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Measurement of the Market Data for the Ocean and Coastal Economy

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Abstract

This paper supplements reports and data released on the Coastal and Ocean Economies of the United States by the NOEP. It provides a discussion of the relevant literature involved in the investigation of the Ocean and Coastal related Economies, the theoretical background of measures such as gross domestic product (GDP) and gross state product (GSP), and provides details on sources, methods, assumptions, and limitations of the data provided by NOEP.

Those concerned with the health of coastal and ocean resources increasingly need to understand the socio-economic context in which changes are occurring. The market data of the National Ocean Economics Program provides a comprehensive set of measures of changes in economic activity throughout the coastal regions of the United States. It is built on a number of standard government data sources, which have been specifically adapted to permit a better understanding of what is happening in coastal areas. It is designed to help answer questions such as:

1. How large is the economic activity associated with ocean resources?
2. How has the economic use of the ocean changed over time?
3. How is economic activity distributed across coastal regions, from the areas nearest the shore to the interior?

The data is organized by coastal state, including the Great Lakes, and by coastal counties. It includes employment, total wages paid, establishments, and contributions to national economic output (measured as gross state product). Data is available from 1990 to the most recent year of the underlying data sources.

A Guide to the Measurement of the Market Data for the Ocean and Coastal Economy in the National Ocean Economics Program

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NATIONAL OCEAN ECONOMICS PROGRAM

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Introduction

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All data in the NOEP market database are part of an ongoing research project. Data are subject to revisions as refinements to the methodology are developed. Users should check the website of the program (www.oceaneconomics.org) for regular updates of the data and methodology.

Those concerned with the health of coastal and ocean resources increasingly need to understand the socio-economic context in which changes are occurring. The market data of the National Ocean Economics Program provides a comprehensive set of measures of changes in economic activity throughout the coastal regions of the United States. It is built on a number of standard government data sources, which have been specifically adapted to permit a better understanding of what is happening in coastal areas. It is designed to help answer questions such as:

- How large is the economic activity associated with ocean resources?
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The data is organized by coastal state, including the Great Lakes, and by coastal counties. It includes employment, total wages paid, establishments, and contributions to national economic output (measured as gross state product). Data is available from 1990 to the most recent year of the underlying data sources.

This User's Guide provides information about the market data set in two formats:

Part I provides brief answers to a set of Frequently Asked Questions (FAQ'S) about the market data, along with hyperlinks to further detail in this document or helpful resources on the Internet.

Part II provides a more technical introduction to the data, including data sources, estimating methods, a discussion of previous studies, and issues involved in the creation of the NOEP data sets such as confidentiality.

Comments on the User's Guide and data are welcome.

PART I. Frequently Asked Questions: A Guide for Users of National Ocean Economics Program Market Economy Data

This section provides brief answers to frequently asked questions about the NOEP data. Each answer also provides a hyperlink to a more complete discussion of the data and methodology, which is contained in Part II of this document. Readers wishing to start with the complete discussion should go to Part II.

What data are available in the NOEP Market Economy Data Series?

Data on establishments, employment, wages, and gross state product are available for coastal states and counties for 1990-2004 for both the Ocean Economy and Coastal Economy. The Figure on page 4 provides a graphic overview of the data.

For an introduction to the available data, click here.

What is the difference between the Ocean Economy and the Coastal Economy?

The Ocean Economy is defined as the economic activity, which indirectly or directly uses the ocean (or Great Lakes) as an input. The Coastal Economy is defined as all activity, which takes place in the coastal areas.

For more information, click here.

How is "coast" defined?

The Coastal Economy definition of NOEP relies on a tiered approach of geography extending inland from the shorelines of the ocean or Great Lakes. The definitions of tiers are based on zip code and county boundaries. The following categories are used starting with the shore-line and proceeding in an inland direction:

Near-Shore: establishments or population located in a zip code that is immediately adjacent to an ocean, Great Lake, or included river or bay.

Shore-Adjacent Coastal Zone County: a county touched in whole or in part by a state's coastal zone for purposes of the Coastal Zone Management Act of 1972 as defined by that state and which is adjacent to an ocean, Great Lake, or included river or bay. This includes near-shore zip codes.

Non–shore-Adjacent Coastal Zone County: a county touched in whole or in part by a state's coastal zone for purposes of the Coastal Zone Management Act of 1972 as defined by that state and which is not adjacent to an ocean, Great Lake, or included river or bay.

Coastal Zone Counties: counties comprised of shore-adjacent plus non-shore adjacent counties. For Illinois, which does not have a Federal Coastal Zone

Management program, the coastal zone counties are defined as Cook and Lake counties. Both are shore-adjacent.

Non-Coastal Zone Watershed County: a county that is located outside of the coastal zone, but within a coastal watershed.

Coastal Watershed County: a county located within a coastal watershed as defined by the U.S. Geological Survey. Watershed counties include all coastal zone counties and non-CZ watershed counties.

Inland County: a county located outside a coastal watershed.
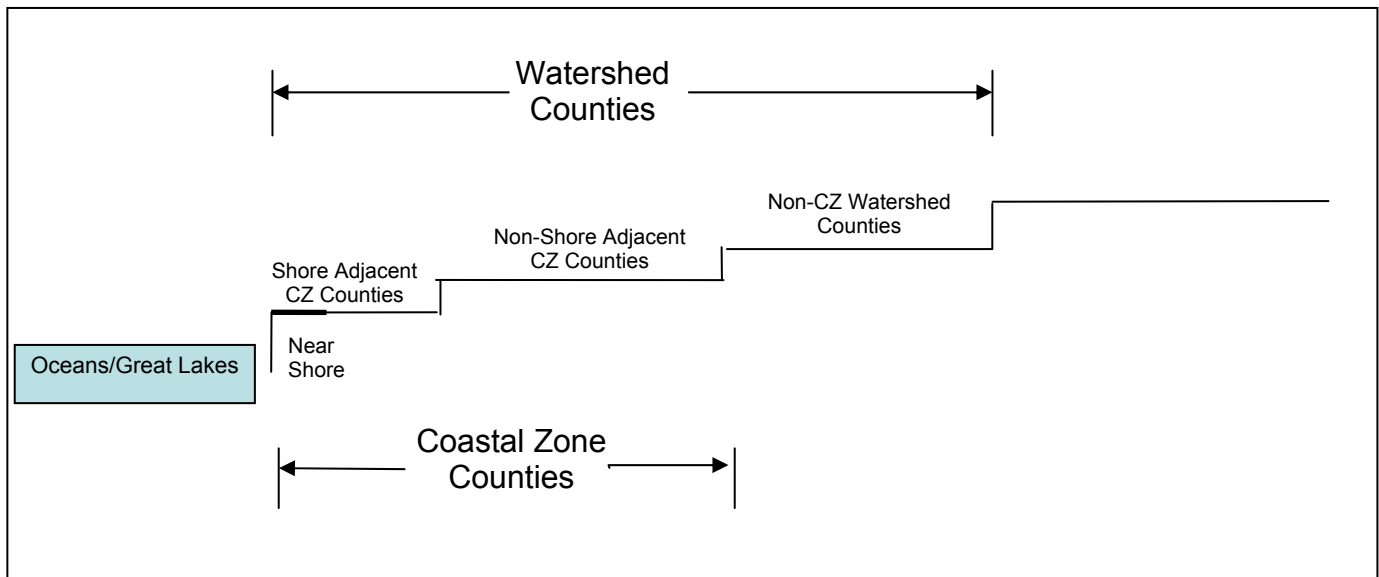
MARKET DATA SUMMARY

Ocean Economy

Coastal Economy

Industrial Classification Used

NAICS: 1990 - 2004
SIC: 1990, 2000, and 2001

National & State 1990-2004

DATA: Establishments, Employment, Wages,
   GSP (Nominal and Chain-Weighted)
   Includes 6 Ocean Economy Sectors and
   24 Ocean Economy Industries

National & State 1990-2004

DATA: Establishments, Employment,
 Wages, GSP (Nominal and Chain-Weighted)
   Includes all Super Sectors defined by the
   Bureau of Labor Statistics (BLS)

Forecasts 2005-2015

All states except Massachusetts
DATA: Employment and Wages
   Includes 6 Ocean Economy
   Sectors

IMPLAN Models Applied to
National & State 2000-2004

DATA: Employment, Wages
   Includes 6 Ocean Economy
   Sectors and 24 Ocean
   Economy Industries

Forecasts 2005-2015

 Coastal Zone Counties
      Shore-Adjacent Coastal Zone
       Non-Shore Adjacent Coastal Zone
 Watershed Counties
       Coastal Zone Watershed
        Non-Coastal Zone Watershed
 Inland Counties

   DATA: Employment and Wages

Coastal Counties 1990-2004

DATA: Establishments, Employment, Wages,
GSP (Nominal and Chain-Weighted)
      Includes 6 Ocean Economy Sectors

Counties 1990-2004

 Coastal Zone Counties
     Shore-Adjacent Coastal Zone
      Non-Shore Adjacent Coastal Zone
 Watershed Counties
      Coastal Zone Watershed
       Non-Coastal Zone Watershed
 Inland Counties

 DATA: Establishments, Employment,
  Wages, GSP (Nominal and Chain-Weighted)
      Includes all Super Sectors defined by the
       Bureau of Labor Statistics (BLS)

Supplemental Data: Casinos & Refineries

DATA: Establishments, Employment, Wages,
GSP (Nominal)
State and County 2001-2004

Last Updated January 2007

How is "ocean" defined?

The concept of the Ocean Economy derives from the ocean (or Great Lakes) being a direct or indirect input to the economic activity. This is defined in part by the definition of an industry (for example, Deep Sea Freight Transportation) and partly by geographic location (for example, a hotel in a coastal town). This leads to the following definition:

An establishment is included in the Ocean Economy when it either:

(1) is included in an industry whose definition explicitly ties the activity to the ocean, or (2) is located in an industry which is partially related to the ocean and is located in a shore-adjacent zip code.

For more information, click here.

Are the Great Lakes included in the definition of the Ocean and Coastal Economies?

Yes, the Great Lakes from Lake Superior to the St. Lawrence River are included in the data set. For purposes of these data, the Great Lakes, Atlantic Ocean, Gulf of Mexico, Pacific Ocean, and Arctic Ocean all are considered "ocean" and the lands abutting them are "coastal."

Are rivers and bays included in the definitions of ocean and coastal?

