The Economic Contribution of Working Waterfronts

Local Estimation and Case Studies
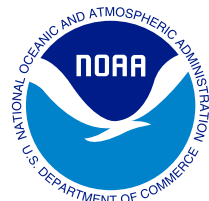
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NOAA's Office for Coastal Management

"Coastal management" is the term used by communities and organizations striving to keep the nation's coasts safe from storms, rich in natural resources, and economically strong. The national lead for these efforts is the National Oceanic and Atmospheric Administration's Office for Coastal Management, an organization devoted to partnerships, science, and good policy. This agency, housed within the National Ocean Service, oversees major initiatives that include the Coral Reef Conservation Program, Digital Coast, National Coastal Zone Management Program, and National Estuarine Research Reserve System.

Introduction

Working waterfronts represent a valuable economic engine for coastal communities, but quantifying this contribution can be challenging. Obstacles standing in the way include an inconsistent definition of which businesses to include in the analysis, and the difficulties of gathering the needed economic data points.

Data produced by the National Oceanic and Atmospheric Administration (NOAA) have helped to remedy this situation on the national stage by defining the ocean and Great Lakes economy and providing time-series data for economic analysis. NOAA's recent data show that the ocean and Great Lakes economy directly supports more than three million jobs and contributes more than $350 billion to the nation's gross domestic product.

NOAA's economic data, however, are only available down to the county level. To help fill the gap for data at a local scale, NOAA worked with partners from the National Working Waterfronts Network and Maine Sea Grant to create a methodology for use by local leaders to estimate the economic contribution of their working waterfronts (interchangeable with "local ocean economy" in this document).

This publication provides background information about this methodology, ideas and information on data sources, estimation options, and implementation case studies. For a step-by-step guide for generating data using two data set examples, please see the companion document, "The Economic Contribution of Working Waterfronts: Step-by-Step Process Guide using Zip-Code Business Patterns Data."

An Ocean and Great Lakes Economy Framework

NOAA uses two statistical data sets to describe the economic activity related to the ocean and Great Lakes economy.

- The first is called Economics: National Ocean Watch, or ENOW, which is based on statistics maintained by the Bureau of Labor Statistics for businesses with one or more employees.
- The second data set captures the activity of self-employed workers and is produced by the Census Bureau using confidential data derived from tax records.

Both data sets provide statistics at county, state, regional, and national scales. Data are available for the years 2005 to 2015 and include the following indicators: number of business establishments, employment, wages, gross domestic product, self-employed workers, and gross receipts by self-employed workers.

These data sets, along with the definitions used to produce them, create a framework that can be replicated and customized for different needs and geographies.

Defining the Ocean Economy Framework with NAICS

As is the case with most economic data produced by national and state statistical agencies, jobs in the two data sets are organized using the North American Industrial Classification System (NAICS).

NAICS codes represent a hierarchical classification system with varying levels of detail. Using two-digit codes provides a general breakdown of economic activity with a broad level of detail, while a six-digit code represents the finest level of detail. An example of the hierarchy is shown in Figure 1 below.
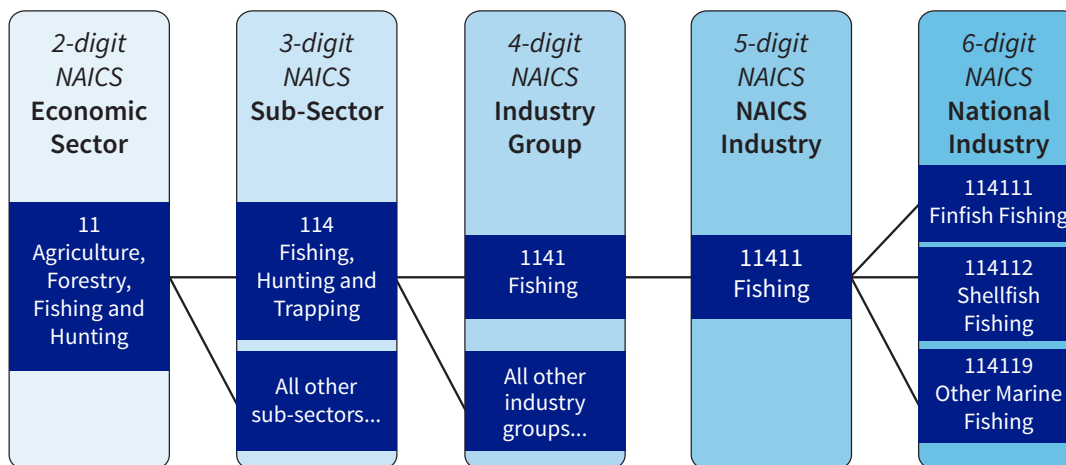
Figure 1. The designation of 2- to 6-digit NAICS code structure – example of the agriculture, forestry, fishing, and hunting industry (NAICS 11)

NOAA's ENOW data are compiled using economic activity at the 6-digit level of the NAICS. NOAA defines an economic activity as ocean- or Great Lakes-dependent if it meets at least one of the following criteria:

- Production of goods or services where ocean and marine resources are an input, such as fishing.
- Production of goods or services that will be used primarily or exclusively in the marine setting, such as marine passenger and freight transportation.
- When the geographic location of the economic activity implies a relationship with the ocean, such as beachfront hotels or warehouses that operate near ports.

In total, ENOW covers 47 such classes of these economic activities, organized into six sectors:
- Living resources
- Marine construction
- Marine transportation
- Offshore mineral resources
- Ship and boat building
- Tourism and recreation

The full ENOW ocean economy framework with its 47 NAICS classes and six sectors can be seen on the next page in Table 1.

Ocean and Great Lakes Economy Sectors and Industries by NAICS Codes

Table 1. ENOW Ocean Economy Framework – Crosswalk table of ENOW Sectors and 6-digit NAICS

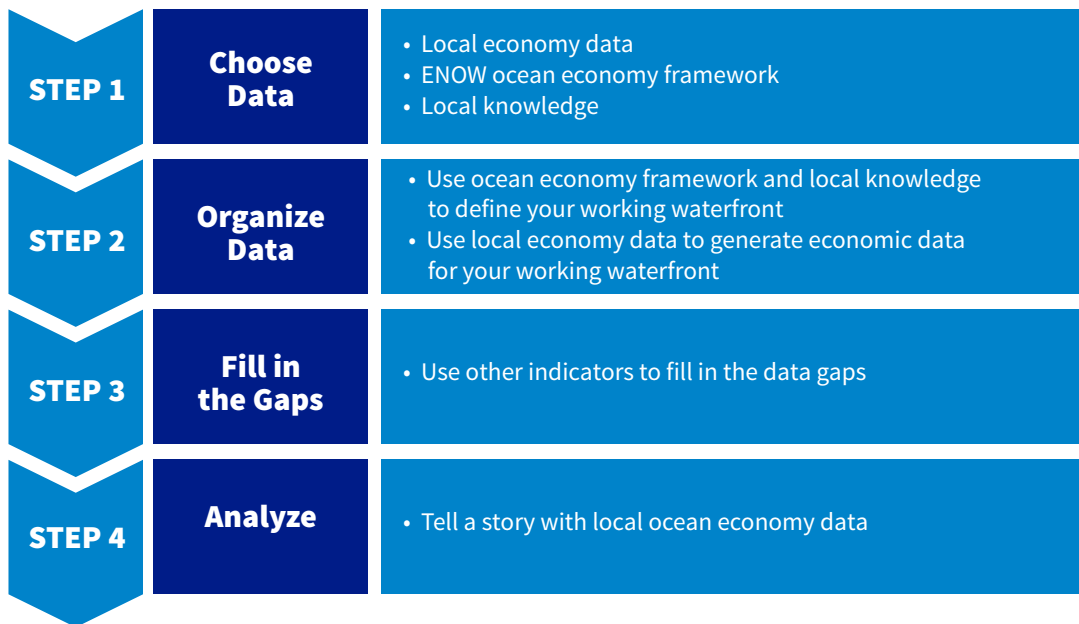| Sector	Industry	NAICS	NAICS Industry (2012 NAICS)
Living Resources	Fish Hatcheries and Aquaculture	112511	Finfish Farming and Fish Hatcheries
		112512	Shellfish Farming
		112519	Other Aquaculture
	Fishing	114111	Finfish Fishing
		114112	Shellfish Fishing
		114119	Other Marine Fishing
	Seafood Processing	311710	Seafood Product Preparation and Packaging
	Seafood Markets	445220	Fish and Seafood Markets
Marine Construction	Marine Related Construction	237990	Other Heavy and Civil Engineering Construction
Marine Transportation	Deep Sea Freight	483111	Deep Sea Freight Transportation
		483113	Coastal and Great Lakes Freight Transportation
	Marine Passenger Transportation	483112	Deep Sea Passenger Transportation
		483114	Coastal and Great Lakes Passenger Transportation
	Marine Transportation Services	488310	Port and Harbor Operations
		488320	Marine Cargo Handling
		488330	Navigational Services to Shipping
		488390	Other Support Activities for Water Transportation
	Search and Navigation Equipment	334511	Search, Detection, Navigation, Guidance, Aeronautical and Nautical System and Instrument Manufacturing
	Warehousing	493110	General Warehousing and Storage
		493120	Refrigerated Warehousing and Storage
		493130	Farm Product Warehousing and Storage
Ship and Boat Building	Boat Building and Repair	336612	Boat Building and Repair
	Ship Building and Repair	336611	Ship Building and Repair

