise. These are long-established presences in the provincial economy, that depend on the ocean either as a resource or as a medium of operation. The primacy of these two sectors in terms of GDP also carries through to the analysis of household incomes, employment, and exports.

Table 5.2 Coastal Industries - GDP Impacts

Sector	Output (\$ million)	Direct GDP (\$ million)	Total (direct + indirect + induced) GDP (\$ million)
DND	963.50	764.30*	980.89
Fish processing	954.80	269.42	779.30
Tourism	308.00	107.20	260.61
Ports	300.00	90.33	245.76
Oil and gas	201.20	76.35	151.70
DFO	187.60	81.50*	121.49
Primary fishing	103.47	63.70	104.11
Ocean technologies	60.00	27.59	59.47
Shipbuilding	60.90	27.15	51.32
Aquaculture	7.20	4.43	7.24
NS Fisheries	6.20	4.00*	5.36
Environment Canada	6.00	3.70*	5.01
CNSOPB	1.50	1.10*	1.43
Boatbuilding	1.54	0.69	1.30
NS Environment	1.40	0.80*	1.10
Total	3163.30	1522.26	2776.09

Note* Direct GDP for public sector departments and agencies is commonly accepted to be net payroll; see Tables 5.1 (page 38) and 5.3 (page 40).

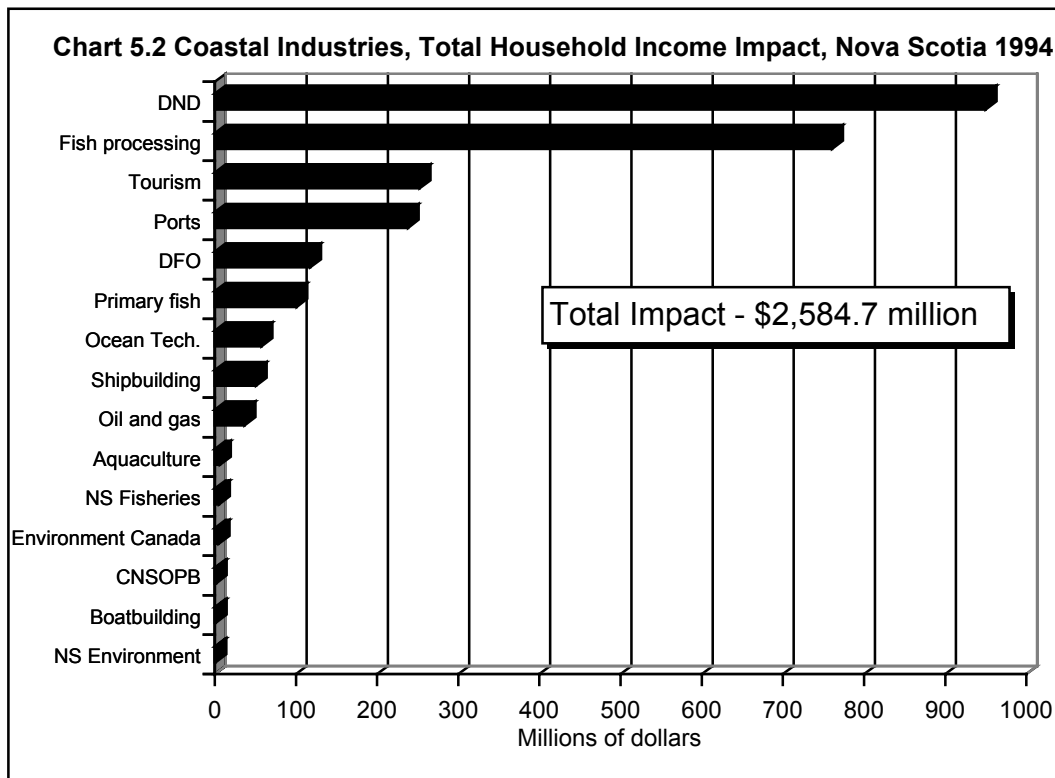


5.2.2 Household Income Impacts

Coastal industries also contribute significantly to household incomes in Nova Scotia (Table 5.3 and Chart 5.2).