The following major embayments are used in the definition of Ocean and Coastal economies:

- Penobscot Bay
- Long Island Sound
- Delaware Bay
- Chesapeake Bay
- Albemarle and Pamlico Sounds
- Tampa Bay
- Lake Ponchartrain
- Galveston Bay
- San Francisco Bay and Delta
- Puget Sound

Rivers included in coastal watershed counties are automatically included. In addition, the following major rivers are included in state-defined coastal zones and therefore included as well in the definitions of ocean and coastal:

- The Hudson River from New York City to Albany County
- The Delaware River to Bucks County, Pennsylvania and Monmouth County, New Jersey

- The James, Rappahannock, and York rivers in Virginia and the Potomac River to Alexandria
- The Mississippi River to Baton Rouge Parish in Louisiana
- The American River to Contra Costa County in California
- The Columbia River including Clatsop and Columbia counties in Oregon and Wahkiakum County in Washington.

How are the Ocean and Coastal Economies measured?

Four indicators are used to define the Ocean and Coastal Economies:

- Establishments
- Wage and salary employment
- Wages
- Gross State Product

For more information, click here.

What is Wage and Salary Employment?

In general, most employment is covered by federal and state unemployment insurance laws and these laws govern who reports their employment to the state and federal governments. The NOEP data uses these employer-reported data. This definition covers about 90% of employment in the U.S. It excludes farm employment, the military, railroads, and self-employment. The exclusion of self-employment excludes almost all the Fish Harvesting industry's employment, plus self-employed persons in the Tourism & Recreation sector among the ocean economy sectors. Self employment is also excluded from the coastal economy data series.

Wage and salary employment measures employment by place of work, not by place of residence. It also measures jobs, not people. It does not distinguish between full-and part-time work, or year-round and part-year jobs. The data in the NOEP database are annual average employment.

What is Gross State Product (GSP)?

The Bureau of Economic Analysis (BEA) defines GSP as follows:

GSP is the value added in production by the labor and property located in a state. GSP for a State is derived as the sum of the gross state product originating in all industries in a State. In concept, an industry's GSP, referred to as its "value added", is equivalent to its gross output (sales or receipts and other operating income, commodity taxes, and inventory change) minus its intermediate inputs (consumption of goods and services purchased from other U.S. industries or imported). Thus, GSP is often considered the state counterpart of the nation's gross domestic product (GDP), BEA's featured measure of U.S. output. In

practice, GSP estimates are measured as the sum of the costs incurred and incomes earned in the production of GDP, e.g. the net cost of production.
GSP data are published only at the state-level and for industry aggregations greater than used in the Ocean Economy definition. In order to estimate a share of GSP in an Ocean or Coastal Economy industry, the proportion of the GSP for a given sector is calculated based on the proportion of total wages paid in that sector by a given establishment. The proportion of GSP for a given establishment or industry equals that establishment's or industry's share of total wages. Since wages often account for as much as 60% of GSP, this method is a reasonable approximation of individual establishments' contribution to GSP. Where does the 60% come from?

For more information, click here.

What are establishments?

Establishments are simply places of work. Employment is measured by the location of an establishment, not the firm, as there are many firms that have multiple establishments.

What are the sources of data?

Establishments, employment, and wages are taken from the Quarterly Census of Employment and Wages (QCEW). This data series also is known as the ES-202 data.

These data are based on the quarterly reports of nearly all employers (click here for more information) in the United States. These reports are filed with each state's employment or labor department, and each state then transmits the data to the Bureau of Labor Statistics (BLS), where the national databases are maintained. The data for the Ocean and Coastal Economies have been taken from the national databases at BLS (except in the case of Massachusetts).

For more information on employment and wages, click here.

GSP data are taken from the BEA, which develops the estimates of GSP from a number of sources. For more information on GSP, click here.
For more information on Massachusetts, click here.

For what time period are data available?

Data are available from 1990 to the most recent year in which the federal data sources are available.

How often is the data updated?

The employment, wage, and establishment data is updated annually, usually in the fall for the previous year. Thus, 2005 employment data will become available in the fall of 2006.

Gross state product data is available at the industry level about 18 months after the end of the year. GSP data is incorporated into the NOEP data as soon after it becomes available as possible. Thus, GSP data for 2005 will become available in the summer of 2007.

Both the employment and GSP data are subject to periodic revisions by the Bureau of Labor Statistics and Bureau of Economic Analysis. Any revisions by the federal agencies are incorporated in the NOEP data in the course of the annual NOEP updates.

What industries are included in the definitions of the Ocean Economy?

The following six sectors comprise the Ocean Economy:

- Construction, Marine
- Living Resources
- Minerals
- Ship & Boat Building
- Tourism & Recreation
- Transportation

The industries comprising these sectors depend on definitions of industries used for government statistical purposes. The measurement of the Ocean Economy has been developed at a time of transition between the Standard Industrial Classification (SIC) and North American Industrial Classification System (NAICS). The NOEP data is provided using NAICS definitions for all years from 1990 on. Data is also available in SIC for 1990, 2000, and 2001 for comparison with other data sets.

For more information, click here.

Why do the county totals not sum to state totals in the Coastal Economy data?

Because the data are drawn from administrative records filed by employers, there is some degree of reporting error. Reports from employers that cannot be identified by either industry or location are classified as "Unknown or unclassified." This category makes up the difference between the sum of county data in a state and the reported state totals.

What industries are included in the definition of the Coastal Economy?

The Coastal Economy data in NOEP uses the broadest definitions of industrial activity. Under the SIC, data for the following sectors (called "industrial divisions" in the SIC) are available:

- Natural Resources
- Construction
- Manufacturing
- Transport/Utilities
- Wholesale
- Retail
- Finance, Insurance, Real Estate
- Services
- Public Administration

Under NAICS, the following sectors (called "super sectors" in the Bureau of Labor Statistics NAICS-based employment data) are shown:

- Construction
- Education and Health Services
- Financial Activities
- Information
- Leisure and Hospitality
- Manufacturing
- Natural Resources and Mining
- Other Services
- Professional and Business Services
- Public Administration
- Total, all industries
- Trade, Transportation, and Utilities

What are "SIC" and "NAICS"?

SIC is the Standard Industrial Classification, which was developed in the 1930s to provide a standard basis for defining industries in government statistical series.

NAICS is the North American Industrial Classification System. It was developed in the 1990s as a part of the North American Free Trade Agreement (NAFTA) to provide a common basis for the U.S., Canada, and Mexico to measure their economic activity.

The transition between SIC and NAICS has been taking place at different times for different government statistical series. Employment related data changed from SIC to NAICS in 2001 when all employers ceased to report their information based on SIC and switched to NAICS. NOEP employment-related data uses employer-reported data from 2001 on and a special series of data using NAICS codes for 1990-2000 imputed by the Bureau of Labor Statistics.
GSP related data changed from SIC to NAICS in 2003, but the Bureau of Economic Analysis re-estimated GSP data on a NAICS basis back to 1997.

NOEP data are estimated from the NAICS codes for all years since 1990. Data also are available on an SIC basis for reference purposes for 1990, 2000, and 2001.

For more information, click here.

How do the SIC and NAICS classification systems differ?

There are four major differences between the two classification systems:

1. <u>Different groupings of industries</u>. For example, under SIC restaurants were included in the Retail sector, while hotels were in the Services sector. Under NAICS they are together in Leisure and Hospitality services.
2. <u>More detail</u>. Many industries were divided into smaller groups to provide additional detail in NAICS. For example, casino hotels and all other hotels were combined in SIC, but are separate industries under NAICS.
3. <u>More information on services related industries</u>. The single SIC Services industrial division was subdivided into five (5) different services sectors under NAICS.
4. <u>A change in the basis of classification</u>. Under SIC, each establishment was classified based on the principal line of business of the firm. Under NAICS, the classification is based on what the establishment does. For example, a ship building firm with its headquarters in one county and its ship yard in another county would have seen both establishments classified as Ship & Building under SIC. Under NAICS, the shipyard would still be a ship building facility, but the headquarters would now be classified under Management.

How does the difference between SIC and NAICS affect the measurement of the Ocean and Coastal Economies?

The NAICS classification provides greater precision in the definition of a number of industries than the SIC. As a result the Ocean Economy definitions under NAICS are able to exclude many establishments with no, or questionable, connection to the ocean. The NAICS estimates tend to be somewhat smaller than SIC estimates as a result.

Both NAICS- and SIC-based definitions of the Ocean Economy are provided for each state (except Massachusetts) in 2001 so that users can compare the two systems.

For more information, click here.

For more information on Massachusetts, click here.

Why are casinos and refineries coded separately?

Casinos and refineries are large industries, often located in coastal areas. However, their connection to the ocean is subject to debate. hence, data on casinos and refineries are presented as separate industries within the sectors so that users can decide whether to include them in their own Ocean Economy data. However, users should note that the large size and small numbers of these establishments make them particularly vulnerable to data suppressions for confidentiality purposes. Thus data on these two industries are shown for only those counties where there are more than three casinos or refineries.

Why are no data shown in many cases?

Federal law prohibits the publication of any economic data that could reveal the characteristics of a single establishment. The majority of NOEP Ocean Economy data are based on confidential establishment-level data, which are not accessible to the public, and which, must be carefully screened in order to avoid violating federal law. The Coastal Economy data are from publicly available BLS data sources and use a sufficiently high level of industrial aggregation such that data suppressions are rare.

The NOEP data derived from confidential data sources are passed through four (4) levels of screenings. Data for any industry in any location that fails any *one* test are not shown. ("Region" in these definitions means states or counties.)

1. Any industry in any region where there are three (3) or fewer establishments is not shown.
2. Any industry in any region that has one (1) establishment comprising 80% or more of employment in that industry and region is not shown.
3. If total employment is shown for a region, then it cannot be possible to subtract other industry totals from the regional total to show an industry that has been suppressed. In this case, a second industry must also be suppressed even if it otherwise passes rules 1 and 2. This is called complementary suppression.
4. Industry data for a given region cannot be shown in the NOEP database if they are suppressed in any other publicly available BLS database.

For more information, click here.

Is the county-level Ocean Economy data different from the state-level data?

The county-level Ocean Economy data are highly subject to data suppressions because many sectors and industries in the Ocean Economy have too few establishments in small counties to be shown. (Click here for more information on data suppressions). This problem can be reduced, but not eliminated, by taking a different approach to assembling county-level Ocean Economy data from

that used in the state- and national-level data. State- and county-level data for ocean sectors and industries are drawn entirely from the confidential establishment data.