(continued)

Sector	Industry	NAICS	NAICS Industry (2012 NAICS)
Offshore Mineral Resources	Limestone, Sand and Gravel	212321	Construction Sand and Gravel Mining
		212322	Industrial Sand Mining
	Oil and Gas Exploration and Production	211111	Crude Petroleum and Natural Gas Extraction
		211112	Natural Gas Liquid Extraction
		213111	Drilling Oil and Gas Wells
		213112	Support Activities for Oil and Gas Operations
		541360	Geophysical Exploration and Mapping Services
Tourism and Recreation	Boat Dealers	441222	Boat Dealers
	Eating and Drinking Places	722511	Full Service Restaurants
		722513	Limited Service Eating Places
		722514	Cafeterias
		722515	Snack and Nonalcoholic Beverage Bars
	Hotels and Lodging	721110	Hotels (except Casino Hotels) and Motels
		721191	Bed and Breakfast Inns
	Marinas	713930	Marinas
	Recreational Vehicle Parks and Campsites	721211	RV Parks and Recreational Camps
	Scenic Water Tours	487210	Scenic and Sightseeing Transportation, Water
	Sporting Goods	339920	Sporting and Athletic Goods Manufacturing
	Amusement and Recreation Services	487990	Scenic and Sightseeing Transportation, Other
		611620	Sports and Recreation Instruction
		532292	Recreation Goods Rental
		713990	Amusement and Recreation Services Not Elsewhere Classified
	Zoos and Aquaria	712130	Zoo and Botanical Gardens
		712190	Nature Parks and Other Similar Institutions

State and local data commonly identify different types of economic activity using NAICS codes. However, the ENOW framework can be used as a starting point for a nationally consistent baseline and for data tailored to a local scale.

Local Estimation

This section describes the method of estimating the economic contribution of your working waterfront. The method follows the four steps shown in Figure 2 below.

STEP 1	Choose Data	• Local economy data • ENOW ocean economy framework • Local knowledge
STEP 2	Organize Data	• Use ocean economy framework and local knowledge to define your working waterfront • Use local economy data to generate economic data for your working waterfront
STEP 3	Fill in the Gaps	• Use other indicators to fill in the data gaps
STEP 4	Analyze	• Tell a story with local ocean economy data

Figure 2. Flowchart of the method to estimate the economic contribution of a working waterfront

Step 1: Choose Your Base Data

There are several data options to choose from. All have strengths and weaknesses, and understanding the pros and cons of each is important before committing to a data set.

These data sets come from a variety of sources and use different economic indicators. The most commonly used indicators include (but are not limited to) number of business establishments, employment, and wages developed from labor, payroll, business registry, sales, and tax records.

The next sections provide information about potential data sources.

Nationally Available Data

The most basic and most easily accessible data for the local economy are found in the Census Zip Code Business Patterns data set (*www.census.gov/programs-surveys/cbp/data/tables.html*). These data provide the number of business establishments, at the zip code level, for most of the U.S. The data are organized into NAICS codes and can be sorted using the ENOW definition of the ocean economy (the six sectors). Businesses are categorized by employment ranges (1 to 4 employees, 5 to 9 employees, 10 to 19 employees, etc.), which means the values being estimated leave room for uncertainty.

- **Indicators:** establishments, employment
- **Pros:** nationally available; uses NAICS codes
- **Cons:** employment ranges rather than actual numbers of employees

Locally Available Data

Certain states provide data developed by that state's bureau of labor or a corresponding agency. These data can vary in terms of accessibility, data format, and use of NAICS codes.

Here is an example:
Massachusetts provides employment and wage statistics by the 4-digit NAICS industries for each city and town. These data are easily accessible on the website of the Executive Office of Labor and Workforce Development (lmi2. detma.org/lmi/lmi_oes_a.asp).

In other instances, a state or local agency may have a completed economic study. These agencies include but are not limited to regional, state, and local economic development councils, chambers of commerce, departments of labor and workforce, and departments of revenue and taxation.

Here is an example:
Washington's Working Coast Project (www.onrc.washington.edu/ AquaticPrograms/WWC.html) reported a list of ocean businesses for the five Pacific Coast counties in Washington State. These businesses are categorized according to the type of ocean use.

- **Indicators:** variable; includes establishments, employment, and wages
- **Pros:** more specific counts of employees; may contain wage information; may contain spatial information about businesses for mapping
- **Cons:** may not be available to everyone; may not have the same level of industrial detail

Proprietary Data

Private-sector companies are also great data sources. These sources sometimes offer great detail for smaller geographies, but can be costly to access and limited by rules that dictate what can and cannot be shared with the public.

However, there are more economical ways to access these businesses data. These approaches include working with universities and research institutes on an educational license, or working with communities or business analysts who already have a subscription to these resources.

- **Indicators:** establishments, employment, wages, and sales
- **Pros:** more data detail; may contain spatial information about businesses for mapping
- **Cons:** can be cost-prohibitive; restrictions may apply for publishing information

Step 2: Organize the Data

To provide an adequate estimation for the economic contribution of local working waterfront, three things are needed: 1) the ENOW framework for defining and organizing the data; 2) local economic data; and 3) local knowledge.

Use Ocean Economy Framework and Local Knowledge to Define Your Working Waterfront

The ENOW ocean economy framework defines the most common ocean industries consistently across the nation. This is a good starting place, but there can be other industries or jobs to consider.

Here is an example:

The harbor planners of the City of Gloucester, Massachusetts, identified grocery product wholesalers, an industry that is not characteristically ocean-dependent, as a group that nearly exclusively supports the sale of fish and shellfish in their community. Therefore, they added grocery product wholesalers into the ENOW ocean economy framework for their analysis.

The locally defined framework, relying on local knowledge, will be used next in generating economic data for your working waterfront.

Use Local Economy Data to Generate Economic Data for Your Working Waterfront

Depending on the availability of local statistics and the extent of their attributes, there are several options for deriving economic data for local working waterfronts.

Here is an example:

If you are working with Census Zip Code Business Patterns data, you can follow the detailed steps in the companion document, "The Economic Contribution of Working Waterfronts: Step-by-Step Process Guide using Zip-Code Business Patterns Data."

Option 1: If the available data use the 6-digit NAICS or an equivalent classification system, the local-defined ocean economy framework can be directly used to sort the data, categorize the ocean sectors, and estimate the total ocean-dependent portion of the local economy.

Option 2: If economic data are aggregated in higher-level industry groups, such as at 4- or 5-digit NAICS codes, the industry groups that contain one or several ocean industries could be used to match with corresponding sectors in the ocean economy framework and demonstrate the ocean-dependent portion of the local economy.