Table 5.3 Coastal Industries - Direct and Total Household Income Impacts

Sector	Direct Impact (\$ million)	Total impact (\$ million)
DND	764.30	950.01
Fish processing	122.20	760.59
Tourism	86.00	252.39
Ports	87.40	238.01
DFO	81.50	117.67
Primary fishing	30.60	100.76
Ocean Technologies	48.38	57.60
Shipbuilding	24.23	50.70
Oil and gas	9.70	36.70
Aquaculture	4.90	6.47
NS Fisheries	4.00	5.20
Environment Canada	3.70	4.86
CNSOPB	1.10	1.39
Boatbuilding	0.39	1.28
NS Environment	0.80	1.07
Total	1269.20	2584.70



The direct impact was almost \$1.3 billion in household incomes in 1994, and the total impact \$2.6 billion. These figures represent 12.3% and 24.8% respectively of total wages and salaries in that year. The ranking for household incomes is much the same as for GDP. One sector that drops relative to its position in the GDP ranking is oil and gas (fifth place in GDP, ninth in household income). This reflects the capital intensity of the industry, meaning that employment levels in it are modest relative to value of output.

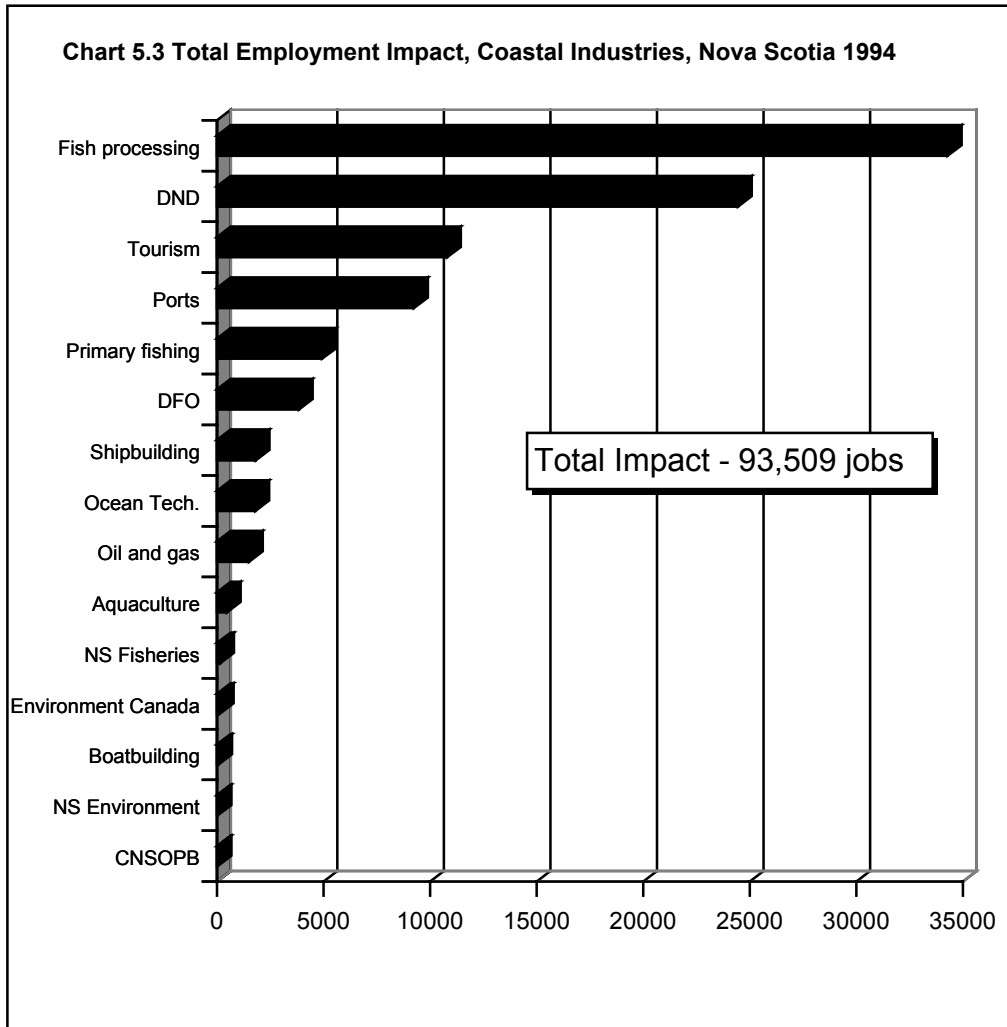
5.2.3 Employment Impacts

Total employment impacts of coastal industries are shown in Table 5.4 and Chart 5.3, page 42. The direct employment impact was 34,800 jobs in 1994, or 9.4% of total employment. The total impact was almost 93,500 jobs, equivalent to one-quarter of provincial employment in 1994. Indeed, as job numbers are calculated in this project as full-time equivalents (FTEs), these percentages will be higher, as only four of five jobs in total in 1994 were full-time. Estimating three part-time jobs as equal to one full-time would result in about 333,000 FTE jobs in Nova Scotia in 1994 (compared with 379,700 full-time plus part time), and computing total oceans-related employment as a proportion of the FTE total means that about 28% of all full-time employment in the province was directly or indirectly linked to oceans-related industries in 1994.