For county-level data, two modifications to this procedure are made:

- First, only sector-level data are shown at the county-level; the industry detail available at the state-level is not shown.

- Second, data are drawn from both the confidential establishment data and from the publicly available data.   Data for the Ocean Economy total and the Tourism & Recreation sector are taken from the confidential establishment records, as these totals rarely require suppression. Data for the other five (5) Ocean Economy sectors are drawn not from the confidential longitudinal database (LDB) at the Bureau of Labor Statistics, but from the public data set for the Quarterly Census of Employment and Wages, available from BLS. This database already has been screened for suppressions, and permits more ocean-related data to be shown at the county-level than could be shown if the confidential data set were used.

Users should be cautious about using the county-level data. The Ocean Economy and Tourism & Recreation sector are available in almost all counties for every year, but the data may be sporadically available or unavailable in smaller sectors (such as Construction and Minerals) in many counties.

In addition, the use of two different databases means that even if all sectors and industries are present the totals will not necessarily sum to the Ocean Economy totals.   Users should always use the reported Ocean Economy totals when available rather than attempting to sum sectors or industries at the county-level.

For more information, click here.

Why are Massachusetts' data different?

The data on employment and wages are a cooperative state-federal program, and the states have some discretion over how the data are used. Massachusetts is one of a handful of states (and the only coastal state) whose legislature prohibits outside researchers from accessing its confidential establishment data.

Massachusetts Ocean Economy data in the NOEP data series are estimated using an approach that is similar in concept to the estimates in other states, but uses only publicly available data. It is somewhat less accurate than the other states, but is sufficiently comparable for inclusion in the overall data series.

For more information, click here.

What are multipliers and how are they applied to the Ocean Economy?

The total economic role of a given industry in a given region is the sum of its direct, indirect, and induced activity. Using employment as an example, direct activity is the employment in the industry itself. Indirect employment is the employment in firms within the region who supply goods and services to the industry. Induced employment is the employment affected by the spending of the direct and indirect employment within the region for the purchases of food, cars, services, etc.

The total economic influence of a given industry's employment in a given region is thus defined as:

Total Employment = Direct Employment + Indirect Employment + Induced Employment.

The sum of indirect and induced employment is referred to as the "multiplier." Total employment may thus also be defined as:

Total Employment = Direct employment * multiplier

Where the multiplier = 1 + (Indirect + Induced Employment)
                                          Direct Employment

The same equivalency can be defined for wages and GSP. The relationship between direct activity and total economic influence is defined as the multiplier effect.

The multiplier effect can be estimated a number of different ways. NOEP uses a regional economic model called IMPLAN, which is commonly used for this type of analysis in a large number of settings. Multiplier effects are calculated for all Ocean Economy sectors and industries at the state and national level.

Note that except in the specific data series labeled as "multipliers," all employment, wage, and GSP data in the NOEP market database refers to direct employment, wages, and GSP.

For more information, click here.

How are the forecasts of the Ocean and Coastal Economy prepared?

The forecasts of Ocean and Coastal Economic data are in cooperation with Moody's/Economy.com, a leading provider of economic data and forecasting services. Coastal Economy forecasts in NOEP show the population, employment, wage, and GSP forecasts for the county-based regions (coastal zone counties, watershed counties, non-CZ watershed counties, and inland counties). County-

level forecasts are not shown in the NOEP database as they are the property of Moody's/Economy.com.

Ocean Economy forecasts are currently shown at the state-level for the Ocean Economy sectors and for the total Ocean Economy. Data are available for employment, total wages, and gross state product. The Ocean Economy forecasts are prepared by NOEP based on the industry level forecasts prepared by Moody's/Economy.com. Forecasting models are fit for each sector in each state and the Ocean Economy forecast is the sum of the individual sector forecasts.

Forecasts currently available from NOEP are based on the August 2005 forecast prepared by Moody's/Economy.com. These forecasts do not include the effects of the hurricanes that affected Florida and the Gulf of Mexico states in August and September 2005.

For more information, click here.

Have there been efforts before to define the Ocean and Coastal Economies?

There have been a number of efforts to define Ocean and Coastal Economic activities beginning in 1974. For more information about previous studies and their relationship to the NOEP, click here.

What are the strengths and weaknesses of the NOEP method for defining the Ocean and Coastal Economies?

The principal strength of the NOEP data is consistency across time and space. Unlike many studies of the Coastal and Ocean Economies, which have used *ad hoc* methods and definitions, and which, have thus not produced comparable data, the NOEP data use definitions and methods that are as consistent as possible across all states and across multiple years. Thus, it is possible to measure change over time and to compare one coastal region to another, and one sector to another, with reasonable accuracy.

The NOEP approach also allows greater precision over any other approach in geographic and industrial definitions by using the original source data at the establishment-level to create customized definitions uniquely suitable to the concept of an Ocean Economy.

The principal weaknesses lie in the data series used for measurement.
- Key definitions like the industrial classifications have changed.
- Many industries are still too aggregate for true "ocean" economy measurement.
- Shore-adjacent zip code is an imperfect geographic unit for the purpose of defining location.

In addition, certain ocean-related activities are excluded from the data sets used for measurement. These include the Fish Harvesting industry (which is not

covered by unemployment insurance laws), the Government sector, Scientific and Education Research, and Coastal Real Estate, none of which report employment in a way that ocean-related activity can be separated from other activities.

For more information, click [here](#).

PART II. Detailed Information on the Market Economy Data of the National Ocean Economics Program

The National Ocean Economics Program: An Introduction

The National Ocean Economics Program (NOEP) goals of the market data components are 1) to compile a comprehensive collection of data on the economic value of the ocean and coastal resources of the United States; and 2) to define, describe, and estimate the values of sectors of the Ocean and Coastal Economies. The NOEP also has a goal of compiling and making available comprehensive access to the large number of studies to define and measure the non-market values of the Ocean Economy (for more information, click here).

The market data goal is to permit consistent measurement of the contribution of the ocean to the U.S. economy across time, and regions including the nation, states, and counties. Contributions can be measured in terms of output (gross domestic product (GDP) or its state equivalent, Gross State Product, , employment, and wages.

Data on population and housing growth in the coastal areas also are critical to understanding the overall socio-economic dimensions of the coastal and ocean areas. These data are available from the U.S. Census Bureau, and relevant data are included in the database constructed by the NOEP. Since these data are presented as reported by the Census, the methodological issues involved in this data are the same as those of all census data. For more information on these issues, see (Census 2000). A more complete database for the examination of demographic data is available on the Spatial Trends in Coastal Socioeconomics website. To access the STICS data, click here.

Defining the Ocean and Coastal Economies

Two concepts underlie the data on economic activity associated with the ocean: the Ocean Economy and the Coastal Economy. The two are related, but not identical.

- The **Ocean** Economy consists of all economic activity that derives all or part of its inputs from the ocean or Great Lakes. The definition of the Ocean Economy is a function of both industry and geography and is described in detail below. While most of the Ocean Economy is located in coastal regions, some of the Ocean Economy (for example, some boat building and seafood retailers) is located in non-coastal regions.

- The **Coastal** Economy consists of all economic activity in the coastal region, and is thus total employment, wages, and output in each of the geographies defined as part of the Coastal Economy. Some of the Coastal Economy is the Ocean

Economy, but the Coastal Economy incorporates a broader set of economic activity.

Ocean Economy Discussion

Although the problem of defining an Ocean Economy appears at first glance to be a problem of defining the economic value of a natural resource, it is perhaps more properly thought of as a problem in defining the characteristics of a regional economy whose boundaries are tied to the ocean (and Great Lakes). A regional approach requires the use of such data as employment, income, and output. It leaves open the question of the marginal value of the natural resources of the ocean for additional studies within a traditional resource economic framework. The current approach may thus be considered the measure of economic activity *associated with* the ocean. Both types of information are necessary for a full understanding of the economy of the ocean, but the economy of an "ocean region" is the place to start given available data.

Coastal Economy Discussion

A major issue in this field is the definition of the coastal region. The term "coast" has taken on a wide variety of physical definitions ranging from the strip of land immediately adjacent to the shoreline of the oceans and Great Lakes to the headwaters of the watersheds of major rivers. The term has different meanings depending on whether one approaches the coast from a geological, biological, hydrological, ecological, or political perspective.

The offshore boundaries of the "coast" vary with activities, depending on legal definitions, such as 200-mile exclusive economic zones for fisheries and outer continental margin definitions for offshore minerals development. The inland boundaries of the coast for economic and demographic analysis are even less clear. Definitions have included arbitrary distances such as 100km from the shore (which begs the question of the shore boundary in estuarine areas), or a "days drive" from the shore, which could easily change depending on transportation systems and their capacity.

For purposes of the analysis of the Coastal Economy, three tiers of "coast" are selected based on the boundaries of administrative and political jurisdictions. These regional tiers are imperfectly related to geographic or ecological features, but are selected to at least roughly coincide with natural features. In general, the administrative and political boundaries include more land than a strict ecological or geographic interpretation would probably support. For example, coastal watersheds include the Santa Ana River in California, which rises in San Bernardino County, a county that extends all the way to the Nevada border. Similarly, the coastal zone in New York State extends as far up the Hudson River as Albany, which is approximately 200 miles from the sea.

The tiers of coast are:

- Near-Shore Region. This is defined by zip codes adjacent to the shores of the oceans, Great Lakes, and major bays. The selection of these zip codes is discussed in greater detail in a following section on the Ocean Economy.

- Coastal Zone Counties. Coastal zone counties are any county that includes in whole or part the area under the jurisdiction of the Coastal Zone Management Act of 1972 (CZMA) as defined for that purpose by each state participating in the program. Four (4) states include the entire state in the coastal zone (Rhode Island, Delaware, Florida, and Hawaii). Nine (9) states (Washington, Alaska, Texas, Louisiana, Georgia, South Carolina, North Carolina, Virginia, and Maryland) define their coastal zones using county or county-equivalent boundaries. Other states use various combinations of political (e.g. town boundaries) and geographic features (adjacency to tidal waters) to define their coastal zones for purposes of the CZMA. All counties that include territory defined as the coastal zone in such circumstances are included in this category. In addition, while not officially a part of California's state coastal zone management program, the NOEP elects to include San Joaquin, Yolo, and Sacramento to the State's coastal zone counties due to their large contribution to the coastal and ocean economies.

  Coastal zone counties are further subdivided into shore-adjacent and non-shore adjacent counties in those states where the state-defined coastal zone extends inland further than the counties immediately adjacent to the shore.