Table 2. Crosswalk Table of ENOW Sectors and 4-digit NAICS

4-digit NAICS	Corresponding ENOW Sector	4-digit NAICS	Corresponding ENOW Sector
2379	Construction	3399	Tourism and Recreation
1125	Living Resources	4412	Tourism and Recreation
1141	Living Resources	4872	Tourism and Recreation
3117	Living Resources	4879	Tourism and Recreation
4452	Living Resources	5322	Tourism and Recreation
2111	Minerals	6116	Tourism and Recreation
2123	Minerals	7121	Tourism and Recreation
2131	Minerals	7139	Tourism and Recreation
5413	Minerals	7211	Tourism and Recreation
3366	Ship & Boat Building	7212	Tourism and Recreation
4931	Transportation	7221	Tourism and Recreation
3345	Transportation	7222	Tourism and Recreation
4831	Transportation	7211	Tourism and Recreation
4883	Transportation		

While the 4- or 5-digit NAICS industry groups lump non-ocean activities together with the ocean activities, therefore causing an overestimation, these industry groups are the closest approximation of the 6-digit NAICS ocean industries.

Option 3: If the available economic data do not have suitable indicators, additional computation is required to make them usable for decision-making.

Here is an example:

Zip Code Business Pattern data provide the number of businesses by the range of employment size. To get the total employment, an average needs to be derived by multiplying the midpoint of the employment size range by the total number of businesses in each employment size category.

Option 4: If a list of businesses is available but not classified by NAICS or an equivalent classification system, additional research is required to sort the data and find out each business' corresponding 4- or 6-digit NAICS code.

Then the data can be aggregated by ocean industries and sectors according to the locally defined ocean economy framework.

Option 5: If no economic data are available at a local scale, ENOW data can be downscaled by applying local factors.

Step 3: Fill In the Gaps

To get a full picture of the economic contribution of working waterfronts, it is necessary to consider a broader base of information.

Dig Deeper into Important Industries, Especially Fisheries

In addition, there are further data resources available to give a deeper understanding of what the ocean-dependent jobs support. Supplementary information can be used to show the value and tonnage of cargo moving through ports, barrels of oil produced, and number of fishing vessels, to name a few items. A list of potential additional data resources can be found in *Appendix A*.

For most industries, employment data will cover the majority of the people involved in the activity. For commercial fishing, however, most people involved with this job category are self-employed. Finding supplemental data that capture the economic impact of fishermen is essential. A variety of resources are available from different agencies, both federal and local. These additional data resources, such as information from the regional statistical cooperatives, license data, and catch-landing data, will give a more in-depth picture of how many people are involved in the fisheries.

Identify Additional Indicators for Ocean Activities Not Reflected in NAICS

Certain industries, such as government agencies (Navy, NOAA, and Coast Guard) and educational research facilities (Darling Marine Lab, Woods Hole Institute) cannot be classified as ocean-dependent based on NAICS codes.

These activities are generally classified under general categories, such as government and education. Finding other ways to describe these resources is important to show the full picture of what is involved in the working waterfronts.

Caveats about Supplementary Indicators

The additional data resources are extremely valuable to give a better understanding of local working waterfronts. They may, however, require additional effort to create a truthful estimate of the economic impact of their industries. For example, if you have access to fishing license data, you may need to identify unique fishermen involved in different fisheries to avoid double-counting.

Besides, these data resources use economic indicators that are very specific to each industry. Thus, additional computation may be required to present supplementary indicators in a consistent manner.

More caveats and best practices are explained in *Appendix B*.

Step 4: Analyze

Data alone are not enough; good stories can help better demonstrate why and how we need to maintain and develop our working waterfronts.

Tell a Story with Data

Statistics by themselves are useful, but creating a cohesive narrative around the numbers can be much more powerful. For example, the tourism and recreation sector usually accounts for a large percentage of the local ocean economy. In many cases, tourism is heavily reliant on healthy ocean and coastal ecosystems. Tourism is also closely dependent on cultural heritage and traditional ocean activities, such as lobstering and shrimping.

Tourism supports many part-time and seasonal jobs, and provides entry-level jobs for young workers. The tourism story demonstrates the need to maintain a good balance between nature and sustainable development.

Be Clear Communicating Assumptions Made

All methods of processing source data will introduce a certain level of error. Some data-processing errors can be avoided using better indicators and methods; if the errors are not avoidable, they need to be well explained.

Here is an example:
In the case of Census Zip Code Business Patterns, the midpoints of employment ranges are used as proxy for the actual counts of employees per business. However, for some areas with small populations and many small businesses, using midpoints can dramatically overestimate the employment totals. Therefore, the midpoints should be adjusted to adapt to individual cases.

When communicating about estimation methods and outputs, a short explanation is recommended to clarify all the caveats and demonstrate that the approximations are the closest possible values to reflect your working waterfront economy. More caveats and best practices are explained in *Appendix B*.

Describe the Things You Can't Easily Count

Another essential factor to consider is the nonmarket (less formal and non-cash transaction) activities of the ocean and Great Lakes resources. These are the values associated with goods and services not well represented in the traditional marketplace, such as healthy fish stocks, scenic vistas, and the production of oxygen.

While these items are not easy to provide a specific value to, they should be considered and described as part of what supports or drives the ocean economy. *Appendix C* contains a list of resources that provide valuable guidance for data analysis and telling stories.

Case Study: Gloucester, Massachusetts

Issue

Gloucester, Massachusetts, is one of the oldest fishing communities in the U.S. After experiencing a decline in its fisheries over the last 30 years, Gloucester and its Harbor Plan Committee recognized the need to diversify its maritime economy. An initial assessment showed only 140 fishing jobs as part of the waterfront economy. Knowledge of ocean-dependent industries and jobs was essential to making the case for investment in the community's working waterfront, so an economic analysis was needed to accurately reflect the maritime workforce.
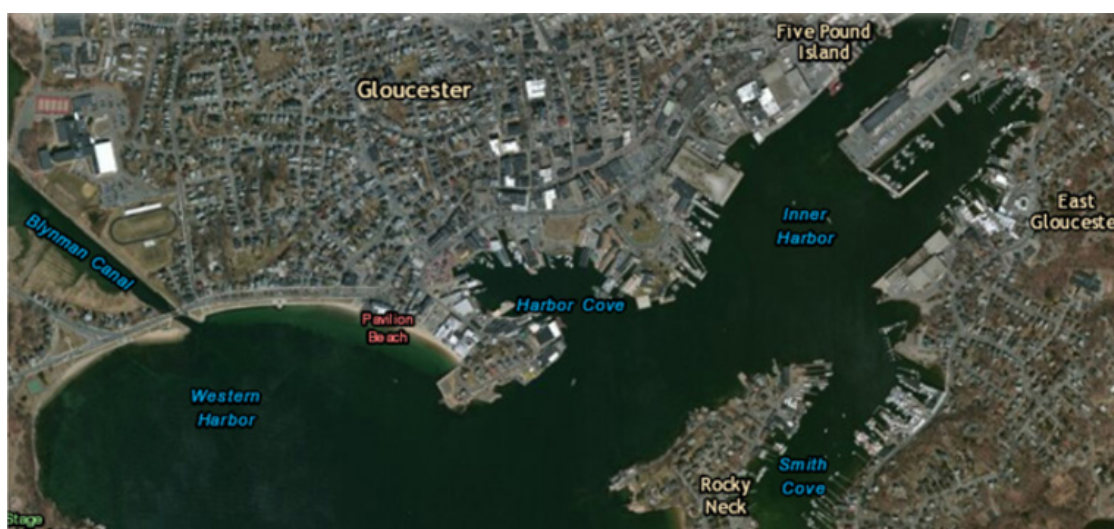
Figure 3. *City of Gloucester's working waterfront*

To achieve its goals, the committee sought better data to accurately characterize and identify the strengths of the maritime sector in order to help develop new, diverse maritime companies.

Choosing Data

Local economic data from Massachusetts' Executive Office of Labor and Workforce Development include employment and wages statistics classified by 4-digit NAICS codes. The data set includes the same indicators as ENOW source data but discloses information at smaller geographic scales than ENOW, such as cities and town.

Organizing Data

Gloucester's harbor planning director worked with NOAA's Office for Coastal Management to identify ocean industries using the ENOW framework, as well as some additional industries that were specifically part of the working waterfront in Gloucester. Local knowledge identified that grocery product wholesalers nearly exclusively supported the sale of fish and shellfish product in the community. For this reason, this class of economic activity was added to generate a localized ocean economy framework.

The NAICS codes identified for the Gloucester working waterfront were applied to employment and wages from the state's labor office. The data were sorted and summarized by ocean industries. Each industry was designated with an approximate ENOW ocean sector, and finally, an economic profile was created for Gloucester's working waterfront.