Fish processing is far and away the most important contributor to employment (34,290 jobs directly and indirectly), followed by defence. A strong second tier of sectors includes tourism, ports, primary fishing, and DFO. Ocean technologies move ahead of oil and gas as a source of employment, and almost matches shipbuilding.

Table 5.4 Coastal Industries - Direct and Total Employment Impacts

Sector	Direct Impact	Total Impact
Fish processing	5800	34290
DND	16161	24449
Tourism	3369	10795
Ports	2520	9241
Primary fishing	1797	4929
DFO	2233	3847
Shipbuilding	632	1813
Ocean technologies	1383	1795
Oil and gas	293	1498
Aquaculture	394	464
NS Fisheries	94	147
Environment Canada	75	127
Boatbuilding	17	57
NS Environment	19	31
CNSOPB	13	26
Total	34800	93509



The high multiplier (the ratio of total impacts to direct impacts) for fish processing in terms of both household incomes and employment impacts deserves further comment. The multiplier for all household income, for example, is 2.04, but for fish processing is 6.2. Corresponding figures for employment are 2.7 and 5.9. These are the results of numerous iterations of the simulation exercise, each successively using more refined data. There were numerous consultations with people who deal with fishing industries routinely, and are familiar with their structure. Each time the model was run, a relatively high multiplier resulted for fish processing. Part of this may be due to the IO tables used, that substantially reflect industrial structures in the early 1980s when fishing and fish processing was a very different industry than in the mid-1990s. This may be a case of the IO tables not reflecting current reality, and richly deserves further investigation.

Put another way, fish processing is an important coastal industry in Nova Scotia, but the impact results obtained here may overstate its importance at the provincial level. Considering the status of fish processing in many communities in Nova Scotia, however, gives us a better appreciation of its role in the provincial economy. Very often the fish plant is the only

significant source of income in a small town, and as such underpins almost everything else that is bought and sold there. It not only has extensive direct linkages with the ocean (through the fish harvesting sector) but also with many other industries (machinery, packaging, electrical power, ice-making, transportation). The incomes earned in the plant are spent on a variety of household goods from cars to haircuts. Although the multiplier might seem to be high, much of it can be explained in these terms.

5.2.4 Export Impacts

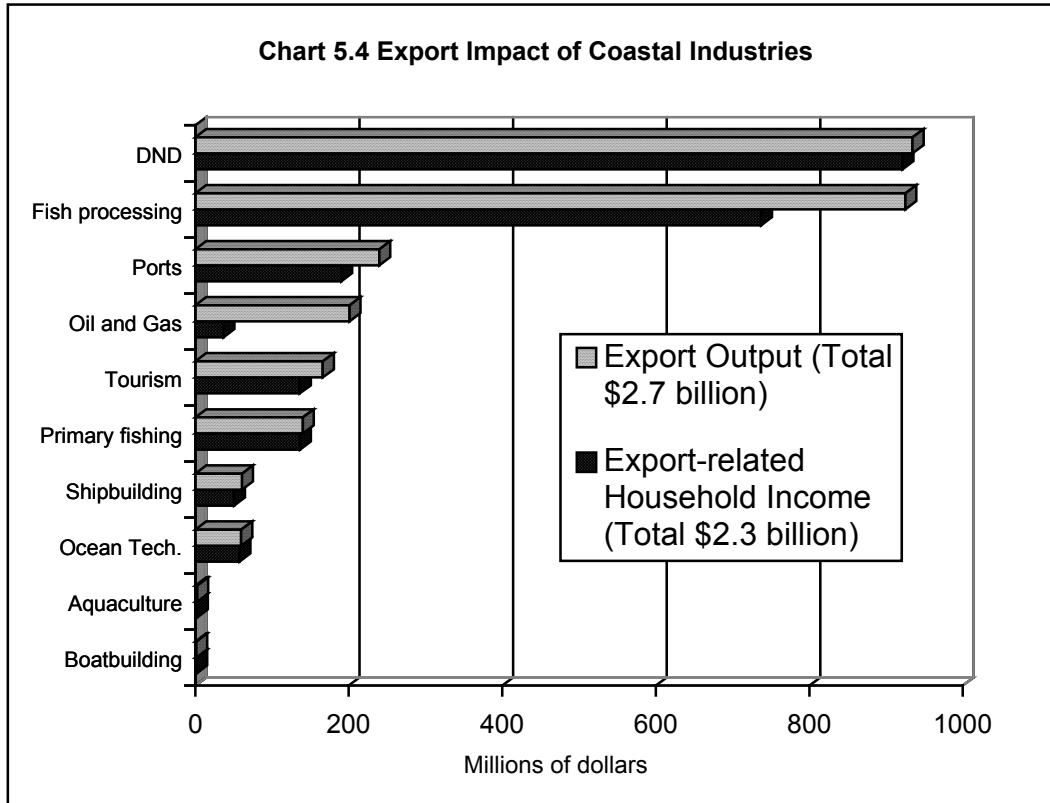
The export impacts of ocean industries are shown in Table 5.5 and Chart 5.4, page 44. (These represent exports outside Nova Scotia, whether to other parts of Canada or to markets outside Canada. This means the Department of National Defence is accounted as a major exporter, as the people in the rest of Canada are deemed to benefit from, and pay for, the department's activities in Nova Scotia.)

