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# NOAA Economic Statistics

**U.S. Department of Commerce**  
National Oceanic and Atmospheric Administration  
Office of Policy and Strategic Planning

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## Forward

This publication, **NOAA Economic Statistics**, is a compendium of economic statistics relevant to NOAA's mission and programs. It is intended to serve as a common reference when discussing the economic impacts and benefits of NOAA programs.

In particular, it should provide a consistent set of economic statistics for senior NOAA management as well as staff when preparing for Congressional visits and testimony, budget preparation, speeches, and other external events.

This first edition of **NOAA Economic Statistics** was prepared with the assistance and input of NOAA staff throughout the Line and Staff Offices. Two criteria were established for inclusion. The first is relevance and importance to NOAA's mission and activities. Second is the ability to cite a credible source in either peer-reviewed or gray literature or correspondence.

Statistics are grouped into three general categories.

- **Economic and Social Impacts** reflect how natural marine, atmospheric, and coastal phenomena affect the general public. For example, weather and climate sensitive industries account for nearly 25 percent of the Nation's GDP.
- **Contributions to U.S. Income, Employment, and Output** are statistics that directly reflect the market value and human uses of resources impacted by NOAA's programs. For example, the economic value added to the national economy by the U.S. commercial fishing industry was approximately \$28 billion in 2000. In addition, some of these statistics are a direct measure of the economic benefits of investing in NOAA programs such as improvements in El Niño forecasts to U.S. agriculture.
- **Values and Uses of Coastal Ocean Natural Resources** statistics illustrate the demographic, social, and economic importance of the Nation's coastal areas. They also reflect the quantitative importance of so-called "nonmarket" benefits of coastal resources such as beaches and recreational boating, which are not directly measured in dollar terms.

**NOAA Economic Statistics** is noteworthy in that it illustrates the economic importance of NOAA's programs to the Nation's economy and public well-being. This publication will be updated and added to periodically, and will be placed on the Economics page of NOAA's Website.

Questions and comments should be directed to Dr. Rodney Weiher within the Office of Policy and Strategic Planning by e-mail at [Rodney.F.Weiber@noaa.gov](mailto:Rodney.F.Weiber@noaa.gov), or by phone on (202) 482-5181.

# **Economic and Social Impacts**

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# Weather and Climate Impacts

Weather and climate sensitive industries, both directly and indirectly, account for about 25 percent of the Nations' GDP, or \$2.7 trillion, ranging from finance, insurance, and real estate to services, retail and wholesale trade and manufacturing.

**Cite:** *Weather and Climate Sensitive GDP Components 1999*, Dr. John Dutton, Pennsylvania State University, 2001.

Industries directly impacted by weather such as agriculture, construction, energy distribution, and outdoor recreation account for nearly 10 percent of GDP.

**Cite:** *Economic Implications of an El Niño Forecast for 2002-2003*, NOAA website, <http://www.noaa.gov>

Drought is estimated to result in average annual losses to all sectors of the economy of between \$6 billion and \$8 billion.

**Cite:** National Mitigation Strategy Partnerships For Building Safer Communities, FEMA, Washington, DC, 1995.

Average annual damage from tornadoes, hurricanes, and floods is \$11.4 billion, of which:

- hurricanes average \$5.1 billion and 20 deaths per year;
- floods account for \$5.9 billion, and average over 80 deaths per year;
- tornadoes cause \$1.1 billion in damages.

**Cite:** Website: <http://sciencepolicy.colorado.edu/sourcebook/>, Extreme Weather Source Book, Science Policy, Colorado EDU/Source Book.

The costliest U.S. hurricane was in 1926 in Miami, causing \$90 billion in damage (in 2000 dollars). By contrast, 1992's Hurricane Andrew caused \$40 billion in damage (in 2000 dollars).

**Cite:** NWS-Tropical Prediction Center-1, *The Deadliest, Costliest, and Most Intense United States Hurricanes from 1900 to 2000 and Other Frequently Requested Hurricane Facts*, 2001.