Analysis

Gloucester's working waterfront economic profile is shown in Table 3. Compared with the initial estimate of 140 fishing jobs, the analysis found that 2,300 of the 10,000 jobs in the city could be identified as ocean-dependent.

Table 3. Estimated Contribution of Ocean Industries to Gloucester's Economy in 2011

| Approximate Sector	NAICS	Industry Description	Employment	Total Wages
Living Resources	1141	Fishing	125	7,131,226
Living Resources	3117	Seafood Product Preparation & Packaging	561	40,927,222
Living Resources	4452	Specialty Food Stores	74	2,572,677
Offshore Minerals	5413	Architectural and Engineering Services*	44	2,568,877
Tourism & Recreation	4872	Scenic/Sightseeing Transportation, Water	46	904,235
Tourism & Recreation	7121	Museums, Parks and Historical Sites	39	1,034,303
Tourism & Recreation	7139	Other Amusement & Recreation Industries	151	4,312,872
Tourism & Recreation	7211	Traveler Accommodation	93	1,629,139
Tourism & Recreation	7221	Full-Service Restaurants	590	10,583,209
Tourism & Recreation	7222	Limited-Service Eating Places	362	5,440,749
Marine Transportation	4883	Support Activities for Water Transport	7	295,024
Marine Transportation	4931	Warehousing and Storage	NA	NA
Marine Transportation	4244	Grocery Product Merchant Wholesalers*	203	12,551,310
Marine Transportation	4842	Specialized Freight Trucking*	NA	NA
All Ocean Sectors	-	Total	2,295	89,950,843

Additional activities added to Gloucester's ocean economy framework.

With the ENOW framework and county-level ENOW data, harbor planners were able to identify ocean-related businesses at a city level and create an economic profile for Gloucester's working waterfront. Through this analysis, the City of Gloucester changed the local discussion regarding the long-term viability of its working waterfront and moved forward with planning for emerging and diverse markets.

Case Study: Olympic Peninsula, Washington

Issue

The Olympic Peninsula, which is located in the northwest corner of the State of Washington, has two major water bodies that face different policy issues. Some parts of Clallam and Jefferson Counties border the Pacific Coast while the other parts border the non-Pacific areas along the Strait of Juan de Fuca and Puget Sound, as shown in Figure 4. Washington Coastal Marine Resource Committees conducted a project called Washington's Working Coast in collaboration with the Olympic Natural Resources Center, Washington Department of Natural Resources, and other organizations to identify and address the differences between the areas.
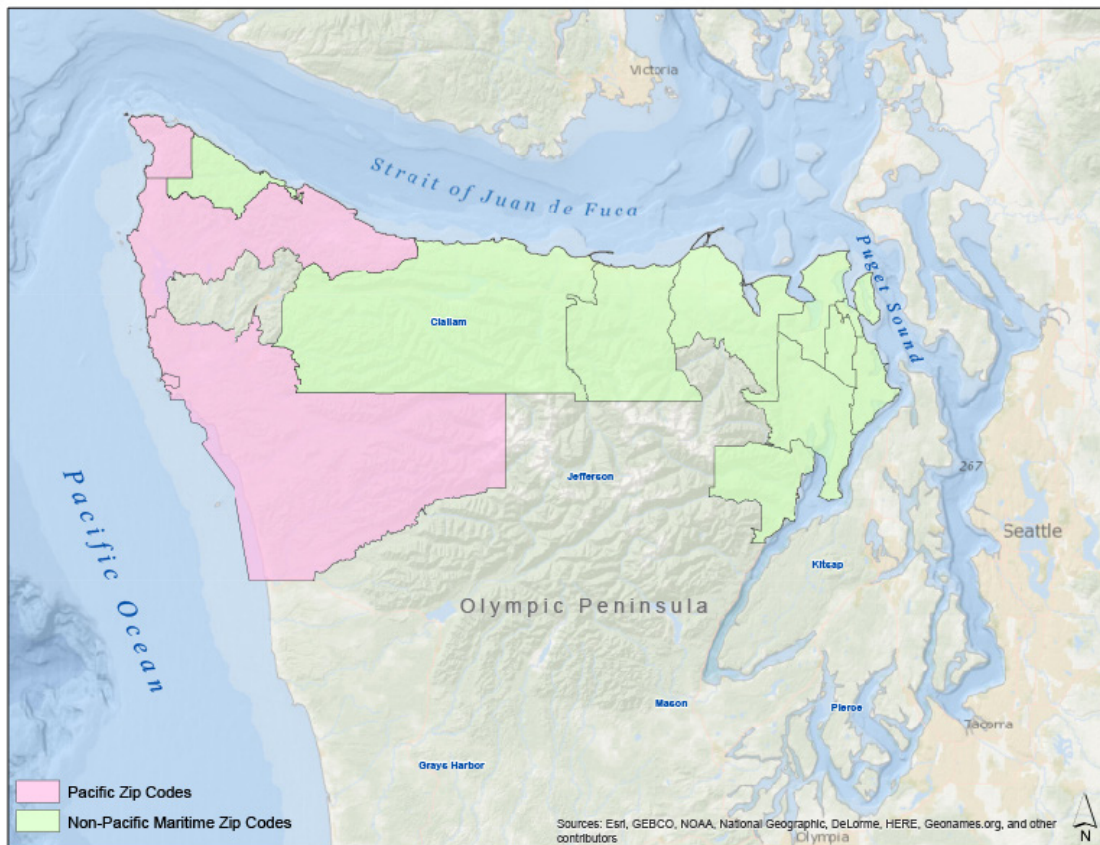
Figure 4. Pacific-adjacent zip code areas and non-Pacific zip code areas

Local decision makers were having difficulty finding data needed to address the different issues facing areas along the outer coast of the Olympic Peninsula and the non-Pacific areas along the strait and the sound. Completing an economic analysis of the marine-based sector and the challenges it faced was recognized as an important need. However, local decision makers faced a challenging roadblock when trying to compare these two coastal zones of their state.

Choosing Data

- ENOW
- Census Zip Code Business Patterns

Organizing Data

Ocean economy data from ENOW for Clallam and Jefferson Counties included all the working waterfront activities for those counties, but did not distinguish between activities within those counties that occurred on the Pacific Coast or on the strait and sound. Census Zip Code Business Pattern data for these counties were classified into ocean sectors using the same NAICS codes used in ENOW. The resulting employment ranges from the Census data were used to define a ratio of ocean economy activity for each water body, and that ratio was applied to the ENOW ocean economy data for the two counties.

Table 4 and Table 5 show the two counties' ocean economy by Pacific Coast area and non-Pacific area, distributed according to the ratio.

Table 4. Clallam County Ocean Economy by Area

Area	ZBP* Ratio	Establishments	Employment	Wages	GDP
Clallam	100%	265	3044	$75,882,186	$156,357,487
Clallam – Pacific	4%	11	122	$3,035,287	$6,254,299
Clallam – non-Pacific	96%	254	2922	$72,846,898	$150,103,188

*ZBP = Zip Code Business Pattern

Table 5. Jefferson County Ocean Economy by Area

Area	ZBP* Ratio	Establishments	Employment	Wages	GDP
Jefferson	100%	146	1367	$27,276,307	$64,253,907
Jefferson – Pacific	14%	21	198	$3,947,886	$9,299,907
Jefferson – non-Pacific	86%	125	1169	$23,328,420	$54,953,999

*ZBP = Zip Code Business Pattern

Filling in the Gaps

Washington's Working Coast Project also developed a list of ocean-use businesses for the five Pacific Coast counties using local sources of data. The local data provided a list of business with names, addresses, and other information for spatial mapping. However, the business list was not classified by industry.

Assessment of business names was combined with local knowledge to classify each business according to the type of ocean use. Then, ENOW sectors were assigned to Wahkiakum County's businesses as an example of how to identify and categorize individual ocean-related businesses, as shown in Table 6.