  Coastal zone counties were identified using geographic information systems. Data showing the boundaries of each state's coastal zone were obtained from National Oceanic and Atmospheric Administration's (NOAA) Office of Coastal Resource Management and overlaid on the county boundary data of the U.S. Census Bureau to determine the intersection. In the case of Illinois, which is preparing to participate in the CZM program, Cook and Lake Counties were included as the counties that will be included in an Illinois CZM program.

- Coastal Watershed Counties. These are defined by the U.S. Geological Survey and NOAA as follows:

  The coastal watershed is composed of all lands within Estuarine Drainage Areas (EDAs) or Coastal Drainage Areas (CDAs) in NOAA's Coastal Assessment Framework. EDAs and CDAs are individual coastal watersheds that border the coast of the contiguous United States, not including Alaska or Hawaii. An EDA is defined as that part of an estuary's entire watershed that empties directly into the estuary and, for each river in the estuary's watershed, includes the downstream-most USGS cataloging unit in which the head of tide is found. CDAs are defined as that component of an entire watershed that meets these three criteria: 1) it is not part of any one of the EDAs; 2) it drains directly into an ocean, an estuary, or the Great Lakes; and 3) it contains the downstream-most cataloging unit in which the head of tide is found (in the Great Lakes, tide refers to meteorologically created tides).

  A coastal cataloging unit is a drainage basin that falls entirely within or straddles an EDA or CDA. Typically, most EDAs or CDAs are composed of several complete cataloging units (drainage basins).

Population and Housing Discussion

All population and housing data reported by NOEP are from the Census of Population and Housing for 1970, 1980, 1990, and 2000. All calculations of population and housing density were made using the Census Bureau's data on land area for each jurisdiction. Land area excludes water bodies and wetlands.

Methodology Discussion

The estimation of the economic activity associated with the ocean is inherently limited by data availability, conceptual difficulties, and the need to make some subjective choices about what to include and exclude. The choices that must be made in the design of statistical measures of ocean economic activity should be informed by clear objectives for the system. The NOEP methodology has the following objectives:

- *Comparability across industries and space* The data should be consistent from the national to the local level and across all states. The measure of employment in one location should be the same as all other locations.

- *Comparability across time* The data should be sufficiently consistent over time so that changes can be observed and measured with the same data at all points.

- *Theoretical and accounting consistency* The data should reflect standard economic theory describing the measurement of economic activity. It should not permit double counting of economic activity, meaning all measures can be summed across industries and geographies.

- *Replicability* The assembly of the data should be done using a methodology that can be replicated by other researchers and that can form the basis for continued generation of data series into the future in order to establish long term time series measures of the Ocean Economy.

The Basic Data: The Quarterly Census of Employment and Wages

The methodology developed to do this is based on using the Quarterly Census of Employment and Wages (QCEW) employment data, which are collected monthly by each state's department of labor and reported to the U.S. Department of Labor. The QCEW data are used as the basis for administering the nation's unemployment insurance laws, and covers about 90% of all employees.[1] It excludes farm, military, railroad, and

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[1] In 2001, BLS estimated a total of 12.1 million employees in agriculture, domestic service, and certain state and local employees were excluded from the QCEW. This was 9% of total wage and salary employment. See http://www.bls.gov/cew/cewbultn.htm#2b. This employment, plus military and self employment not covered by unemployment insurance laws is added to wage and salary employment by the Bureau of Economic Analysis to estimate total employment. In 2005, wage and salary employment was

self-employment. It also excludes most employment in the commercial fish harvesting industry. Most fish harvesting firms are not required by the federal law to report employment, although some fish harvesting firms may, by virtue of their form of legal incorporation, report their employment. This is most common in the Pacific Northwest, particularly in the State of Washington.

 QCEW data are reported at the establishment-level. Any single place of business is an establishment, regardless of who owns it. A business firm may have many establishments or only one. Nonprofit organizations and governments also report their employment through this system. Nonprofit organizations are included in the NOEP data. Government employment is included in the coastal data series, but not the ocean economy series.

All QCEW data are reported to the Bureau of Labor Statistics of the U.S. Department of Labor (BLS), which compiles the state reports into a longitudinal database (LDB) of all reporting establishments in the United States. Because of differences in revisions of the data between the LDB and state labor agencies' records, there may be minor differences, between totals reported here and those available from state departments of labor or publications of the BLS or Bureau of Economic Analysis (BEA).
All reported employment data are annual average data from monthly reports. All wage data are annual totals from monthly reports. A weakness is that reports do not reflect seasonal swings in employment.

Industrial Definitions: The Ocean Economy

The NOEP methodology defines the Ocean Economy as comprised of nine (9) sectors. Currently, data are available for six (6) of these categories, noted in Table 1. Data on ocean-related activities of federal, state, and local governments, as well as on the real estate industry and research and education values are not available. Their values are not easily extracted from these data sources, and will be compiled using different methods in later phases of the project.

For purposes of the NOEP methodology, sectors and industries (see Table 1) have been defined as ocean-related based on 1) the Standard Industrial Classification codes (SIC) and, 2)the North American Industrial Classification System (NAICS). (For a full discussion of SIC codes see page 25.) Certain industries, shown in italics in Table 1, are defined as ocean if the establishments are located in near-shore zip codes.

Table 1: Sectors and Industries of the Ocean Economy

Construction – Marine	Tourism & Recreation – Coastal
Marine-related Construction	*Amusement and Recreation Services, NEC**
Living Resources – Marine	*Boat Dealers*
Fishing	*Eating & Drinking Places*

estimated by BEA to be 81% of total employment. See BEA Personal Income Table SA-25 at www.bea.gov.

Fish Hatcheries and Aquaculture	*Hotels & Lodging Places*
Seafood Processing	*Marinas*
Seafood Markets	*Recreational Vehicle Parks & Campgrounds*
Minerals – Offshore	*Scenic Water Tours*
Limestone, Sand, & Gravel	*Sporting Goods Retailers*
Oil and Gas Exploration	*Zoos, Aquaria*
Oil and Gas Production	**Transportation – Marine**
	Deep Sea Freight Transportation
	Marine Passenger Transportation
Ship & Boat Building	Marine Transportation Services
Boat Building and Repair	Search and Navigation Equipment
Ship Building and Repair	*Warehousing*

* Not elsewhere classified

Most of the industries defined in this table have single 4-digit SIC codes. Some 4-digit SIC industries have been combined to create the industries as shown in order to minimize the disclosure of data for single firms, since disclosure is prohibited. Table 2 shows the industries and corresponding SIC codes (1987 Revision) and the correspondence between the SIC and the North American Industrial Classification System (NAICS) codes.

Table 2: Ocean Economy Sectors and Industries by SIC and NAICS Codes

Ocean Economy Sectors and Industries by SIC and NAICS Codes					
Sector	Industry	NAICS Code	NAICS Industry (1997 NAICS)	SIC Code	SIC Industry (1987 SIC)
Construction - Marine	Marine Related Construction	237120	Oil and Gas Pipeline and Related Structures	1629	Heavy Construction Not Elsewhere Classified
		237990	Other Heavy and Civil Engineering Construction		
Living Resources - Marine	Fish Hatcheries & Aquaculture	112511	Finfish Farming and Fish Hatcheries	0273	Animal Aquaculture
		112512	Shellfish Farming	0921	Fish Hatcheries and Preserves
	Fishing	114111	Finfish Fishing	0912	Finfish Fishing
		114112	Shellfish Fishing	0913	Shellfish Fishing
	Seafood Processing	311711	Seafood Canning	2077	Animal and Marine Fats and Oils
		311712	Fresh and Frozen Seafood Processing	2091	Canned and Cured Fish and Seafoods
				2092	Fresh and Frozen Fish and Seafoods
	Seafood Markets	445220	Fish and Seafood Markets	5421	Meat and Fish (Seafood) Markets, Including Freezer Provisioners (seafood)
Minerals - Offshore	Limestone, Sand & Gravel	212321	Construction Sand and Gravel Mining	1422	Crushed and Broken Limestone
		212322	Industrial Sand Mining	1442	Construction Sand and Gravel
	Oil & Gas Exploration and Production	211111	Crude Petroleum and Natural Gas Extraction	1446	Industrial Sand
		213111	Drilling Oil and Gas Wells	1311	Crude Petroleum and Natural gas
		213112	Support Activates for Oil and Gas Operations	1321	Natural gas liquids
		541360	Geophysical Exploration and Mapping Services	1381	Drilling Oil and Gas Wells
				1382	Oil and Gas Field Exploration Services
				1389	Oil and Gas Field Services Not Elsewhere Classified
Ship & Boat Building and Repair	Boat Building & Repair	336612	Boat Building & Repair	3732	Boat Building & Repair
	Ship Building & Repair	336611	Ship Building & Repair	3731	Ship Building & Repair

			Ocean Economy Sectors and Industries by SIC and NAICS Codes		
Sector	**Industry**	**NAICS Code**	**NAICS Industry (1997 NAICS)**	**SIC Code**	**SIC Industry (1987 SIC)**
Tourism & Recreation - Coastal	Boat Dealers	441222	Boat Dealers	5551	Boat Dealers
	Eating & Drinking Places	722110 722211 722212 722213	Full Service Restaurants Limited Service Eating Places Cafeterias Snack and Nonalcoholic Beverage Bars	5812	Eating Places
	Hotels & Lodging Places	721110 721191	Hotels (Except Casino Hotels) and Motels Bed and Breakfast Inns	7011	Hotels and Motels
	Marinas	713930	Marinas	4493	Marinas
	Recreational Vehicle Parks & Campsites	721211	RV Parks and Recreational Camps	7033	Recreational Vehicles Parks & Campsites
	Scenic Water Tours	487210	Scenic and Sightseeing Transportation, Water		
	Sporting Goods	339920	Sporting and Athletic Goods Manufacturing	3949	Sporting and Athletic Goods Manufacturing Not Elsewhere Classified
	Amusement & Recreation Services	487990 611620 532292 713990	Scenic and Sightseeing Transportation, Other Sports and Recreation Instruction Recreation Goods Rental Amusement and Recreation Services Not Elsewhere Classified	7999	Amusement and Recreation Services Not Elsewhere Classified
	Zoos, Aquaria	712130 712190	Zoos and Botanical Gardens Nature Parks and Other Similar Institutions	8422	Zoos and Aquaria