\$6 billion annually is lost in economic efficiencies as a result of air traffic delays, of which 70 percent are attributed to weather.

**Cite:** *2002 State of the U.S. Airline Industry: A Report on Recent Trends for U.S. Carriers*, Air Transport Association, Washington, DC, 2002.

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## El Niño Impacts

Overall, the 1997-1998 El Niño is estimated to have had a total U.S. economic impact of \$25 billion.

**Cite:** Chagnon, Stanley, ed. *El Niño 1997-1998; The Climate Event of the Century*, Oxford Press, 2000.

Property losses associated with the 1997-1998 El Niño were \$2.6 billion; crop losses approached \$2 billion.

**Cites:** Chagnon, Stanley, ed. *El Niño 1997-1998; The Climate Event of the Century*, Oxford Press, 2000.

*Improving El Niño Forecasting: The Potential Economic Benefits*, NOAA, U.S. Dept. of Commerce, 1997.

California storm losses in the 1997-1998 El Niño were \$1.1 billion.

**Cite:** Chagnon, Stanley, ed. *El Niño 1997-1998; The Climate Event of the Century*, Oxford Press, 2000.

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## Coastal Storm Impacts

Coastal storms account for 71 percent of recent annual U.S. disaster losses. Each event costs roughly \$500 million. With 14 events in a year, losses would total \$7 billion per year.

**Cite:** *The Hidden Costs of Coastal Hazards: Implications for Risk Assessment and Mitigation*, Island Press, Washington, DC, 2000.

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## Harmful Algal Bloom (HAB) Impacts

Economic impact of HABs in the United States average annually \$49 million, but individual outbreaks can cause economic damage exceeding the annual average. Outbreaks in Chesapeake Bay in 1997 cost the Maryland seafood and recreational fishing industries almost \$50 million in just a few months.

**Cite:** D. M. Anderson, P. Hoagland, Y. Kaoru, A. W. White, 2000. *Estimated Annual Economic Impacts from Harmful Algal Bloom (HABs) in the United States*. Technical Report WHOI-2000-11 Woods Hole Oceanographic Institute, Woods Hole, MA.

Annual public health impacts due to shellfish poisoning from HABs estimated at \$1 million per year.

**Cite:** D. M. Anderson, P. Hoagland, Y. Kaoru, A. W. White. *Estimated Annual Economic Impacts from Harmful Algal Bloom (HABs) in the United States*. Technical Report WHOI-2000-11 Woods Hole Oceanographic Institute, Woods Hole, Mass., 2000.

Commercial fishery impacts from HABs, including wild harvest and aquaculture losses, average \$19 million per year.

**Cite:** D. M. Anderson, P. Hoagland, Y. Kaoru, A. W. White. *Estimated Annual Economic Impacts from Harmful Algal Bloom (HABs) in the United States*. Technical Report WHOI-2000-11 Woods Hole Oceanographic Institute, Woods Hole, Mass., 2000.

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### NOTES

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## Seafood Impacts

Human sickness and death from tainted seafood resulted in lost wages, medical treatment, and investigation averaging \$22 million per year.

**Cite:** D. M. Anderson, P. Hoagland, Y. Kaoru, A. W. White. *Estimated Annual Economic Impacts from Harmful Algal Bloom (HABs) in the United States*. Technical Report WHOI-2000-11 Woods Hole Oceanographic Institute, Woods Hole, Mass., 2000.

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# Coastal Pollution and Hazardous Waste Site Impacts

More than 700 coastal hazardous waste sites have contaminated sediments in our Nation's estuaries that reduce the economic and ecological productivity of coastal resources.

**Cite:** *Coastal Hazardous Waste Site Review*, NOAA Office of Response and Restoration, NOAA 1999.

Polluted runoff caused over 7,000 beach closings and swimming advisories in 1998.