Table 6. Example List of Wahkiakum County's Coastal Businesses, 2012

Approximate Sector	Business Name	Ocean Use	Notes
Living Resources	Brittany Enterprises	Finfish Fishing	
Living Resources	Fishing Vessel Ida W II	Shellfish Fishing	Possibly self-employed
Living Resources	Kent Martin	Fish and Seafood Markets	
Living Resources	C&H Smoked Fish	Fish Processing	
Marine Transportation	Port District #1	Port and Harbor Operations	
Ship and Boat Building	Jacob's Northwest	Marine Mechanic	Possibly self-employed
Ship and Boat Building	Troy Blix	Marine Welding	Possibly self-employed
Tourism and Recreation	Cathlamet Boat Rentals Inc	Recreational Goods Rental	
Tourism and Recreation	Bradley House Inn	Accommodations	Possibly self-employed
Tourism and Recreation	Earl & Shirley's Riverview	Restaurant	
Tourism and Recreation	Peterson's Outfitting & Guide Services, Inc.	Recreational Fishing	
Marine Construction	Consolidated Diking District No. 1	Other Specialty Contractors	
Not Ocean Industry	Cary Brown	Backyard Mechanic	Not ocean-related
Not Ocean Industry	Cathlamet Realty West	Realtors	Not directly ocean-related
Not Ocean Industry	The Gray River Café	Restaurant	Not shore-adjacent
……..	……..	……..	……..

The list suggests that many people working in the living resources sector were self-employed fishermen, with at least three family businesses identified. Some businesses identified by this project as tourism-related were not directly ocean-dependent; they either were financial agencies located in shore-adjacent areas but not connected to any ocean sectors, or restaurants and hotels not located in shore-adjacent zip codes.

Analysis

The results indicated that the Pacific Coast accounted for only 4 percent of Clallam County's ocean-dependent activity and 14 percent of the ocean-dependent activity of Jefferson County. Most of the ocean-dependent economic activities in these counties were focused on the Strait of Juan de Fuca and Puget Sound.

This study demonstrates the process to scale and transfer the ENOW framework. It also serves as a model for other local users to customize ENOW county data to support investment in more resilient and thriving working waterfront initiatives.

Case Study: Harpswell, Maine

Issue

To develop a method of using the ocean economy framework to estimate the economic contribution of local working waterfronts, Maine Sea Grant and the Office for Coastal Management developed a pilot study that included a step-by-step process guide with examples of how to analyze the results. The area of Harpswell, Maine, was selected by local partners to test the process.

Choosing Data

- Census Zip Code Business Patterns

Maine provides employment and wage statistics through the Center for Workforce Research and Information for cities and towns within the state. However, the data are only available at the 2-digit NAICS (economic sector) level.

Because of this, the Census Zip Code Business Pattern data were the source used in this analysis.

Organizing Data

The Zip Code Business Pattern data were sorted directly using the NAICS codes from the ENOW framework. Then the data were summarized by ocean sectors for all coastal zip codes in Maine, as well as for the three local Harpswell zip codes, as shown in Figure 5. The state-level data were used as a baseline comparison for the Harpswell area.
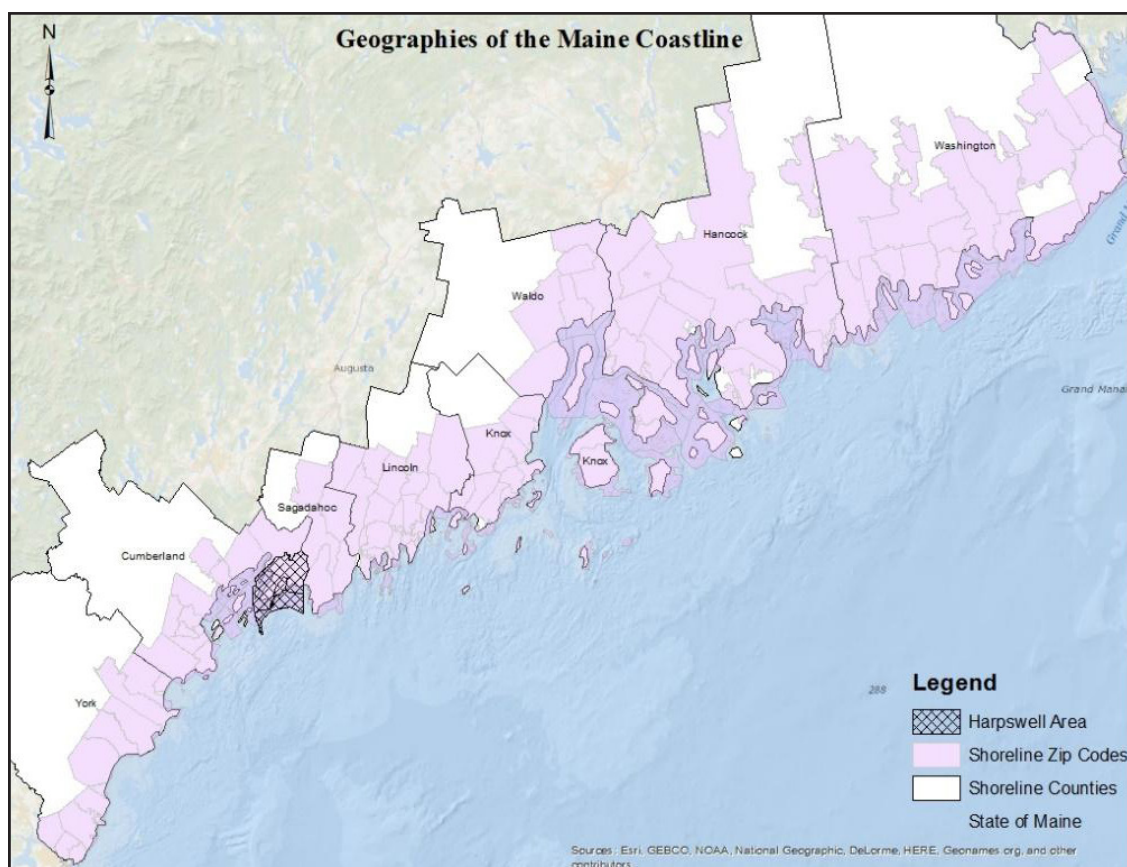
Figure 5. Harpswell and shore-adjacent zip code areas in the coastal counties of Maine

There are eight coastal shoreline counties of Maine (Cumberland, Hancock, Knox, Lincoln, Sagadahoc, Waldo, Washington, and York) and 142 shore-adjacent zip code areas in these counties. Of these shore-adjacent zip code areas, 69 (49 percent) had at least one ocean-dependent business establishment.

The town of Harpswell is in Cumberland County, within Casco Bay in the Gulf of Maine. The town includes three of the state's 142 shore-adjacent zip code areas—Bailey Island, Great Island, and Orr Island (zip code areas: 04079, 04003, 04066).

Analysis

The results show that shore-adjacent zip code areas have 1,837 business establishments that depend on ocean resources, employing 22,657 people. As seen in Table 7, the ocean sectors of shore-adjacent zip code areas, including the hotel and restaurant industry, accounted for about 1 in 10 employees in Maine. Excluding the hotel and restaurant industries, the ocean sectors in shore-adjacent zip code areas accounted for 1 in 49 employees in Maine.

Table 7. The Economic Contribution of the Ocean Sectors to Maine's Shore-Adjacent Zip Code Areas in 2014

Ocean Sectors	Business Establishments	Employment
Marine Construction	12	92
Living Resources	330	1,634
Offshore Mineral Resources	3	9
Ship and Boat Building	42	640
Marine Transportation	35	1,013
Tourism and Recreation, Including Hotels and Restaurants	1,415	19,269
Tourism and Recreation, Excluding Hotels and Restaurants	201	1,275
All Ocean Sectors, Including Hotels and Restaurants	1,837	22,657
All Ocean Sectors, Excluding Hotels and Restaurants	623	4,663
Total Economy for Maine's Shore-Adjacent Zip Codes	19,032	229,187

The Town of Harpswell, as shown in Table 8, supported 146 businesses and employed 419 people. The ocean sectors of Harpswell supported about 44 business establishments and employed about 168 people (Zip Code Business Pattern), accounting for approximately 40 percent of the total employment in Harpswell. Excluding the hotel and restaurant industries, the ocean sectors accounted for 29 percent of employment in Harpswell.