Ocean Economy Sectors and Industries by SIC and NAICS Codes					
Sector	**Industry**	**NAICS Code**	**NAICS Industry (1997 NAICS)**	**SIC Code**	**SIC Industry (1987 SIC)**
Transportation - Marine	Deep Sea Freight	483111	Deep Sea Freight Transportation	4412	Deep Sea Foreign Transportation of Freight
		483113	Coastal and Great Lakes Freight Transportation	4424	Deep Sea Domestic Transportation of Freight
				4449	Water Transportation of Freight Not Elsewhere Classified
	Marine Passenger Transportation	483112	Deep Sea Passenger Transportation	4481	Deep Sea Transportation of Passengers Except by Ferry
		483114	Coastal and Great Lakes Passenger Transportation	4482	Ferries
				4489	Water Transportation of Passengers Not Elsewhere Classified
	Marine Transportation Services	488310	Port and Harbor Operations	4491	Marine Cargo Handling
		488320	Marine Cargo Handling	4492	Towing and Tugboat Services
		488330	Navigational Services to Shipping	4499	Water Transportation Services Not Elsewhere Classified
		488390	Other Support Activities for Water Transportation		
	Search and Navigation Equipment	334511	Search, Detection, Navigation, Guidance, Aeronautical and Nautical System and Instrument Manufacturing	3812	Search, Detection, Navigation, Guidance, Aeronautical and Nautical System and Instrument Manufacturing
	Warehousing	493110	General Warehousing and Storage	4225	General Warehousing and Storage
		493120	Refrigerated Warehousing and Storage	4222	Refrigerated Warehousing and Storage
		493130	Farm Product Warehousing and Storage	4221	Farm Product Warehousing and Storage

The SIC and NAICS Industrial Classifications

One of the byproducts of the 1993 North American Free Trade Agreement (NAFTA) was the need to standardize the system of industrial classification used by the U.S., Canada, and Mexico in order to implement some of the provisions of the agreement. This need arose just as the U.S. economy was undergoing a significant transformation as information technologies and other complex shifts in the services sector were transforming the economy in ways that could no longer be adequately captured by the SIC system, which, though revised many times (most recently in 1987), had been in use since the 1930s. Thus the NAICS was created.

NAICS began to be implemented in federal statistical programs with the 1997 Economic Census. Gradually all government statistics programs that are compiled on an industrial basis are being migrated to NAICS. Employment and wage data began to appear in this format in 2002.

In order to accommodate the shift to NAICS, the NOEP offers both NAICS and SIC data.

- Data is available in NAICS for all years beginning in1990. Employment data was reported on the basis of NAICS classifications by establishments beginning in 2001. Employment and wage data prior to 2001 was imputed to the NAICS codes by the BLS, and this data is used for both the Ocean and Coastal Economies.
- GSP data was estimated by the BEA on a NAICS basis for 1997 and later. GSP estimates for 1990-1996 are only available on an SIC basis from BEA. For these years GSP estimates were made by disaggregating the GSP data on an SIC basis and the reaggregating on a NAICS basis using the establishment-level data at the BLS, which is coded both by the reported SIC code and the imputed NAICS code.
- SIC based estimates are available for 1990, 2000, and 2001 for reference purposes to other data series. Note that 2001 was the first year in which all employment data was required to be reported by employers using the NAICS classification.

The shift to the NAICS system represents a significant shift in the basis of estimating the Ocean Economy. Releasing establishment, employment, and wage data on both bases for 2001 will allow users to see where the differences in the taxonomies affect the estimates of ocean-related economic activity.

There are a number of changes between the SIC and NAICS systems.[2] The major changes made are:

- Shifting from a four-digit classification system to a six-digit classification, permitting a larger number of industries to be identified.

- The creation of new sectors, particularly in the services industry sectors, showing a much greater diversity of industries.

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[2] For a complete discussion see: Office of Management and Budget 1998 North American Industrial Classification 1997 Lanham, MD Bernan Press and North American Industrial Classification System 2002.

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- With the additional industry codes created and the evolution of different types of economic activity, many SIC groups are now split into multiple NAICS groups resulting in less mixing of dissimilar activities.

- A shift in the basis upon which establishments are classified. Under SIC, an establishment was classified in the code appropriate to what the firm produced. Under NAICS, the classification is based on what the establishment produces. For example, if a ship building firm had two establishments, a corporate headquarters and a ship yard located in two different towns, both would be classified as Ship Building and Repair (3731) under the SIC code, but under NAICS, only the ship yard itself would be classified as Ship Building and Repair, while the corporate headquarters would be classified as a service industry establishment.

   This change primarily affects the manufacturing ship and boat building and the oil and gas exploration and production industries in the Ocean Economy, resulting in a significant reduction in the number of establishments in these sectors.

NAICS and Ocean Industries

Table 3 on page 31 shows the Ocean Economy sectors and industries as defined by the NOEP along with the SIC codes and industries and the NAICS codes and industries for each Ocean Economy industry. Many of the ocean industries are essentially unchanged in classification between SIC and NAICS. The major changes in classification are:

1. SIC 2077 Animal and Marine Fats and Oils. Under NAICS, a separate code is created for animal fats and oils. Marine fats and oils are now incorporated in NAICS 311711, Canned and Cured Seafood.

2. SIC 5810 Eating and Drinking Places. This sector is broken into five (5) NAICS industries. Alcoholic beverage bars are excluded from the Tourism & Recreation ocean sector; all others are included.

3. SIC 7999 Amusement and Recreation Services Not Elsewhere Classified. This industry is divided into a number of NAICS industries. Those included in the ocean industry are shown in Table 3 on page 31. Excluded are firms involved in activities such as theater booking agents, dance studios, travel agents, ticket agents, etc.

4. SIC 4449 Water Transportation of Freight Not Elsewhere Classified and SIC 4489 Water Transportation of Passengers Not Elsewhere Classified. These industries were reclassified as inland transportation of freight and inland transportation of passengers (not including the Great Lakes) and are not included in the Ocean Economy. SIC 4489 also included activities now included in NAICS 487210, Scenic Water Tours. This industry is included in the Tourism & Recreation sector.

5. SIC 4225 General Warehousing. This sector is now divided between commercial warehouses and mini-warehouses and storage facilities. The former group is included in the Ocean Economy, the latter is excluded.

6. SIC 7011 Hotels and Lodging Places. Hotels that are parts of casinos are now a separate NAICS code. These are excluded from the Ocean Economy sector. Casinos that were owned and operated by Native American tribes were classified under the SIC system in local government, and were not included in SIC 7011.

Table 3 on page 31 provides a comparison of estimates for Ocean Economy sectors and industries for 2001 to illustrate the difference between the SIC and NAICS-based estimates.[3] The NAICS based estimates show a total employment of 2.1 million, while SIC estimates show 2.4 million. The largest differences are in Oil & Gas Exploration and Production, Ship and Boat Building, and Hotels and Lodging Places. Greater geographic specificity does not eliminate the problem of counting more activity than is directly tied to the ocean. For example, hotels and restaurants, which are clearly an important part of the tourist economy related to the ocean and which provide the bulk of the employment in the reported data, serve customers who do more than go to the beach or engage in other ocean-recreation activities. For restaurants, there is a mixture of local and tourist customers, while hotels have a mixture of leisure and non-leisure travelers (though even business travelers may specifically seek a coastal location for the amenities it provides).

Ideally, data would be available that would permit the Tourism & Recreation or Minerals sectors to be further disaggregated by ocean-related activity. Such data do exist in some locations, but not others. For example, California has good survey data on hotel patrons on the proportion that are leisure-related and the proportion traveling on business. But these data are not available for all states, and no one state is likely to be sufficiently representative of all states so that its data could be used for national data. Geographic location, on the other hand, is consistently measured, within reason, across all jurisdictions.

Where data permit, and more refined estimates of ocean-related activity are available, the information will be used in studies of those regions. This was done in a project estimating the California Ocean and Coastal Economies. Again, however, alternative methods do not necessarily mean greater accuracy. This can be seen using the example of offshore oil and gas activity. The method employed here uses QCEW employment and wages for all establishments located in the near-shore area as defined by shore-adjacent zip codes (see below) and attributes the offshore oil and gas economic activity to a region based on these observations.

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[3] Figures in Table 3 may not match the most current estimates available from the NOEP website. Readers should use the website data as estimates are updated when the federal data sources are revised.

Table 3: National Summary of Ocean Economy Sectors and Industries for 2001*

Ocean Sector	Ocean Industry	NAICS BASED ESTIMATES			SIC BASED ESTIMATES		
		Establishments	Employment	GSP	Establishments	Employment	GSP
Construction	Marine Related Construction	1,844	27,751	$2,602,299,208	2,094	34,570	$2,888,410,964
	Total	1,844	27,751	$2,602,299,208	2,094	34,570	$2,888,410,964
Living Resources	Fish Hatcheries & Aquaculture	588	4,669	$880,977,811	601	4,756	$892,941,185
	Fishing	2,290	5,779	$728,807,564	2,304	6,175	$793,365,115
	Seafood Markets	2,408	13,196	$589,319,547	6,881	41,899	$1,611,058,873
	Seafood Processing	1,061	42,751	$2,194,454,160	1,272	49,562	$2,771,833,428
	Total	6,347	66,393	$4,393,559,083	11,058	102,391	$6,069,198,601
Minerals	Limestone, Sand & Gravel	53	1,597	$121,188,514	1,129	27,296	$13,422,282,173
	Oil & Gas Exploration and Production	1,215	25,431	$11,998,341,238	292	5,008	$469,879,762
	Total	1,268	27,028	$12,119,529,752	1,421	32,304	$13,892,161,935
Ship & Boat Building	Boat Building & Repair	1,303	43,284	$1,880,414,533	805	116,260	$6,521,130,215
	Ship Building & Repair	639	111,220	$6,258,200,400	2,954	51,886	$2,230,154,004
	Total	1,942	154,504	$8,138,614,933	3,759	168,146	$8,751,284,219
Tourism & Recreation	Amusement & Recreation Services	4,931	45,262	$1,390,164,506	6,849	124,412	$4,562,316,614
	Boat Dealers	2,049	15,535	$1,061,082,244	2,051	15,540	$1,059,389,994
	Eating & Drinking Places	73,683	1,109,323	$33,090,055,591	79,446	1,192,856	$36,593,716,092
	Hotels & Lodging Places	10,905	326,323	$17,590,057,391	10,984	379,643	$21,491,710,975
	Marinas	1,957	13,897	$730,382,707	1,960	13,973	$730,179,231
	Recreational Vehicle Parks & Campsites	657	4,810	$209,572,440	658	4,825	$210,082,901
	Scenic Water Tours	1,419	10,079	$403,566,843	N/A	N/A	N/A
	Sporting Goods	407	8,430	$819,162,718	393	8,544	$849,420,387
	Zoos, Aquaria	293	19,246	$706,964,726	157	8,363	$57,740,391
	Total	96,301	1,552,907	$56,001,009,167	102,498	1,748,155	$65,554,556,584
Transportation	Deep Sea Freight Transportation	625	20,313	$2,512,372,921	935	33,756	$3,834,929,308
	Marine Passenger Transportation	212	13,155	$1,017,808,645	997	25,715	$1,621,214,287
	Marine Transportation Services	3,205	91,217	$7,519,733,248	3,638	95,005	$8,054,747,414
	Search and Navigation Equipment	745	117,013	$11,235,409,573	779	118,624	$11,092,008,773
	Warehousing	1,548	39,199	$2,818,036,314	2,147	21,248	$1,382,270,906
	Total	6,335	280,897	$25,103,360,702	8,496	294,348	$25,985,170,687
Ocean Economy	**Total**	**114,037**	**2,109,480**	**$108,358,372,845**	**129,326**	**2,379,914**	**$123,140,782,988**