**Cite:** *Testing the Waters 1999: A Guide to Water Quality at Vacation Beaches*. Natural Resources Defense Council (NRDC), July 1999.

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# **Contribution to U.S. Income, Employment and Output**

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## Fisheries Contributions

The economic value added to the national economy by the commercial fishing industry was approximately \$28 billion in 2000.

**Cite:** *Fisheries of the United States, 2000*, <http://www.st.nmfs.gov/st1/>

Total consumer expenditures for fisheries products are estimated at \$54 billion in 2000.

**Cite:** *Fisheries of the United States, 2000*, <http://www.st.nmfs.gov/st1/>

Approximately four million tons of fish are landed in the United States in 2000, representing an aggregate value of approximately \$3.5 billion.

**Cite:** *Fisheries of the United States, 2000*, <http://www.st.nmfs.gov/st1/>

U.S. aquaculture sales total almost \$1 billion per year, including both marine and freshwater products.

**Cite:** *Economic Value for the Nation*, NOAA/NESDIS, September 2001.

More than 17 million Americans engage in marine fishing as a recreational activity and spend approximately \$20 billion per year on fishing related activities.

**Cite:** NOAA Technical Memorandum NMFS-F/SPO-49, October 2001, <http://www.st.nmfs.gov/st1/recreational>

U.S. exports of seafood products in 2000 were 2.2 billion pounds, valued at \$3 billion; the U.S. imported four billion pounds of seafood, valued at \$10.1 billion

**Cite:** *Fisheries of the United States, 2000*, <http://www.st.nmfs.gov/st1/>

U.S. consumers ate an estimated 15.6 pounds of seafood each in 2000, making it the third largest consumer of seafood in the world.

**Cite:** *Fisheries of the United States, 2000*, <http://www.st.nmfs.gov/st1/>

Approximately 85,000 people were employed in the seafood processing and wholesaling sectors in 1999.

**Cite:** *Fisheries of the United States, 2000*, <http://www.st.nmfs.gov/st1/>

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## Coastal Contributions

Coastal and marine waters support 28.3 million jobs, generate \$54 billion in goods and services, contribute \$30 billion to the U.S. economy through recreational fishing, and provide a tourism destination for 89 million Americans each year.

**Cite:** Leeworthy, V.R. and J.M. Bowker, 1997. *Nonmarket Economic Users Values of the Florida Keys/Key West*. National Oceanic and Atmospheric Administration, Silver Spring, Md., May 15, 2001.

Travel and tourism is the Nation's largest employer and second largest contributor to the GDP, generating over \$700 billion annually. Beaches are the leading tourist destination, with coastal states earning 85 percent of all U.S. tourism revenues. Approximately 89 million Americans visit U.S. coasts each year.

**Cite:** Leeworthy, V.R. and J.M. Bowker, 1997. *Nonmarket Economic Users Values of the Florida Keys/Key West*. National Oceanic and Atmospheric Administration, Silver Spring, Md., May 15, 2001.

California's coastal industries contribute over \$17 billion and 370,000 jobs.

**Cite:** *How Much is the Beach Worth? Calculating the Value of the Environment*, see the Web site for the NOAA Coastal Services Center's magazine, *Coastal Services*, <http://www.csc.noaa.gov/magazine/2001/01/worth.html>.

In the summer of 2000 (June-August 2000), it is estimated that there is almost \$600 million in spending on beach activities in Los Angeles and Orange counties, California. This spending generated between \$203 million and \$221 million in local income and between 19,000 and 20,000 full and part-time jobs.

**Cite:** Hanemann, M., Pendleton, L., and Layton, D., Summary Report on Beach Expenditure Module, Southern California Beach Valuation Project, Dec. 16, 2001.

In 1999-2000, 12.6 million Americans age 16 and older visited California beaches, spending more than 151 million days at the beaches.

**Cite:** Leeworthy, V.R. and Wiley, P.C. 2001. *Current Participation Patterns in Marine Recreation*. Chapter in forthcoming book on the National Survey on Recreation and the Environment (NSRE), Sagamore Publishing, 2000 .