Table 8. The Economic Contribution of the Ocean Sectors to the Town of Harpswell, Maine

Ocean Sectors	Business Establishments	Employment
Marine Construction	2	6
Living Resources	26	78
Offshore Mineral Resources	0	0
Ship and Boat Building	0	0
Marine Transportation	0	0
Tourism and Recreation, Including Hotels and Restaurants	16	84
Tourism and Recreation, Excluding Hotels and Restaurants	2	38
All Ocean Sectors, Including Hotels and Restaurants	44	168
All Ocean Sectors, Excluding Hotels and Restaurants	30	122
Total Economy for Harpswell	146	419

The figures above are limited to employed workers in ocean sectors. Therefore, for the living resources sector, another data set would be needed for a more complete picture of the fishing jobs.

According to Zip Code Business Pattern data, tourism and recreation accounted for over 85 percent of the total business establishments and employment in Maine's shore-adjacent zip code areas (Figure 6). Hotels and restaurants are leading industries in this sector. To avoid the large number of hotels and restaurants skewing the significance of other activities, local partners have expressed the need for reporting separate figures for businesses in the tourism and recreation sector that do not include hotels and restaurants.

INCLUDING HOTELS AND RESTAURANTS

EXCLUDING HOTELS AND RESTAURANTS

Living Resources
Marine Transportation
Ship and Boat Building
Marine Construction
Offshore Minerals
Tourism and Recreation
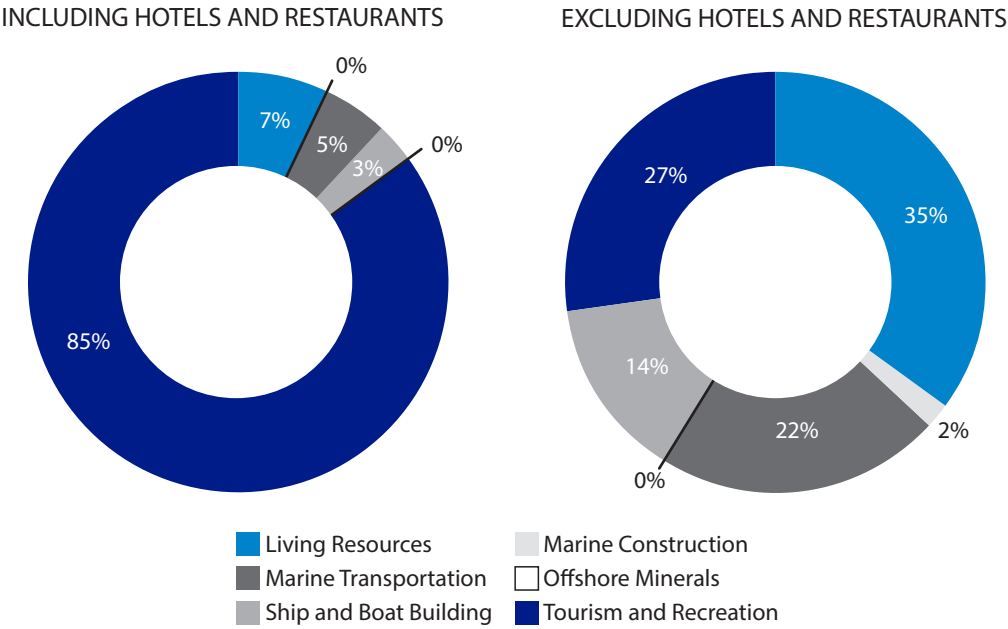
Figure 6. Distribution of ocean-dependent employment in shore-adjacent zip code areas

With hotels and restaurants excluded, tourism and recreation becomes a less dominant part of the ocean economy. Nevertheless, the contributions of other industries in this sector, such as recreational boating and fishing, marinas, and water sports equipment rentals, are clearly represented. The contributions of other ocean sectors are also more visible. For example, living resources moved up as the largest contributor in Maine's ocean economy.

The geographic distribution of ocean-dependent employment and the share of total employment within each zip code area varies. As expected, zip code areas with greater population have more ocean-dependent jobs, especially in large municipalities such as Portland (Figure 7).
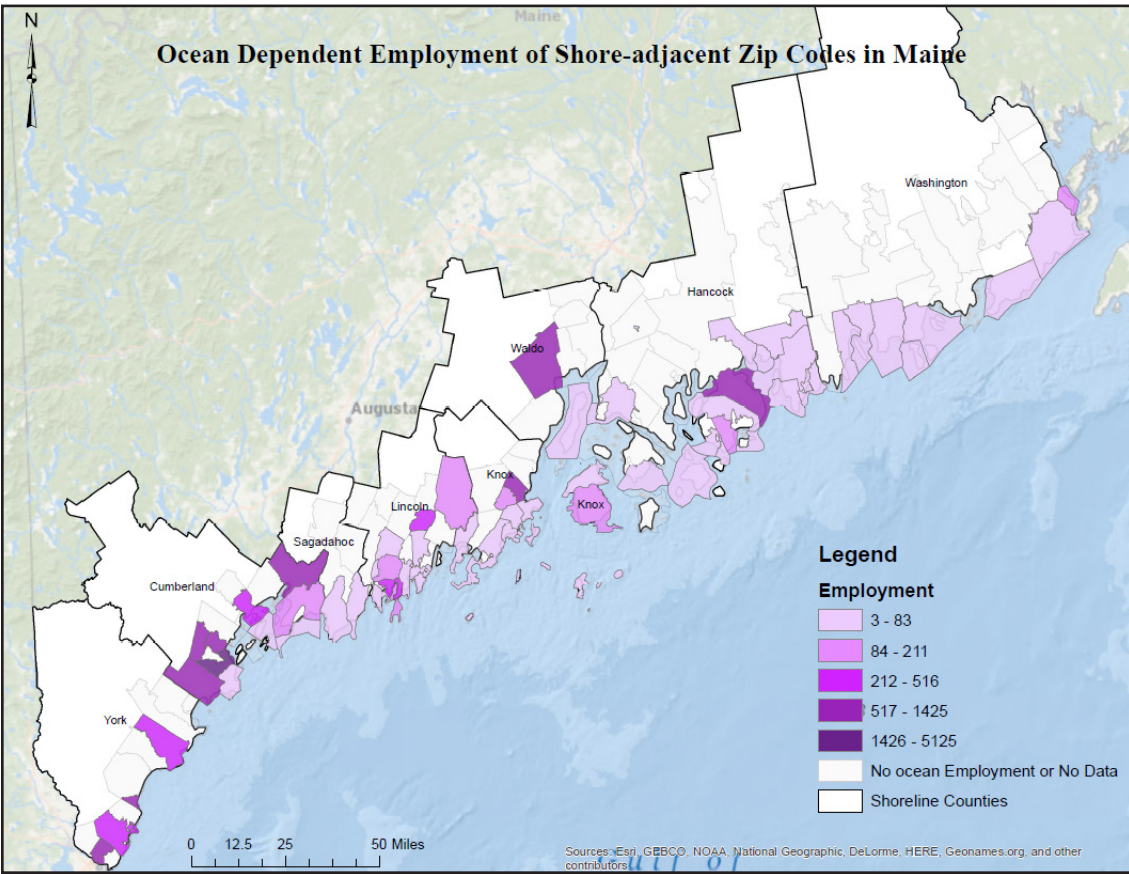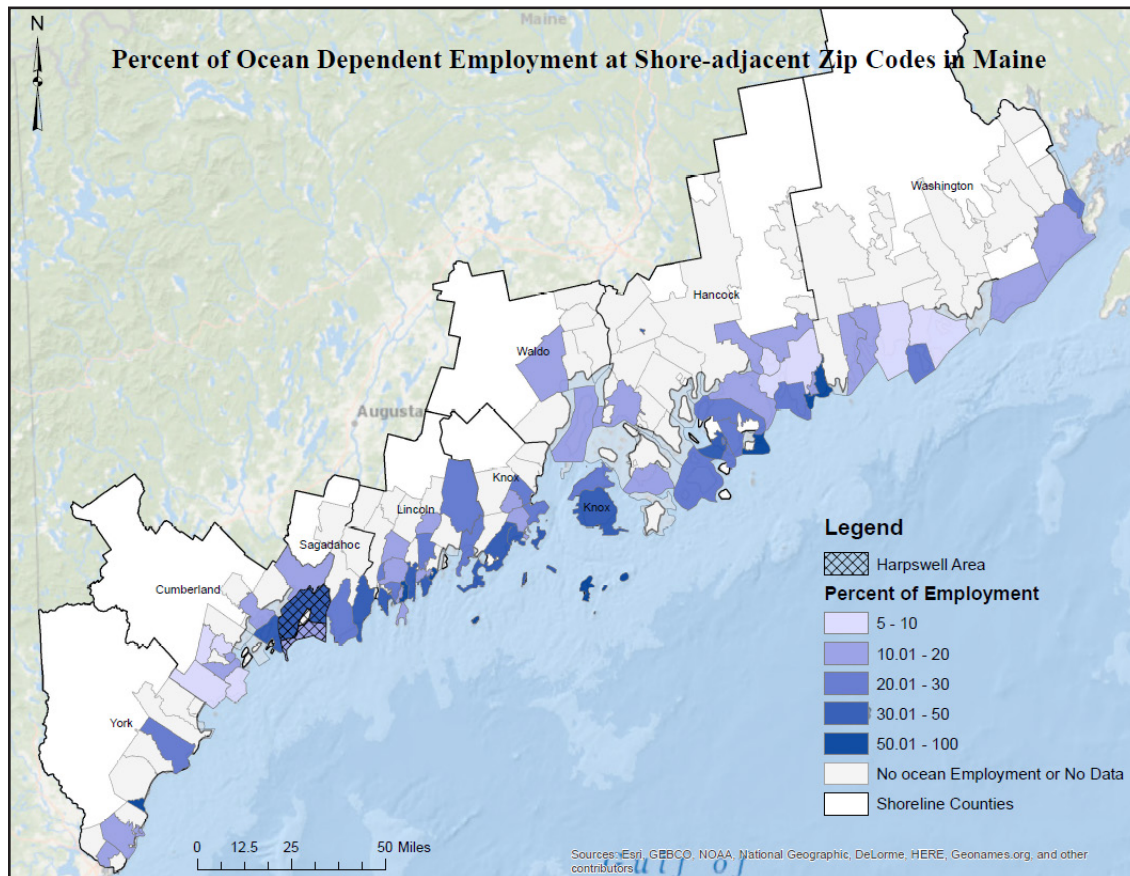