*See footnote 2, page 27

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An alternative method apportions employment, wages, and output in the oil and gas industry based on production of oil and gas onshore and offshore. Such data are reported by the U.S. Minerals Management Service of the Department of the Interior and by comparable agencies in each state. Such an apportionment makes intuitive sense, but would miss employment and related activity associated with exploratory activities (from which no production is currently being derived) and redevelopment activity in producing areas, when production may fall but employment may rise.

The use of SIC codes for the industrial selection also entails some compromises. For example, Marine Construction is included in SIC 1629 (Heavy Construction), which also includes other types of heavy construction activity. In the revised industrial taxonomy provided by the NAICS, marine construction activity is separated from other construction activity such as water and sewer construction..

A somewhat similar problem occurs with Search and Navigation Equipment. This industry produces primarily electronic equipment such as radar, sonar, geographic positioning systems, etc. These products all have applications in marine transportation (and increasingly in recreational boating), but also in aviation. No information exists to separate the applications to which the products of this industry may be put. All of the output is counted in Marine Transportation, which overstates the actual marine component of the output.

Another problem arises from the grouping of industries into sectors. Industries could be included in more than one ocean sector. The example of search and navigation equipment just discussed indicates that the products of the industry may be used both in marine transportation of goods and people as well as in recreational boating. We have assigned it to Transportation since the largest dollar volume of marine-related products is in the commercial side of the business.

Marinas are another example of possible sectoral confusion. Marinas are the home to both recreational boats and some commercial boats, primarily in the fishing industry. However, the vast majority of boats in marinas are recreational boats and so this sector is assigned to Tourism & Recreation. Where data for the individual industries are available, users may adjust the sector totals to suit their preferences of sectoral definition.

The use of the SIC classification undoubtedly leaves out a number of industries that are directly related to the ocean. These include:

- Specialized services like boat designers
- Rental of homes as temporary lodging
- Sales in food stores to tourists
- Sales from miscellaneous retail outlets in tourism areas
- Ocean-related production that does not take place in coastal states, for example the manufacture of recreational boats and other recreational equipment in inland states.

These omissions can be addressed, at least in part, by using the national input/output tables to estimate total national direct and indirect economic activity based on the data estimated as described here. This may be a future task by NOEP.

Gross State Product

Previous measures of the Ocean Economy (Pontecorvo, Wilkinson et al. 1980; Pontecorvo 1988; Luger 1991) have sought to measure the Ocean Economy as a proportion of the national economy. This is an important first step, but measurement of the ocean's contribution to the economy should go beyond simply measuring the share of the national economy. Three additional criteria are proposed by NOEP:

- Measures should be consistent across time and space and should sum to national, state, and regional measures of the economy.

- Measures must be able to show detail at the industrial level.

- Measures must be able to reflect the geographic character that defines ocean sectors such as Tourism & Recreation, which is ocean-related only when located in certain areas.

This section discusses the derivation of the measures used at the national level and their adaptation to the Ocean Economy.

The National Income and Product Accounts are the basic measure of the level of economic activity in the United States. These accounts have been developed to the values to ultimate consumers as the principal measure of value. This means distinguishing between final goods and services (those purchased by ultimate consumers) and intermediate goods and services. These latter are the inputs to the production process that creates final goods and services; their value is subsumed within the final market prices of goods sold at final demand (Seskin and Parker 1998).

The total market value of goods and services at the national level is measured as the Gross Domestic Product (GDP). This measure provides the sum of the value of goods and services measured at market prices to the final consumers. Three broad classes of final consumers are considered: households and businesses, government, and those in other countries. A fourth category, investment, counts the purchases of long-lived goods by households, businesses and government. GDP is thus defined as:

$$GDP = C + I + G + X$$

Where:

GDP = Gross Domestic Product
C = Expenditures for personal consumption of goods and services
 I = Net private investment
G = Government purchases of goods and services for both consumption and
     investment
X = Net Exports (Total Exports – Total Imports).

The measurement of GDP is based also on the equivalence between production and consumption. GDP is a measure of production (what the economy produces), but is measured as consumption (what is bought) in order to avoid the problem of double counting. If each sale of goods or services in the economy were simply summed, many values would be counted twice. For example, the sale of cod from the fishing boat to the processor to the restaurant constitutes three separate sales, but only the final sale to the consumer at the restaurant includes all the previous sales. It is this value that is counted in the GDP as the value of the ocean's output of fish for food.

The equivalence of production and consumption also means there is equivalence between income and output. At the national level, the income equivalent of GDP is Gross Domestic Income, and it is calculated as:

$$GDI = Cp + T - S + NOS + K$$

Where:

   Cp = Compensation of employees
   T = Taxes on production and imports
   S = Government subsidies
   NOS = Net operating surpluses of private enterprises and government enterprises
   K = Consumption of fixed capital.

Because GDP is measured by the values paid by the final customers (whether of consumer or investment goods and services), it is not possible to identify the contribution of any particular industry to the nation's output of goods and services. To address this need, the BEA has developed a companion measure to the GDP, Gross Product Originating (GPO), which measures output by sector of production and basically reflects the payments to industries for the purchase of labor and intermediate inputs. This measure is also called "GDP by Industry." It is derived from the Gross Domestic Income data (Lum. and Moyer 1998) and is defined as:

$$GPO = \sum_i^n S_i - \left(L_i + \sum_i^n I \right)$$

Where:
   S_i = sales by industry i
   L_i = labor inputs purchased by industry i
   I_i^n = intermediate inputs (goods and services) purchased from all other industries i
       to n.

As this definition indicates, GPO is the "value added" of each sector but it is derived from the measurement of payments to labor and the sales of intermediate goods, which are measures of income. This measurement of income may be interpreted as a measure

of the gross output of the region because by definition the income earned in a region equals what the region produces (output).

As noted, the GDP measure does not permit disaggregation by contribution, so the GPO figure was developed for this purpose to describe industry output at the national level. Similarly, due to the way GDP is defined and measured, it is not possible to disaggregate it by region since no regional measure of consumption is available. The regional counterpart to the GDP by industry is the GSP, which is estimated by BEA for all states. GSP is defined as:

$$GSP_s = Cp_s + T_s + NOS_s$$

Where:

$\quad$ GSP_s = GSP for state s
$\quad$ CP_s = Compensation of employees in state s
$\quad$ T_s = Taxes on production in state s
$\quad$ $NOS =_s$ = Net operating surplus of State s.

This definition is essentially the same as Gross Domestic Income; the sum of state level GSP is equivalent to national level GDI when certain statistical discrepancies and adjustments are made. BEA estimates gross product by industry only at the state-level because detailed data required to construct these estimates are not available consistently at levels below the state.

Like the GDP, GSP is a measure of value added designed to avoid double counting of output. GSP differs from GDI and GDP in several important ways:

- Government wages and salaries for personnel outside the United States are excluded from GSP, while they are included in GDP.

- GSP and GDP are estimated and revised on different schedules by BEA. GDP is released and revised quarterly, generally about two quarters after the close of the subject quarter. GSP is released and revised once a year, about 18 months after the close of the year.

Since the goal of the NOEP estimates is to have data that are available at the national, state, and local levels, the GSP is the appropriate measure of output, considering regional variations in output for each industry are best captured using this measure rather than the national estimates of gross product by industry. GSP allows differences in industries across states to be measured so that both state and national estimates can be made. For example, the transportation equipment industry is dominated by the automobile industry in some states (e.g. Michigan) and the ship building industry in other states (e.g. Maine). If firms in the transportation equipment industry were measured using a single national figure for the industry, automobiles would be overemphasized in Maine and underemphasized in Michigan. These differences are essential to correctly measuring the Ocean Economy.

The GSP for each industry in the Ocean Economy is estimated using the equation below, which states that an establishment's share of the state's GSP is based on the establishment's share of the appropriate industry GSP for that state. Wages as reported by the BEA are multiplied by the GSP for that two-digit industry, and then summed across all establishments in that industry.[4] This method assures that the sum of wages and GSP for the Ocean Economy sector is consistent with the total GSP for the state as reported by BEA.

$$GSP_r^i = \sum_{i=1}^{n} \left(\frac{W_e^i}{W_S^I} \right) GSP_S^I$$

Where:

GSP_r^i = the Gross State Product for industry i in region r

W_e^i = the wages for a given establishment in industry i

W_S^I = the total wages in industry i in state S (from BLS data)

GSP_S^I = the total gross state product for industry I in state S from BEA.

Disaggregation of GSP by wages represents the most practical method of developing specialized regional or industrial estimates of GSP, since the BLS data provides primary observations of wages. Wages and salaries are also a major component of GSP, which is calculated from employee compensation, indirect business taxes, and property income by industry. Employee compensation used by BEA in estimating GSP includes more than wages. It also includes benefits and self-employment income. But wages comprise the vast bulk of employee compensation, so the disaggregation using wages is a reasonable, if an imperfect approach to estimating sub-state and detailed industry GSP.

The GSP is reported by the BEA for sixty-three (63) industries, which generally are consistent with the two-digit SIC level. Many of the industries in the ocean sectors are defined at the four-digit level. This introduces some distortions into the results. For example, in the SIC codes, boat dealers are a subgroup of auto dealers, which are part of the Retail sector. But the retail industry is not broken down in the BEA GSP figures, meaning that this methodology groups boat sales with all other retail industries, and thus understates the value of boat sales since boats are among the highest value items sold at retail. Possible future disaggregation of the GSP data for retail by the BEA would address this issue.