In seven estuaries alone, tourism and beach going activities generate economic benefits of more than \$16 billion to their respective regions.

**Cite:** *Natural Resources Valuation: A Report by the Nation's Estuary Program*, Environmental Protection Agency (EPA), 1997.

Economic impacts of coastal recreation impacts in Monroe County, home of the Florida Keys Sanctuary, include sales of \$1.33 billion, income of \$506 million, and 21,850 jobs.

**Cite:** English, D.B.K., Kriesel, W., Leeworthy, V.R., and Wiley, P., *Economic Contribution of Recreating Visitors to the Florida Keys/Key West*. National Oceanic and Atmospheric Administration, Silver Spring, Md., 1996.

Offshore oil and gas development currently produces 22 percent of all domestically produced oil and 27 percent of natural gas. Federal royalties and taxes on offshore production average about \$4 billion per year.

**Cite:** [http://www.pewoceans.org/articles/2001/10/04/brief\\_19075.asp](http://www.pewoceans.org/articles/2001/10/04/brief_19075.asp)

In 2000-2001, the artificial and natural reefs off the four-county area of south-east Florida (Palm Beach, Broward, Miami-Dade, and Monroe counties) supported almost 28 million person-days of recreational diving, fishing and viewing activities. These activities generated about \$4.4 billion in local sales, almost \$2 billion in local income and 71,300 full and part-time jobs.

**Cites:** Johns, G.M., Leeworthy, V.R., Bell, F.W., and Bonn, M.A., *Socioeconomic Study of Reefs in Southeast Florida*, 2001.

Hazen and Sawyer, *Final Report for Broward, Palm Beach, Miami-Dade and Monroe Counties*, Florida Fish and Wildlife Conservation Commission and National Oceanic and Atmospheric Administration. October 19, 2001.

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## Satellites

Commercial remote sensing industry sales were \$1.6 billion in 1999.

**Cite:** *About the Industry*, NASA/American Society of Photogrammetry and Remote Sensing (ASPRS) Market Study (NOAA-supported).

To date, 17 licenses have been granted by NOAA for the operation of 40 commercial remote sensing satellites, representing approximately \$2 billion in system investments.

**Cite:** NOAA Licensing Files.

To date, 26 License Amendments and 20 Foreign Partnership Agreements with NOAA licenses have been approved, worth approximately \$565 million.

**Cite:** NOAA Licensing Files.

Each year from 1980 to 1995, on average, five commercial jets encountered volcanic ash clouds in flight. About 10 percent of these encounters resulted in loss of power.

**Cite:** *Benefits of NPOESS for Commercial Ship Routing — Transit Time Savings*, Woods Hole Oceanographic Institute (WHOI), October 2000.

The overall economic risk from airborne volcanic ash effects historically is about \$70 million per year.

**Cite:** *Benefits of NPOESS for Commercial Ship Routing — Transit Time Savings*, WHOI, October 2000.

The benefit from NPOESS data to volcanic ash avoidance in commercial aviation is estimated at \$10 million per year.

**Cite:** *Benefits of NPOESS for Commercial Ship Routing — Transit Time Savings*, WHOI, October 2000.

The economic value of an operational geomagnetic storm forecasting system in the North American electricity industry is estimated at about \$450 million over three years, well above the \$100 million cost of the system.

**Cite:** T. J. Teisberg and R. Weiher, *Economic Valuation of Geomagnetic Storm Forecasts in the North American Electric Industry*: Journal of Policy Analysis and Management (vol 19:2).

Collectively, the world fleet undertakes in excess of 33,000 ocean transits annually.

**Cite:** *Benefits of NPOESS for Commercial Ship Routing — Transit Time Savings*, WHOI, 2000.

The expected average annual benefit to ship routing from NPOESS data in the two decades following the launch of NPOESS in 2007 is about \$95 million per year. Because of the U.S. share of world trade, perhaps 20 percent of the total benefit—some \$20 million per year—will be realized by consumers in the United States.