Coastal-related exports earned Nova Scotia more than \$2.7 billion in 1994, and contributed \$2.3 billion to household incomes. In the private sector, fish processing dominates coastal-related exports in Nova Scotia, earning more than \$900 million for the province in 1994, with almost \$800 million of household incomes related to these exports. There are significant contributions from ports, oil and gas, tourism, and primary fishing.

Table 5.5 Coastal Industries - Export Impact

	Export Output (\$ million)	Export-related Household Income (\$ million)
DND	934.60	921.50
Fish Processing	925.38	737.16
Ports	240.00	190.41
Oil and Gas	201.20	36.70
Tourism	166.32	136.29
Primary Fishing	140.28	136.62
Shipbuilding	60.90	50.70
Ocean Technologies	60.00	57.60
Aquaculture	2.52	2.26
Boatbuilding	1.54	1.28
Total	2732.74	2270.52

Note: Sectors specified in other tables in this section, but not in this table, are deemed to have no export impact.

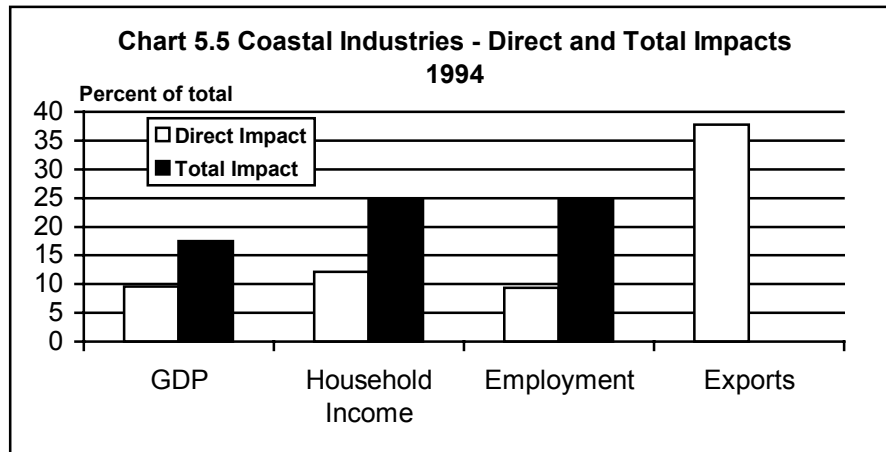


5.3 SUMMARY OF THE IMPACTS

At first blush, the direct GDP impact of coastal industries in Nova Scotia (not quite 10%) appears modest. This is misleading, for at least two reasons. Firstly, as mentioned in the introduction to this report, the estimates for these industries have been done on the low side, both consciously to provide a defensible estimate, and for the reason that some industries are either under-reported or are omitted. Secondly, the direct impact is only the first of several impacts estimated, and will always be the lowest. When incomes earned in coastal industries are spent and respent throughout the economy, the total impact becomes more impressive in terms of GDP, household income, employment, and exports. By any of these measures, coastal industries form an impressive part of the economy of Nova Scotia (Table 5.6 below and Chart 5.5, page 45).

Table 5.6 Summary of Impacts

	Direct Impact (% of total)	Total Impact (% of total)
GDP	9.6	17.5
Household income	12.2	24.8
Employment	9.4	24.6
Exports	37.8	Not Appl.



An indication of the importance of individual sectors can be obtained by aggregating rankings from each of the four major impacts (GDP, household income, employment, and exports, Table 5.7).