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[4] The SIC system uses a four-digit code to denote industries. Thus SIC 2092 is Fresh and Frozen Seafood, with 2 denoting the Manufacturing sector, 20 the Food and Kindred Products industry, 209 the Seafood industry, and 2092 Fresh and Frozen Seafood.

An exception to the GSP being available at the two-digit level is in the transportation equipment industry (SIC 37), where data are reported for the automobile industry and the "rest of transportation equipment." Boat and ship building would be included in the latter category, but so is aviation-related manufacturing. The GSP estimates for Ship & Boat Building are computed as a share of the "rest of transportation equipment," but this may distort upward the GSP figures in regions such as Washington State where there is a much higher degree of aviation-related manufacturing than of boat and ship building in the "rest of transportation equipment" category. These distortions are embedded in the BEA GSP data and cannot be countered without further disaggregation of that data. This is an issue for future research.

The use of this method for estimating GSP represents a departure from the "establishment-level up" methodology that forms the basis of the estimates; the estimates of GSP are based on a disaggregation of higher-level data to the establishment-level. This disaggregated data is then re-aggregated into the appropriate industry and geography. An alternative methodology would be to use the data from the Economic Census to derive GSP estimates for the specific firms and industries selected for this study using a process similar to that which the BEA uses in developing its own GSP estimates. However, the Bureau of the Census refused permission to use its data for this purpose, citing concerns about data disclosure. However, since the Economic Census is conducted only every five years, the method used here has the advantage of being much more frequently updated and always incorporating the most recent methodological improvements of the BEA.

Confidentiality

All data derived from the QCEW data series are subject to confidentiality screening. Federal law prohibits the release of data at any level of aggregation that could reveal the employment or wages of a single firm. The estimates for employment and wages were developed using the original data series, which includes all establishments and are thus not restricted by confidentiality. However, all reported data are screened for confidentiality by the BLS before being released. This screening includes comparing the released data with other published data sources to be certain that no confidential data could be imputed based on combining this data series with any other data.

There are three major filters that prevent the disclosure of confidential data:[5]

- The primary disclosure rule (Rule 1) is also known as the N/K rule: any data that reports three (3) or fewer establishments cannot be released, and any data in which the largest establishment comprises 80% or more of the employment cannot be released.

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[5] For more information on Federal disclosure limitation rules, see Federal Committee on Statistical Methodology (1994) *Statistical Working Paper 22: Report on Statistical Disclosure Methodology*. Office of Management and Budget.

- The secondary disclosure rule (Rule 2) is that it cannot be possible to violate the N/K rule by subtraction. Thus if one industry in an aggregation violates the N/K rule and the total data for the aggregation are shown, then it would be possible to calculate the suppressed data by subtracting the sum of all non-suppressed industries from the total. In this case, a second industry must be suppressed in order to prevent disclosure.

- The complementary disclosure rule is a variation on the secondary rule: it cannot be possible to calculate a suppressed total by comparing the results of a custom analysis of confidential data with any published data from the same data series. This requires that all NOEP data be compared against the publicly available QCEW data.

Illustrations of these principles are shown in Tables 4 through 7. They show three hypothetical counties with Marine Cargo Port Operations. The above rules would operate as follows using the Marine Transportation Services industry (as defined for the Ocean Economy) as an example, but using hypothetical data.

Table 4: Marine Transportation Services

NAICS Code	NAICS Industry	County A		County B		County C	
		Employment	Estab.	Employment	Estab.	Employment	Estab.
488310	Port and Harbor Operations	800	20	75	3	15	1
488320	Marine Cargo Handling	1500	6	125	4	40	1
488330	Navigational Services to Shipping	55	4	0	0		
488390	Other Support Activities for Water Transportation	275	15	75	6	20	2
Marine Transportation Services Total		**2630**	**45**	**275**	**13**	**75**	**4**

In Table 4, County A employment data could be shown for the Marine Transportation Services industry as a whole and for each of the component industries, unless the largest employer in any one industry (for example, 488330) comprised more than 80% of employment. If this were the case, then 488330 would have to be suppressed according to Rule 1 and another industry would have to be suppressed according to Rule 2. The released data would then be:

Table 5: County A Employment Data

NAICS Code	NAICS Industry	County A	
		Employment	Establishments
488310	Port and Harbor Operations	800	20
488320	Marine Cargo Handling	1500	6
488330	Navigational Services to Shipping	D	D
488390	Other Support Activities for Water Transportation	D	D
	Total	**2630**	**45**

(D= Disclosure Not permitted)

For County B, port and harbor operations must be suppressed according to Rule 1 and another industry suppressed according to Rule 2. The released data would then be:

Table 6: County B Employment Data

NAICS Code	NAICS Industry	County B	
		Employment	Establishments
488310	Port and Harbor Operations	D	D
488320	Marine Cargo Handling	125	4
488330	Navigational Services to Shipping	0	0
488390	Other Support Activities for Water Transportation	D	D
	Total	**275**	**13**

(D= Disclosure Not permitted)

Finally, for County C, all individual industry data must be suppressed and only the county totals can be shown, as:

Table 7: County C Employment Data

NAICS Code	NAICS Industry	County C	
		Employment	Establishments
488310	Port and Harbor Operations	D	D
488320	Marine Cargo Handling	D	D
488330	Navigational Services to Shipping	D	D
488390	Other Support Activities for Water Transportation	D	D
	Total	**75**	**4**

(D= Disclosure not permitted)

Massachusetts

The one exception to the methodology described above is Massachusetts, whose state legislature prohibits, by statute, access by researchers to their establishment-level QCEW data. In order to estimate Massachusetts' data, the publicly available QCEW data from the BLS are used to show data for the same industries as defined for other states.

Where zip code level data were required for the Tourism & Recreation industries, data from the Bureau of the Census Zip Code Business Patterns (ZCBP), which shows aggregate employment and wages by zip code, were used to estimate shares of employment and wages. They do not show annual average data for employment, as do the QCEW. The proportion of employment reported in shore-adjacent zip codes, as reported in ZCBP relative to all employment for a given county, is used to estimate the Tourism & Recreation employment that is shore-adjacent in the QCEW data. For Dukes, Nantucket, and Barnstable counties, all of the Tourism & Recreation employment reported by BLS as defined above is included.

Previous Studies

The concept of an "Ocean GDP" is not new. In 1974, the BEA, the agency responsible for maintaining the National Income and Product Accounts, undertook a special study for the Assistant Secretary of Commerce for Policy to identify the contribution of the ocean to the GNP (Nathan Associates 1974). In that study, BEA developed estimates for Gross Product Originating from the Ocean-Related Activities using the Economic Census data for 1972. Two follow-up studies used a similar approach to estimate the values for 1977 and 1987 (Pontecorvo, Wilkinson et al. 1980; Pontecorvo 1988). All of these studies focused on the most clearly identifiable industries and economic activities; those activities that either, as defined in the Nathan Associates study, "utilized an ocean resource in a production process" or "produced a product or service that was demanded because of some quality attributable to the ocean." Sixty-six (66) sectors from the national income accounts were selected for analysis based on these criteria.

Other studies have focused attention on the coast rather than the ocean. Following Pontecorvo, Luger developed a methodology for measuring coast-dependent, coast-linked, and coastal-service activities (Luger 1991). This approach significantly expanded the types of economic activities brought into the measurement process. By focusing on the coastal zone, Luger also brought the Great Lakes into the analysis, since they are defined for federal management purposes as part of the coastal zone.

The last decade has seen increasing attention to the concept of extending the national income accounts to incorporate the kind of resource-related sources of economic value that were attempted in the earlier studies cited above. This attention has stemmed, in part, from long-standing concerns that the national income accounts are a good, but imperfect, measure of economic well-being. Thus, there have been new attempts to include important aspects of economic welfare that were traditionally excluded from the systems of national accounts used by various nations (Eisner 1989).

In 1992, the BEA began work to extend the national income accounts to include assessment of natural resource values. However, in 1995 the U.S. Congress directed the Commerce Department to suspend further work and to obtain an external review of environmental accounting. The National Academy of Sciences, through a panel formed by the National Research Council, examined the experience in European countries and Canada in trying to incorporate the role of natural resources in the economy and affirmed both the desirability and possibility of integrating economic and environmental accounts (National Research Council 1999).

Another group of studies on the economic value of the oceans has focused on the economy of various regions as influenced by the oceans. Some of these studies have been done at the state-level (Moller and Fitz 1994) (Kildow, Colgan et at. 2005) while others have been done at the multi-state and international level (Colgan and Plumstead 1993) (Statistics New Zealand, 2006). Studies of the Ocean Economy in Canadian provinces also have been undertaken (Mandale, Foster et al. 1998; Mandale, Foster et al. 2000). These studies have tended to rely on employment in specific industries or estimates of output from regional econometric models, and have thus focused on the market-related activities that are the most easily measured.

The NOEP created the six (6) sectors based on 1) an accurate representation of ocean-related sectors, and 2) the best fit for those industries listed in the SIC code. The choice of industries to include in the Ocean Economy sectors is inherently subjective. This list is based in part on 1) original research and 2) prior studies such as those of Pontecorvo et al. (1980), Pontecorvo (1988), Luger et al. (1990), and Luger (1991) The NOEP created new sectors and refined other sectors from earlier work, to produce a unique set of categories, now recognized as a standard for similar studies. Table 8 on page 39 compares the NOEP industries as defined above with the Pontecorvo et al. and Luger studies, showing which NOEP industries were included in the previous work.

This comparison shows industries defined by NOEP, including four (4) industries (Boat Dealers, Recreational Vehicles Parks and Campgrounds, Marinas, and Search and Navigation Equipment) that were not included in the other studies. The inclusion of these industries in the NOEP definitions is due in part to the consistent availability of four-digit SIC data in the QCEW dataset, in part to revisions to the SIC codes which broke these industries out from other aggregations, and in part to the growing importance of these sectors in the Ocean Economy since the earlier studies.