**Cite:** *Benefits of NPOESS for Commercial Ship Routing —Transit Time Savings*, WHOI, 2000.

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## Maritime Commerce

More than 95 percent of U.S. overseas trade comes and goes by ship, including nine million barrels of imported oil daily.

**Cite:** *An Assessment of the U.S. Marine Transportation System, A Report to Congress*, U.S. Department of Transportation, September 1999.

Waterborne cargo alone contributes more than \$742 billion to the U.S. GDP and creates employment for more than 13 million citizens.

**Cite:** *An Assessment of the U.S. Marine Transportation System, A Report to Congress*, U.S. DOT, September 1999.

Annually, the U.S. marine transportation system:

- moves more than two billion tons of domestic and international freight
- imports 3.3 billion barrels of oil to meet U.S. energy demands
- supports 110,000 commercial fishing vessels.

**Cite:** *An Assessment of the U.S. Marine Transportation System, A Report to Congress*, U.S. DOT, September 1999.

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## Weather, Climate and Storm Warnings

On an average annual basis, \$2.5 billion in damage costs are *not* incurred as a result of more accurate hurricane watches and warnings. The economic impact of lives saved accounts for \$1.45 billion of the \$2.5 billion, and \$1 billion is due to spared property.

**Cite:** Willoughby, H. E. *Costs and Benefits of Hurricane Forecasting*. Preprints, 24<sup>th</sup> Conference on Hurricanes and Tropical Meteorology, Ft. Lauderdale, Fl., May 29-June 2, 2000. American Meteorological Society, Boston, 2000.

Reducing the length of coastline under hurricane warnings saves between \$600,000 and \$1 million per coastal mile in costs of evacuations and other preparedness actions.

**Note:** *Per mile evacuation costs are highly variable with reports in the literature varying from under \$100,000 to \$1 million. This estimate must be applied with great care, especially in program evaluation.*

National implementation of the Advanced Hydrologic Prediction Service (AHPS) will save lives and an estimated \$240 million per year in flood losses, and will contribute an additional \$520 million per year in economic benefits to water resources users.

**Cite:** *Use and Benefits of the NWS River and Flood Forecasts*, National Hydrologic Warning Council, April 1, 2002.

Better preparation, response, and mitigation could reduce the average cost (approximately \$500 million per event) of storm-related disasters by 10 percent (approximately \$50 million per event). A 10 percent reduction in the cost of storm-related disasters means \$700 million in savings per year. (Fourteen events per year at \$50 million each equals \$700 million savings per year.)

**Cite:** *Evaluation of Erosion Hazards*, H. John Heinz III Center for Science, Economics, and the Environment, Washington, DC, April 2000.

Economists have quantified the benefits of improved El Niño forecast in various sectors:

- Benefits to U.S. agriculture by altering planting decisions have been estimated at \$265-300 million annually, throughout El Niño, normal, and La Niña years.
- Similarly, benefits to Mexican agriculture range from \$10 million to \$25 million annually.

- Benefits in U.S. corn storage could approach \$200 million annually.
- Even in the small Northwest Coho salmon fishery, annual benefits are estimated from \$250,000 to \$1 million.

**Cite:** Weiher, Rodney, ed. *Improving El Niño Forecasting: The Potential Economic Benefits*, NOAA, U.S. Department of Commerce, 1997.

NESDIS's Air-Freezing Index (AFI) reduces construction costs by \$330 million per year and saves an equivalent of 8.6 million gallons of heating fuel.

**Cite:** *Economic Value for the Nation*, NOAA/NESDIS, September 2001.

NOAA's degree-day information is one of a number of inputs to the weather derivatives industry, which began in late 1996 and has issued over \$7 billion in contracts in the four year period of 1997-2000.