Table 5.7 Composite Ranking of Coastal Industries in Nova Scotia

	GDP ranking	Household Income ranking	Employment ranking	Export ranking	Composite ranking (score*)
DND	1	1	2	1	1 (5)
Fish processing	2	2	1	2	2 (7)
Ports	4	3	4	3	3 (14)
Tourism	3	4	3	5	4 (15)
Primary fishing	7	6	5	6	5 (24)
Oil and gas	5	9	9	4	6 (27)
DFO	6	5	6	11=	7 (28)
Shipbuilding	9	8	7	7	8= (31)
Ocean technologies	8	7	8	8	8= (31)
Aquaculture	10	10	10	9	10 (39)
NS Fisheries	11	11	11	11=	11 (44)
Environment Canada	12	12	12	11=	12 (47)
CNSOPB	13	13	15	11=	13 (52)
Boatbuilding	14	14	13	10	14 (51)
NS Environment	15	15	14	11=	15 (55)

Note * Composite score is sum of the four rankings.

This simple ranking puts defence as the most important coastal contributor to Nova Scotia's economy, followed by fish processing. Ports, tourism and primary fishing are third, fourth, and fifth. A surprise of sorts is the high ranking of ocean technologies, eighth equal with shipbuilding and not far behind oil and gas. Oil and gas will increase in importance once the Sable Offshore Energy Project gets under way.

An important point about these overall ranking is that three of the top five coastal industries (fish processing, tourism, and primary fishing) were also identified as *depending* on the sea for their continued prosperity and progress. This is worth

emphasizing here both in terms of their contribution to Nova Scotia's economy, and to reiterate that these industries will not do as well if the resource on which they depend is not managed carefully.

6.0 FUTURE EFFORTS

All of the industries and agencies described and analyzed in this report have one thing in common - the ocean. This brings another overall aspect of this research to the fore, the need to move beyond what this project has done (essentially an economic accounting exercise) to some form of new development paradigm. Nova Scotia is as much sea as land, and it is natural for entrepreneurs to turn towards the water to seek new products and ways of doing things. An increasingly popular way of doing this is to develop a cluster of industries and other institutions (universities, governments), with close and frequent linkages between every part of the cluster. In this way, a “node” of economic and industrial development begins, which once it reaches critical mass can be a potent tool for progress²³. This is not an easy process, but experience from other parts of the world suggests it can be done. An industrial cluster that is centred on the ocean is an obvious development for Nova Scotia, and deserves further investigation.

The linkages in such a cluster could take several forms. Linking boatbuilding with ocean technologies is one, to rejuvenate the former and bring it into line with export opportunities. Aquaculture should also have strong links to boatbuilding, ocean technologies, and universities. Oil and gas extraction should have close ties to ports and shipbuilding, whether to develop structure repair and service industries, or to devise efficient logistics systems to supply offshore drilling platforms. Linkages between primary fishing and fish processing are obvious, but should not be so obvious that we become complacent and believe we have attained some kind of ideal in Nova Scotia. The experience of dwindling stocks in the 1990s should alert us to the fact that ocean resources can be unforgiving to those that build too much dependence on them.

This brings us to the role of government in conserving, regulating and managing oceans and the industries that develop around them. Apart from the Department of National Defence, the most important public sector presence is the Department of Fisheries and Oceans. This is not surprising given the depth and breadth of DFO’s mandate, its oceans-orientation (the department has the lead role in the Oceans Act), and the recent inclusion of Coast Guard responsibilities in the department. The involvement of DFO and other federal and provincial departments in oceans management also reinforces the fact that commercial markets only account for one aspect of marine resources, specifically that in which self-interest (making money) is paramount.

Management of such an important resource demands government involvement, both to ensure that industries that depend on it can be sustained, and also that vital natural systems can be conserved. DFO is not, nor should be, the only public agency involved. Federal and provincial departments all have roles to play, and should constantly examine those roles to make sure they are pertinent and relevant. Cooperation between departments should reduce or eliminate duplication of effort.

²³ The standard reference on industrial clustering is Michael Porter, *The Competitive Advantage of Nations*, Free Press, 1990. See also DRI Canada, *Atlantic Canada: Facing the Challenge of Change*, (with the Atlantic Provinces Economic Council and Canmac Economics Ltd), prepared for the Atlantic Canada Opportunities Agency, 1994.