Table 8: Industries Included in Pontecorvo and Luger Studies

Industry	NOEP Industries	Pontecorvo et al. 1980	Luger 1991
Marine Construction	●	●	○
Fish Harvesting		●	●
Aquaculture			●
Fish Hatcheries and Aquaculture	●		
Fishing	●		
Seafood Markets	●		
Seafood Processing	●		●
Limestone, Sand, and Gravel	●	●	○
Oil and Gas Exploration	●		1
Oil and Gas Production	●	●	
Boat Building		●	●
Boat Building & Repair	●		
Ship Building		●	●
Ship Building & Repair	●		
Amusement and Recreation Services not elsewhere classified	●	●	●
Zoos and Aquaria	●	●	●
Boat Dealers	●		
Eating and Drinking Places	●	●	○
Hotels and Motels	●	●	○
Scenic Water Tours	●		
Sporting Goods	●		○
Deep Sea Freight Transportation	●	●	●
Marine Passenger Transportation	●	●	●
Marine Transportation Services	●	●	●
Warehousing	●	●	●
1 Services component only ° = defined as "coastal-services" ● = defined as "coast-dependent"			

In the Luger study a distinction was made between those industries that are "coast-dependent," "coast-linked," and "coast-related."   Some of the industries shown in Table 8 were included as coast-dependent, and were the closest to the ocean sectors as defined by Pontecorvo and NOEP, except that no attempt was made to estimate a geographic component to these industries. Others were defined as coastal services, which were held to be indirectly related to the Coastal Economy. In cases such as restaurants and lodging, the addition of a geographic component allows a better ocean relationship to be defined.

In the case of oil and gas, Luger does not include offshore oil and gas production or exploration since they were outside his definition of the coastal zone. Only the services component was included in his analysis. Pontecorvo on the other hand includes both exploration and production.

Both Pontecorvo et al. and Luger include a number of industries that are related to ocean or coastal activity by virtue of intermediate industries. A portion of these industries, such as telephone communication, marine insurance, food stores, building materials, etc. are estimated by both previous studies. Pontecorvo et al. designate these as being defined by "demand side" criteria, while Luger defines them within "coastal services." These studies rely on estimates of the share of each of these intermediate industries.

The NOEP selection of industries uses a different approach. The chosen industries may be seen as those whose output is most directly tied to the ocean and may be considered the "primary" sectors of the Ocean Economy. NOEP also includes a number of industries that were not considered by either Luger or Pontecorvo, including:

> Search and Navigation Equipment
> Seafood Markets
> Recreational Vehicle Parks & Campsites
> Scenic Water Tours
> Marinas

Economic activity associated with secondary and tertiary economic activity stemming from intermediate connections to the primary industries can best be estimated using the national input/output tables. This study may be a future task of the NOEP. This approach can both more fully capture the linkages to other intermediate industries, and better capture the "multiplier" effects of the primary ocean-related economic activity.

Multiplier Estimation: Economic Impacts of the Ocean Economy

Economic impact analysis is a method for estimating the total change in a region's economy that results from a change in one or more economic activities within that region. Economic impacts are measured by tracing the flow of dollars between regional industries and their workers. When a local business expands by exporting more goods or services outside the region, the influx of new money stimulates expansion in other businesses. A portion of the additional revenue is used to pay salaries and purchase supplies and equipment from local vendors, who, in turn, use a portion of this revenue to make purchases from other regional businesses. The process continues through multiple rounds of spending until all of the original spending has "leaked" out of the region to purchase goods and services not supplied within the region.

The change in the total economic activity generated by a one-unit change in the direct spending or employment is called its multiplier effect. Each industry within each region has its own unique multiplier, which is largely determined by the wages and salaries paid to employees and the proportion of goods and services supplied from within the region.

Larger regions typically have higher multipliers, as do industries located in regions with more fully developed supply-chains.

To calculate these influences for the Ocean Economy, NOEP uses standard economic impact modeling software called IMPLAN Pro to calculate the indirect and induced impacts for each of the thirty (30) coastal states' Ocean Economies. For more information on IMPLAN, click here.[6]

An economic impact model produces three types of impacts: direct, indirect, and induced. Direct effects are defined as the total change in the volume of goods and services delivered to final consumers within a region. Indirect effects are the summation of total purchases and sales made between regional businesses. Induced effects are the combination of local inter-industry purchases (indirect effects) plus the economic effects of payments to employees of ocean-related industries and those industries that supply the ocean industries within the region. The sum of these three (3) types of impacts equals total economic impact. IMPLAN does not predict whether the expansion of business in one sector may encourage the formation of entirely new supporting industries. It only estimates the amount of additional sales and employment that will occur in existing businesses.

NOEP state-level Ocean Economy industry data for employment, wages, and GSP are taken as the direct effects in the economic impact model. To build an impact model using IMPLAN, the direct sales, employment, and wages of ocean-related industries must be assigned to IMPLAN industry groupings. Ocean industries are matched with IMPLAN industries according to their respective employment shares as reported in the public release of the BLS QCEW series. In cases where QCEW data were suppressed for respondent confidentiality, shares are based on 2002 employment and wage estimates provided by the Minnesota IMPLAN Group. A similar method is used to estimate the values of Ocean Economy industries that are suppressed in the public release data.

With direct effects assigned to appropriate industry categories, the next stage is to build regional inter-industry accounts for each study state. IMPLAN's default regional purchase coefficients are used to determine the share of leakage in each successive round of spending along with IMPLAN's social accounting framework for the construction of inter-industry accounts. The impacts for IMPLAN industries are then re-aggregated to the reported Ocean Economy sectors, and finally checked for feasibility and accuracy.

Forecasts

Forecast data out to 2015 are available for selected data from the NOEP database. These forecasts are prepared in cooperation with Moody's/Economy.com, a leading supplier of data and economic forecast services to government and private sector organizations

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[6] IMPLAN is one of three commonly used models for estimating regional economic impacts and multipliers. The choice of IMPLAN was made because of a combination of cost, comprehensiveness, and familiarity with the models.

throughout the world.[7]   Forecasts as of January 2006 are based on the Moody's/
Economy.com August 2005 forecasts of the U.S. economy and do not include the effects
of the hurricanes that occurred in August and September in Florida and the Gulf of
Mexico 2005.

The county-level forecasts show employment, wages, and GSP for the NAICS
supersectors (see discussion of Coastal Economy definitions above) for the major county-
level aggregations of the Coastal Economy, that is:

- Coastal Zone Counties (including both shore adjacent and non-shore adjacent
  counties)
- Non-CZ Watershed Counties
- Watershed Counties
- Inland Counties

The data presented are the aggregation of county-level forecasts prepared by Moody's/
Economy.com. The county-level forecasts are copyrighted by Moody's/Economy.com.,
and are not available on the NOEP website. Coastal Economy forecasts for Delaware,
Rhode Island, and Hawaii are not available from NOEP as all of these states' counties are
defined in both the coastal zone and coastal watershed. County-level forecasts may be
acquired by arrangement with Moody's/Economy.com.

Ocean Economy forecasts are available for the Ocean Economy sectors in each state.
These forecasts were prepared by NOEP using the Moody's/Economy.com data as a
driver forecast based on the August 2005 U.S. forecast. Separate forecasting models
were fit for each sector in each state using a linear regression model. The general form of
this model for the employment forecast was:

$$ y_i^s = \alpha + \beta_1 + \beta_2 $$

Where:

y_i^s = employment in industry i and state s.

α = a computed constant

β_1 = the forecast for employment in the relevant industry and state from
Moody's/Economy.com

β_2 = a trend variable used in some models

β_1 takes one of two forms depending on the sector and state. It may be the sum
of individual industries or the relevant NAICS sector; the choice between the two
depended on the statistics of the regression.

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[7] Moody's/Economy.com is one of two major firms that regularly provide forecasts and the levels of
geographic detail required for the preparation of the NOEP forecasts. Moody's/Economy.com was
selected because of familiarity with their forecasting system and experience with their models.

The models for forecasting wages were the same as for employment, except that the forecast values for employment from the models just described substitutes for a trend independent variable in β_2.

Strengths and Weaknesses of the NOEP Methodology

Strengths

The NOEP methodology was developed to overcome the limitations of other approaches to measuring the Ocean Economy, particularly the reliance on only disclosure-screened data and the lack of geographic specificity. This methodology met the objectives set out at the beginning of the discussion, and may also be considered to have the following strengths:

- Use of primary data. The use of the QCEW data permits all estimates to be based on primary reporting data from almost all establishments in the United States. The data are verified by both the state and U.S. Departments of Labor and are the basis for all employer-related government employment statistics in the United States.

- Consistency and comparability. The data are collected using consistent methodologies across all states. They can be aggregated by industry and geography (although small area geographies do have limitations discussed below). The data are consistent also over time, at least until the implementation of the new NAICS in 2001, which created a break in the industrial data series.

- Estimates are derived from the bottom up. Employment and wage estimates are the sum of actual reported data and, except where limited by confidentiality restrictions, are the sum of firm-level reports.

- Using the zip code permits a much finer geographic level of detail than the county-level at which employment data are normally released. This is especially important in states like California, where large urban counties, such as in Southern California, seriously distort the picture of ocean-related activities measured at the county-level only.

Weaknesses

- Zip code geography is imperfect. Zip codes change over time, and available Geographic Information System (GIS) files on zip codes (from Environmental Systems Research Institute) do not always contain correct historical or recent revisions. The zip code data used were for 1999. They match very closely with 2000 data, but there may be unknown errors in the 1990 data since zip code information in GIS format were not available for that year.

- There are errors in the original employment reports. Firms make errors in reporting SIC codes and may also make errors in reporting addresses. For example, while required to give the physical location of each establishment, not every record contains this information. In such cases, alternative mailing addresses on the record were used. If no address was given, the record was omitted. These reporting errors introduce biases in the data of unknown directions and sizes that may be amplified in the fine-level geographic detail examined here.

- Industry definitions related to the ocean are imperfect. Some industries, such as those in SIC 44 (Water Transportation), are reasonably well related to the oceans. Others such as restaurants and hotels will always present problems in determining the degree to which they are related to the ocean.

- Still others, such as SIC 1629 (Heavy Construction) and SIC 3999 (Sporting Goods not elsewhere classified) do not separate a marine from a non-marine component. In these cases, the assumption is that the marine component (dredging and pier construction companies or surfboard manufacturers) are most likely located near the shore and so may be captured in a shore-adjacent zip code. But in both cases it is likely that other non-marine related firms may be located in a near-shore zip code and thus over-counted in the data.

On balance, the strengths of the methodology outweigh the weaknesses, primarily because they meet the objectives for the data collection that were defined for the project. For the most part, the weaknesses are inherent to either the original data sources used or to the nature of any taxonomic process, or to data availability limitations that cannot easily be overcome.

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