**Cite:** Price Waterhouse Coopers, 2001 Study, Prepared For Weather Risk Management Association.

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## Defense

The Long Range Weather Forecasting Support of Energy Use at Navy Activities (LRF) program has documented in excess of \$60 million of savings over the past 15 years.

**Cite:** Chief of Naval Operations Memorandum, 20 April 1998.

A decision to relocate the Norfolk harbor fleet could cost \$5 million and require 72 hours advance notice. This includes costs to recall personnel and make ready ships in maintenance or ships being overhauled.

**Cite:** International Hurricane Conference 2001 meeting presentation.

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## Sea Grant

The Sea Grant training of 5,000 seafood processing plant employees will prevent 20,000 to 60,000 seafood-related illnesses a year, which would have cost consumers as much as \$115 million annually.

**Cite:** U.S. FDA and National Sea Grant College Program Biennial Report 1998-99.

In North Carolina, 200 of the 205 new oceanfront homes built to the Sea Grant hurricane standards survived Hurricane Fran in 1996, compared to more than 500 older oceanfront houses in the same area that were destroyed.

**Cite:** National Sea Grant College Program fact sheet, August 2001.

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# **Values and Uses of Coastal Ocean Natural Resources**

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## Coastal Uses

Currently, more than half of the U.S. population—141 million people—resides within 50 miles of a coast, which occupies only 11 percent of the land area of the lower 48 states.

**Cite:** *Trends in U.S. Coastal Regions, 1970-1998: Addendum to the Proceedings, Trends and Future Challenges for U.S. National Ocean and Coastal Policy*, National Oceanic and Atmospheric Administration (NOAA). August 1999.

Over the next 15 years, the U.S. coastal population is projected to increase by 24.7 million people, reaching 166 million people by the year 2015.

**Cite:** *Trends in U.S. Coastal Regions, 1970-1998: Addendum to the Proceedings, Trends and Future Challenges for U.S. National Ocean and Coastal Policy*, National Oceanic and Atmospheric Administration (NOAA). August 1999.

In 1990-2000, more than 43 percent of the civilian population 16 years and older participated in at least one of the 19 marine outdoor recreation activities, which translates into more than 89 million participants.

**Cite:** Leeworthy, V.R. and J.M. Bowker. *Nonmarket Economic Users Values of the Florida Keys/Key West*. National Oceanic and Atmospheric Administration, Silver Spring, Md., May 15, 2001.

Coastal waters are among the most biologically productive regions in the Nation, producing more food per acre than the best Midwestern farmland.

**Cite:** *Healthy Coasts, Healthy Economy: A National Overview of America's Coasts*. Coast Alliance, Washington, DC, June 1995.

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## Nonmarket Coastal Benefits

Nonmarket coastal recreation values for the Florida Keys include \$87 per person-day value, total annual user values of \$1.2 billion and the asset value of the resource is \$40.2 billion.

**Cite:** Leeworthy, V.R. and J.M. Bowker, 1997. *Nonmarket Economic Users Values of the Florida Keys/Key West*. National Oceanic and Atmospheric Administration, Silver Spring, Md. 41 pp.

Recreation use values for three southern California beaches (1989) include annual non-market values of \$360 million and an asset values of \$12 billion.

**Cite:** Leeworthy, V.R. and P.C. Wiley, *Recreation Use Value for Three Southern California Beaches*, NOAA, Rockville, Md., 1993.

In 2000-2001, annual non-market recreation values for the artificial and natural reefs of Southeast Florida by both residents and visitors was estimated at \$312 million and an asset value of \$10.4 billion.

**Cite:** Johns, G.M., Leeworthy, V.R., Bell, F.W., and Bonn, M.A., *Socioeconomic Study of Reefs in Southeast Florida. Hazen and Sawyer, Final Report for Broward, Palm Beach, Miami-Dade and Monroe Counties*, Florida Fish and Wildlife Conservation Commission and National Oceanic and Atmospheric Administration. October 19, 2001.

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