The fact that this has been an economic accounting also deserves extra attention, more for what this does not include than for what it does. Economic growth is not costless, but in many cases these costs are not really reflected (paid for) in markets; they are observed in terms of pollution, environmental degradation, and loss of habitat. The kind of economics that takes account of these costs is beginning to emerge (see the footnote on Gross Progress Indicator on page 5). Canada, and Atlantic Canada in particular, could very usefully develop this kind of overall accounting, incorporating both economics and the environment, to become a leader in innovative oceans-related analysis.

This has been a pilot project that has used economic impact assessment techniques to estimate the importance of coastal industries in the Nova Scotia economy. Ultimately, whether the project team has achieved its objectives depends on reliability of the data used. In their opinion, this has been accomplished, but this does not preclude the need for further work both to refine data collection and estimation techniques, and to bring in industries that are currently left out due to difficulties in obtaining even the roughest data.

This work is incomplete in another sense: Marine resources are not only important in the economy of Nova Scotia, but also in the economy of the other Atlantic provinces (indeed in Newfoundland are proportionally more important than in Nova Scotia). The ocean laps on the shores of all four provinces, and dealing with it as an environmental and economic entity peculiar to Nova Scotia ignores the inter-relationships that link all four provinces together, indeed with other jurisdictions in Canada and the United States. This project has dealt with the case of Nova Scotia partly to develop a template for further work. Testing this template in the Atlantic or eastern Canadian context is an obvious next step.

There is a strong case to be made, indeed, for this kind of accounting exercise to be done in a national context. On one level, this is because Canada is a maritime nation, which bounds on three oceans. On another level, there is a very practical reason for a national approach. Most statistics for oceans-related activity are much more easy to find at a national level than at a provincial level. Some, in fact, are most difficult to find at anything less than a national level. Considerable time has been spent in this project trying to apportion the “correct” share of a national figure to Nova Scotia. While every effort has been made to make this as accurate as possible, any estimation of this nature inevitably involves leaps of faith and intuition.

The evident conclusion from this work is that coastal industries are important contributors to Nova Scotia’s economy, in terms of GDP, household income, employment and exports. But industries, indeed entire economies, are dynamic and subject to change, often in response to external shocks. Oceans-related industries are particularly vulnerable in this respect, subject as they are to natural as well as market forces. For Nova Scotia to maintain and sustain any economic progress based on the marine environment requires constant attention not only to developing new products and markets based on marine activities, but also to the resource and natural environment that makes this possible - the ocean.

Appendix: Notes on Sources and Methods for Section 3

Primary Fishing

Value of landing data and direct employment are from the Department of Fisheries and Oceans, including the Licensing Division. Direct employment is taken as only full-time fishers. The figure of 8700 is close to the Labour Force Survey's estimate of 8400 employed in primary fishing in 1994. In keeping with the project team's decision to estimate conservatively, and in the absence of any reasonable and consistent method to convert 7400 part-time jobs into full-time equivalents (FTEs), the employment figures under-estimate total FTE employment in primary fishing. Personnel from DFO's Policy and Economics Branch helped refine the data both here and in other parts of this report.

Direct payroll is estimated from Revenue Canada's *Taxation Statistics for Individuals - 1994 Tax Year* (1996). In 1994, 10960 taxable returns reported net fishing income of \$186.6 million, or an average of \$17,025. Multiplying this average by 8700 (the estimated number of direct, full-time fishing jobs in 1994) gives a payroll of \$148.1 million. This means that \$38.5 million (21%) of net fishing income in 1994 is unaccounted for in this analysis. An unknown (probably small) part of this would be vessel profits.

Markets for primary fishing are confused by defining what proportion of landings is bought by Nova Scotia-based plants for further processing. This, in turn, requires some judgment on what constitutes "processing". The proportions allocated here are based on the assumption that only live lobsters are exported in an unprocessed state, and therefore are exports from the primary fishery. This means that a high proportion of fish caught off Nova Scotia are bought by local fish plants. The proportions were derived in consultation with the Marketing Division of the Nova Scotia Department of Fisheries and Aquaculture.

Ultimately, however, most fish caught in Nova Scotia waters, whether classified as primary or processing sector products, are exported. (This does not apply to aquaculture; see below.)

Fish Processing

Value of output is taken from NSDFA's estimates of market values for fish landed in the province. This is derived from a ratio based on average past relationships between landed and market values. Since 1986 this ratio has been \$1.90 in marketed value for each \$1.00 in landings. Market values here are essentially "ex-plant" sales. The figure of \$954.8 million is close to Statistics Canada's figure of the value of shipments from fish plants in 1994 (in catalogue 31-203, *Manufacturing Industries of Canada: National and Provincial Areas*) of about \$1 billion. Direct employment and payroll are from Statistics Canada 31-203. Markets were derived in conjunction with the Marketing Division of the Nova Scotia Department of Fisheries and Aquaculture.