Figure 7. Ocean-dependent employment of shore-adjacent zip code areas, including hotels and restaurants
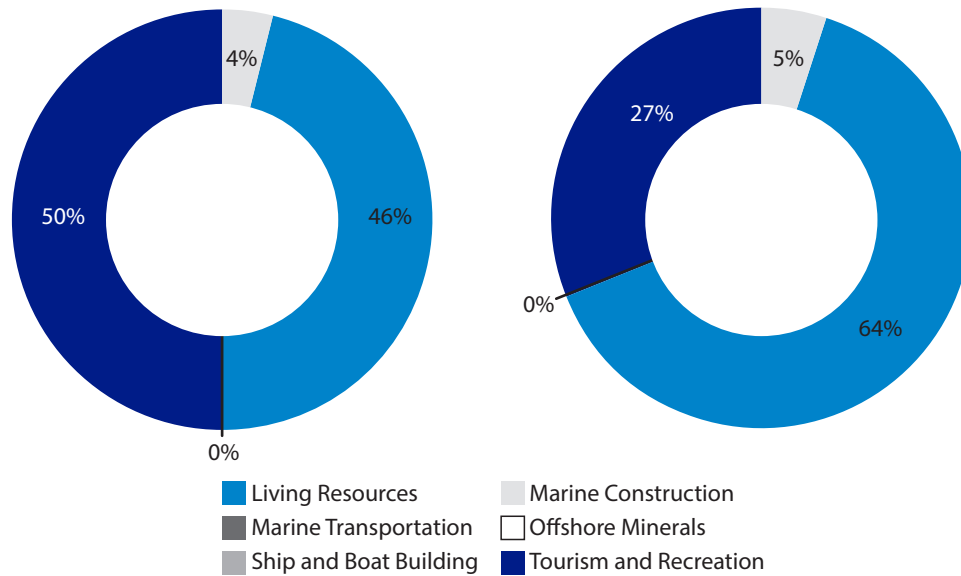
Though ocean job numbers may look small for less populated zip code areas, they are far more significant locally. Especially in the rural areas with closer proximity to ocean resources, the ocean economy is more dominant and represents a larger share of the local employment (Figure 8). For example, the ocean economy makes up a large percentage of Harpswell's total employment (40 percent), which is much higher than for the state of Maine (8 percent) and the nation as a whole (2.3 percent).

Figure 8. Ocean-dependent employment as a percentage of the total economy of shore-adjacent zip code areas, including hotels and restaurants

INCLUDING HOTELS AND RESTAURANTS

4%

50%

46%

0%

EXCLUDING HOTELS AND RESTAURANTS

5%

27%

0%

64%

Living Resources

Marine Transportation

Ship and Boat Building

Marine Construction

Offshore Minerals

Tourism and Recreation

Figure 9. Distribution of ocean-dependent employment in the town of Harpswell

As is common with most working waterfronts, tourism and recreation contributes significantly to Harpswell's ocean economy, accounting for about 50 percent of ocean-dependent employment when including hotels and restaurants, and 31 percent when excluding hotels and restaurants (Figure 9).

However, it is also important to note that jobs are only one indicator of economic contribution. For example, the marine construction sector accounted for only 1.4 percent of total employment, but these industries pay much higher wages and generate higher product values. Their contribution can be better explained with more supporting data on wages, sales, or taxes at this scale.

Tourism and recreation is the largest sector for employment. Including hotels and restaurants, this sector makes up half the total employment in Harpswell. Living resources is the second largest sector in terms of employment, accounting for about 46 percent of the total.

With the exclusion of hotels and restaurants from the tourism and recreation sector, the living resources sector makes up a largest component of Harpswell's ocean economy, accounting for about 64 percent of ocean employment.

Fill in the Gaps

Zip Code Business Pattern data do not include data on self-employed workers. To supplement the data and include estimates of self-employed workers, data were requested from the Atlantic Coastal Cooperative Statistics Program. The additional data represent the number of unique licenses that the fishermen, dealers, or vessels held to land in a port.

Table 9. Atlantic Coastal Cooperative Statistics Program Fisheries Data by Ports of Harpswell, Maine

Port	Pounds	Value	Fishing Contributors	Dealer Contributors	Vessel Contributors
East Harpswell	589,595	$2,329,414	33	3	30
Harpswell	1,626,687	$5,293,357	209	29	125
Harpswell Center	657,150	$2,775,457	55	10	44
Harpswell Total	2,284,427	$10,398,228			

Harpswell has three ports, East Harpswell, Harpswell, and Harpswell Center. As shown in Table 9, total landings in Harpswell amount to 2.3 million pounds valued at about $10.4 million in 2014.

Harpswell port supports 209 fishermen, 29 dealers, and 125 vessels. Thirty-three and fifty-five fishermen land in East Harpswell port and Harpswell Center, respectively. Since the same fishermen can land in different ports during different fishing trips, adding up fishing, dealer, and vessel contributors can generate double-counting. However, the total number for all three ports (without duplicate records) can be requested from the data source, the Atlantic Coastal Cooperative Statistics Program.

Appendix A: List of Industry-Specific Data Sources and Indicators

Commercial Fishing:

NOAA Fisheries Regional Offices, including
- Greater Atlantic Region Permit Office (*greateratlantic.fisheries.noaa.gov/aps/permits/index.html*)
- Alaska Regional Office Permits and Licenses (*alaskafisheries.noaa.gov/permits-licenses*)
- Pacific Islands Regional Office Fishing Permits (*fpir.noaa.gov/SFD/SFD_permits_index.html*)
- Southeast Regional Office List of Current Permits (*sero.nmfs.noaa.gov/operations_management_information_services/constituency_services_branch/freedom_of_information_act/common_foia/index.html*)
- The address, landing port, effective date, etc. by each vessel, dealer, or harvesting permit holder

NOAA National Marine Fisheries Partners and Data Contributors (*st.nmfs.noaa.gov/data/fis/structure/partnerships)*, including
- Alaska Fisheries Information Network (*akfin.org*)
- Atlantic Coastal Cooperative Statistics Program (*accsp.org*)
- Gulf States Marine Fisheries Commission (*www.gsmfc.org*)
- Pacific Fisheries Information Network (*pacfin.psmfc.org*)
- Western Pacific Fisheries Information Network (*www.pifsc.noaa.gov/wpacfin*)
- Recreational Fisheries Information Network (*www.recfin.org*)
- Aggregated fishing statistics from both federal and state resources for landing tons, values, fishing licenses, and vessel permits by species and ports