Aquaculture

Data on this sector are scarce, essentially limited to value of output and numbers of licenses, both from NSDFA. Direct employment is estimated in the following way:

1. An estimate of total employment in aquaculture in 1996 is about 900 jobs, 30% full-time, the rest seasonal or part-time. The ratio between the number of jobs and the number of licenses in 1996 (922:369, or about 2.5 jobs per license) is used to estimate total employment for 1994 (332 licenses times 2.5 for a total of 830 jobs, once again both full-time and part-time).
2. Estimating the number of full-time jobs (30% of the total) gives a split of 249:581 full-time:part-time. To convert part-time jobs to full-time equivalents (FTEs), we assumed part-time workers would be hired for enough time to qualify for Employment Insurance, or about 13 weeks, meaning four part-time jobs are equivalent to one full-time job. Dividing 581 by four means about 145 FTEs. Adding this to the number of regular full-time jobs gives a total FTE of 394 in 1994.

Three methods were tested to estimate direct payroll:

1. The average weekly wage in fish plants (\$396.68 in 1994, from Statistics Canada Catalogue 72-002 *Annual Estimates of Employment, Earnings and Hours 1983-1994*. In the absence of an estimate for fish plants in Nova Scotia, the figure above is for fish plants in Newfoundland. The corresponding figure for all Canada in 1994 was \$418.46.) Multiplying the Newfoundland average by total FTE employment in aquaculture gives a total payroll in 1994 of \$6.4 million. This was rejected as being too high, equivalent to 89% of total output.
2. Average fishing income as estimated for primary fishers (from Taxation Statistics as estimated above) was \$17,025. Applying this to aquaculture employment gives a total payroll of \$6.7 million in 1994. This was rejected as being too high, equal to 93% of total output.
3. An “opportunity cost” approach to estimating payroll considers what workers would earn if they held jobs in other industries in the areas in which they live. Mostly, these are small communities or rural areas. Two examples were retail trade (an average weekly wage of \$301.80 in Nova Scotia in 1994); and accommodation food and beverage services (average weekly wage of \$216.49 in 1994). Using the former of these gives a payroll of \$6.2 million in 1994 (86% of output). Using the latter gives a payroll of \$4.4 million (61% of output). The latter of these was chosen as representative, indeed not much more than minimum wage (which would give a payroll figure of \$4.2 million based on a rate of \$5.15/hour).

Markets for aquaculture output differ markedly from those for primary fishing and fish processing in that total output, still being so small, has not justified any appreciable effort to develop export markets. Most output, therefore, is sold locally (65% within Nova Scotia) with most of the balance in the Rest of Canada. These proportions were developed in conjunction with the Marketing Division of NSDFA.

Shipbuilding

Value of shipments, direct employment, and direct payroll are from Statistics Canada 31-203. Markets have been determined partly in conjunction with Industry Canada. Exports in 1994 were estimated at about 5% of output, the rest of output was apportioned within Canada on broad population distribution on the grounds that government work benefits everyone in Canada more or less equally.

We noted that shipbuilding is a “lumpy” industry, sometimes depending on large orders. Drops in output and employment in 1994 can probably be traced to lack of orders in that year, which could make it atypically low.

Boatbuilding

Value of output, direct employment and direct payroll are taken directly from Statistics Canada 31-203. Exports are estimated from Statistics Canada. Market shares were estimated in conjunction with NSDFA.

Tourism

The data used in this report was taken from Nova Scotia Tourism’s Statistical Review series. Surveys indicated that between 35% (*Nova Scotia Visitor Exit Survey 1992*, Nova Scotia Department of Tourism and Culture), and 65% (*1992 Nova Scotia Visitor Traffic Flows 1992*, Nova Scotia Department of Tourism and Culture) of tourism in Nova Scotia is nature-related (including the coastal-related). The lower of these is chosen as representative in this research. Background information on the tourism industry in Canada was provided through the Canadian Tourism Commission’s series of domestic tourism opportunities. Consultation with Department of Economic Development and Tourism personnel helped increase the accuracy of the data.

Oil and Gas

Value of output was taken from Natural Resources Canada. The same data appears in Statistics Canada Catalogue 26-202 and the annual Nova Scotia Statistical Review assembled by the Statistics Division of the Nova Scotia Department of Finance.

Direct employment includes both operator and contractor employment within Nova Scotia as reported by the Canada-Nova Scotia Offshore Petroleum Board (CNSOPB) in its Annual Reports. This document reports on the Nova Scotia Employment and Industrial Benefits as required by the Canada-Nova Scotia Offshore Petroleum Accord Implementation Acts.

Direct payroll is based on figures contained in the CNSOPB’s Annual Reports. The figures summarize annual operating spending on the oil production projects. Payroll is estimated at 25% of these figures, a ratio determined in consultation with the current operator PanCanadian Petroleum Ltd and corresponds with the ratio contained in Mobil

Oil Canada's proposed production phase of Sable Island gas reserves (see Sable Offshore Energy Project, *Socio-Economic Impact Statement*, Volume 4. Chapter 8.)

The oil has been sold on spot markets and through term contracts with various buyers, but none has gone to refineries within Nova Scotia. Irving Oil of Saint John, New Brunswick was a significant buyer in 1993 and 1994, with most of the rest over the balance of the production sold to refineries on the US Gulf Coast or to Dutch buyers (PanCanadian Petroleum). American refiners took 100% of exports outside Canada in 1992-1994, split the export portion 57:43 with Dutch refiners in 1995, and about 20:80 in 1996 when Dutch buyers took most of the output.

These data do not include spending on exploration during the 1990s. Figures on this (a capital rather than an operating expense) are very difficult to estimate. Information in CNSOPB's Annual Reports indicate there were as many as six active exploration licenses in the 1990s, of which four might have included spending during the benchmark year of 1994. The biggest entailed a spending commitment of \$13.3 million before September 30, 1995, by the early operators of the Panuke-Cohasset-Balmoral oil development. Total spending up to September 1996 was as much as \$20 million. Two exploration licenses are currently active, with Mobil Oil Canada alone (principal developer of gas reserves) having committed \$86.4 million in spending on one parcel before 2005. With development of the gas reserves it is likely there will be an increase in exploration spending off Nova Scotia.

Ports

These data refer only to the Port of Halifax, and thus understate the total direct impact of ports in Nova Scotia. They are derived from an economic impact study conducted for the Port of Halifax in 1991²⁴. The data have been updated to the mid-1990s by the Halifax-Dartmouth Port Commission.

Value of output is direct spending at the port on cargo handling, fuel and water, port services, miscellaneous vessel disbursements, cruise passenger spending, crew spending, surface transportation, and general services. Employment and payroll numbers correspond in general terms with these areas of spending. Markets are taken as the origin or destination of containers shipped through the port, as a broad proxy for total cargoes.

Ocean Technologies

Output and employment data are taken from an update to the 1990 Ocean Technology survey compiled by the Nova Scotia Department of Economic Development. Payroll is estimated on the basis of average wages for an experienced worker in instrumentation manufacturing (about \$35,000). Even this might be too low given that many ocean technologies are now service-based, where knowledge is at a premium.

²⁴ Gardner Pinfold Consulting Economists, Port of Halifax Economic Impact Study, prepared for Halifax-Dartmouth Port Development Commission *et al.*, October 1991.

Public Sector

Value of output in the private sector tables is expressed here as total spending.

Department of National Defence

Spending, employment and payroll data are from the Department of National Defence. Data for Nova Scotia have been scaled back by 10% (a 90% oceans ratio). The ratio was estimated in conjunction with DND personnel.

Department of Fisheries and Oceans

These data are for DFO within Nova Scotia as based on estimates from Maritimes Region, Financial Planning and Analysis Division.

Environment Canada

Data have been estimated in conjunction with the Atlantic Office of Environment Canada. The data refer to budget levels for Nova Scotia in the 1997/98 fiscal year. The department's spending and staffing levels for 1994 would be higher (perhaps significantly higher) than indicated. Extrapolating 1997/98 data back to 1994/95 was initially considered, but was subsequently rejected; this would have involved an "approximation of an approximation", compounding any error contained in the first estimate.

Nova Scotia Department of Fisheries and Aquaculture

Data are taken from the Nova Scotia Public Accounts supplemented by Budget estimates from the Nova Scotia Department of Finance and Annual Reports of NSDFA. One division within NSDFA is responsible for inland fisheries, accounting for about 9% of budget. This amount, plus another 3% for the inland fisheries component of other divisions, is used to estimate the oceans ratio.

Nova Scotia Department of the Environment

Data are taken from the Public Accounts of Nova Scotia supplemented by budget estimates from the Nova Scotia Department of Finance. The oceans ratio has been estimated in conjunction with NSDoE staff.

Canada-Nova Scotia Offshore Petroleum Board

Data are from Annual Reports of the Canada-Nova Scotia Offshore Petroleum Board.