NOAA Commercial Fisheries Statistics (*st.nmfs.noaa.gov/commercial-fisheries*)
- Landing tons and values by species and areas

NOAA Commercial Landings Query (*foss.nmfs.noaa.gov)*
- One-stop shop for fisheries data by states and areas

NOAA Interactive Fisheries Economic Impacts Tool (*st.nmfs.noaa.gov/apex/f?p=160:7:224395037917386::NO)*
- Total jobs impacted by fishing industries by states and areas

State Departments of Natural Resources
- The address, landing port, effective date, etc. by each fishing license and landing permit
- Landing tons and values by species and ports

Regional and Local Fishermen and Fishing Supply Merchants' Associations
- Directory of businesses and relevant information

Marine Construction:

U.S. Army Corps of Engineers: Corps Owned Dredges
(*www.navigationdatacenter.us/data/datadrgcorp.htm*)
  • Information about dredging activities performed by the Corps owned and operated dredges

U.S. Army Corps of Engineers: Dredging Contracts
(*www.navigationdatacenter.us/dredge/dredge.htm*)
  • Information of all corps dredging contracts in the designated fiscal year

Marine Transportation:

U.S. Department of Transportation, Maritime Administration: Open Data Portal
(*marad.dot.gov/resources/data-statistics/)*
  • Foreign trade statistics by port and district
  • List of U.S. flag fleet, tug-barges, and carries, etc.
  • List of merchant and trade fleets
  • Vessel inventory report
  • Vessel calls by port, terminal, and lightering area

Port Industry Statistics (*aapa-ports.org/unifying/content.aspx?ItemNumber=21048*)
  • Tons and values of import and export by port
  • Container box traffic by port

Freight Analysis Framework (*faf.ornl.gov/fafweb/Default.aspx*)
  • Tons and values of freight movement among states and major metropolitan areas by all modes of transportation

U.S. Army Corps of Engineers: Ports and Waterways Facilities
(*www.navigationdatacenter.us/ports/ports.htm*)
  • List of port facilities
  • Complete list of docks

U.S. Army Corps of Engineers: National Waterway Network
(*www.navigationdatacenter.us/data/datanwn.htm*)
  • Shape files of port facilities and boundaries

Intermodal Transportation Network: All Modes
(*www-cta.ornl.gov/transnet/Intermodal_Network.html*)
  • Distribution of National Waterways Network with attached global seaways

Automatic Identification System (AIS) (*marinetraffic.com/ais*)
  • Information for vessel traffic services (VTS) from the automatic tracking system installed on ships

AlphaLiner Shipping Information Service (*alphaliner.axsmarine.com/PublicTop100*)
  • Number of containerships by shipping company

Offshore Minerals:

Energy Information Administration: Crude Oil Production (*eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm*)
- Barrels of oil production by state and area

Energy Information Administration: Offshore Gross Withdrawals of Natural Gas (*eia.gov/dnav/ng/ng_prod_off_s1_a.htm*)
- Millions of cubic feet of natural gas production by state and area

Ship and Boat Building and Repairing:

U.S. Department of Transportation, Maritime Administration: Survey of U.S. Shipbuilding and Repair Facilities (*marad.dot.gov/ships-and-shipping/national-maritime-resource-and-education-center/shipyard-reports/*)
- List of the major U.S. private shipbuilding and repair facilities by region and city

MarineLog Trade Journal: Shipbuilding Contracts
(*simmonsboardman.com/shipbuildingmarinelog*)
- Latest known shipbuilding contracts
- North America Shipyard Directory

Local Boat Builders Show Exhibitor List, Boat Trade Associations, Boat Magazines
- Directory of businesses and relevant information

Tourism and Recreation:

NOAA National Marine Fisheries Service: Saltwater Angler Expenditures
(*st.nmfs.noaa.gov/economics/fisheries/recreational/index*)
- Trip-based expenditures by states

U.S. Coast Guard, Recreational Vessel Accident Statistics
(*uscgboating.org/statistics/accident_statistics.php*)
- Recreational vessel registration and accident records by state

U.S. Fish and Wildlife Service, State Sport Fishing License Sales Data
(*wsfrprograms.fws.gov/Subpages/LicenseInfo/Fishing.htm*)
- Fishing licenses and costs by state

U.S. Department of Transportation, Maritime Administration: Open Data Portal
(*marad.dot.gov/resources/data-statistics/*)
- Cruise passengers by cruise ship and port

Port Industry Statistics (*aapa-ports.org/unifying/content.aspx?ItemNumber=21048*)
- Cruise passenger traffic by port

State Offices of Tourism
- Number of tourists and studies

Local Tourism Industries Report
- Number of visitors, hotel occupancy rates, and admission sales
- Tourism surveys

Short-Term Rental Homes and Cabins Website (VRBO, AirBnB)
- Number of accommodations for tourism and recreation

Appendix B: Caveats and Best Practices for Processing Data Sources

A wide variety of supplementary data sources are available to provide a full picture of working waterfront values. However, several issues may arise in assembling these different industry-specific data, such as double-counting. Here is a list of common caveats and best practices to mitigate these issues.

- **Some data sets may not have a specific employment or job indicator, so a proxy can be used.** Fishing license data, for example, may have a unique identification number for each fisherman. This identifier could be used instead of the total count of individual licenses, which may include duplicates for fishermen involved in multiple fisheries. Using the unique identifier would be a better indicator than total licenses to avoid double-counting.

- **Some data sets may contain important geographic information that needs to be considered in the estimation.** Business-related data usually reflect the business' registered address, instead of where the owners come from or where they conduct their business activities. For example, it's important to realize that fishermen can land their catch in different ports and can be recorded at different locations in the same statistics. Adding up the landing pounds and values across the ports will not double-count the total catch, but adding up the number of fishermen landing at the different ports might generate double-counting.

- **Some data sets may contain indicators with similar names, but which use different computation methods.** Some job indicators are calculated as an average through the full-time equivalent (FTE). Some job indicators are actual counts of jobs, whether full-time or part-time. For example, employment statistics usually provide FTE numbers, while self-employed statistics usually count actual jobs. A proxy of total jobs could be computed by adding up these two indicators, but the estimation results must be accompanied by an explanation of the methods used.

- **Different data sets may not be compatible in a time series.** Most data series have a few months, or years, delay in availability. For example, though preliminary employment statistics might be able to be released quarterly, comprehensive annual statistics are usually released with a one- to two-year delay.

- **Different data sets may not be compatible in geographic scope.** Zip code boundaries and other geographic dimensions of many local data sets change frequently year by year and do not always conform to municipal boundaries. Extra spatial computation might be required to merge different data sets or compare different years of data for one data set.

Appendix C: List of Resources on Non-market Values and Impacts

NOAA Office for Coastal Management Coastal County Snapshots
(*coast.noaa.gov/snapshots*)
- Status, trends, and comparison of ocean jobs and wages by county

NOAA Fisheries Social Indicators for Fishing Communities
(*st.nmfs.noaa.gov/humandimensions/social-indicators)*
- Social vulnerability, gentrification pressure, sea level rise vulnerability, fishing engagement, and reliance indicators by fishing communities

NOAA National Marine Sanctuaries Socioeconomics
(*sanctuaries.noaa.gov/science/socioeconomic)*
- Socioeconomic profiles by marine sanctuary sites

NOAA Office for Coastal Management Stories from the Field
(*coast.noaa.gov/digitalcoast/stories*)
- Economic stories at regional, state, and local scales

Working Waterfronts Case Studies, Oral Histories, and Resources
(*wateraccessus.com/implementation.cfm)*
- Models of coastal stakeholders working cooperatively to resolve challenges of competing working waterfront uses

National Ocean Economics Program (NOEP) Non-market Values Overview and Studies
(*oceaneconomics.org/nonmarket)*
- Valuation studies and estimations by state and territory

Marine Ecosystem Services Partnership Mapper and Valuation Library
(*marineecosystemservices.org/explore)*
- Valuation studies and estimations by ecosystem and location

State and Local Marine Labs, Extensions, and Research Institutes
- National Association of Marine Laboratories Directory (*naml.org/members/directory.php*)
- Local research and development in the physical, engineering, and life sciences

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2018