



Chapter 2

Agencies, Programs, and Budgets

Woods Hole Oceanographic Institution

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Agencies, Programs, and Budgets

Current national programs in oceanography reflect an increasing emphasis on activities that will produce more efficient use of ocean resources, greater coordination between agencies engaged in ocean research, and improved ocean research methods. Legislation in recent years has focused specifically on climate research, ocean pollution, Outer Continental Shelf (OCS) development, and fisheries management and conservation. In these areas and others, primarily eight Federal agencies are currently engaged in 90 programs. The major agencies involved include:

- U.S. Coast Guard (Department of Transportation),
- Department of Energy (DOE),
- Department of the Interior (DOI),
- Environmental Protection Agency (EPA),
- National Aeronautics and Space Administration (NASA),
- National Ocean and Atmospheric Administration (NOAA) (Department of Commerce),
- National Science Foundation (NSF), and
- U.S. Navy (Department of Defense).

Two agencies that are not included are the Maritime Administration and U.S. Army Corps of Engineers. OTA judged that the missions of these agencies were not sufficiently related to oceanographic research or monitoring as addressed in this assessment.

Using the individual agency descriptions of their present programs, budgets, and plans for oceanographic research and data collection, OTA has broadly classified agency programs under the following nine categories in order to simplify their review:

- **Technology Development** programs created specifically to provide technological support

to Federal programs in oceanography, including the design, construction, testing, and deployment of hardware and other equipment.

- **Ocean science** programs to advance scientific knowledge.
- **Weather and climate** programs dealing with the collection and analysis of oceanic and atmospheric data.
- **Energy and mineral resources** programs to explore and develop nonliving natural resources from the ocean.
- **Environmental quality** programs to improve or enhance the quality of the oceans, Great Lakes, and coastal regions.
- **Fisheries resources** programs to develop food resources from the oceans and the Great Lakes.
- **Public service** programs organized especially to communicate with the public and to assist the public in the solution of ocean-related problems, including marine safety.
- **Management and enforcement** programs to manage or assist in managing marine resources, or to enforce laws and regulations pertaining to the coastal and ocean environments.
- Agency **support** programs to support either in-house efforts and missions or those of other Federal agencies.

Although programs have been assigned to categories according to their apparent primary emphases (table 1), such categorization does not adequately represent a total program, since many programs perform tasks outside their primary missions. The following provides a brief summary of agencies and current program areas.

Table 1.—Number of Programs by Category of Activity of Principal Emphasis

Agency	Technology development	Ocean sciences	Weather/climate	Energy/mineral	Environmental quality	Fishery resource	Public service	Management enforcement	Agency support	Total
Coast Guard	1	0	0	0	2	0	2	2	0	7
DOE	0	0	0	2	2	0	0	0	1	5
DOI	0	1	0	2	3	2	6	3	3	20
EPA	0	0	0	0	8	0	0	0	3	11
NASA	7	0	0	0	0	0	0	0	0	7
NOAA	3	3	4	0	2	2	8	3	5	30
NSF	0	6	0	0	0	0	0	0	0	6
Navy	1	2	0	0	0	0	0	0	1	4
Totals	12	12	4	4	17	4	16	8	13	90

NOTE: OTA has assigned each agency program to the category of its principal emphasis, based on agency-furnished descriptions of the program

SOURCE: Office of Technology Assessment

AGENCIES

The major ocean responsibilities of the eight Federal agencies surveyed for this report are listed briefly below.

U.S. Coast Guard: Marine safety programs to minimize loss of life and property; vessel, ports, waterways, and related facilities safety; management and enforcement activities in U.S. waters and the high seas where authorized; navigational research; ocean research and engineering; maintenance and improvement of the quality of the marine environment; the pollution fund; ice- and current-condition tracking and research.

Department of Energy: Research in deep-sea disposal of nuclear wastes; determination of environmental health and safety effects of energy technology and programs; carbon dioxide (CO₂) research and climate research; pollution research in the marine environment; ocean thermal energy conversion (OTEC) research and development; wind, waves, and current research; deep-drilling research for oil and gas exploration.

Department of the Interior: OCS resource evaluation and management; offshore geologic surveys; marine and coastal zone resource evaluation; oilspill trajectory and analysis; responsibility for fish and wildlife habitats and resources, including research and management; barrier island research; advancement of mineral technology and research.

Environmental Protection Agency: Environmental quality research of the oceans and the Great lakes; research on pollution problems of the coastal zone; petroleum and hazardous materials research in the marine environment; ocean-dumping research; water quality evaluation.

National Aeronautics and Space Administration: Development, construction, and operation of aeronautical space vehicles; development of capability to observe the oceans from space for operational and research purposes.

National Oceanic and Atmospheric Administration: Provision of weather forecasts for the United States; weather modification activities; management and research services related to the protection and use of living marine resources, including marine mammals; preparation and issuance of nautical and aeronautical charts; geodetic surveys; prediction of tides, currents, and state of the oceans; marine and atmospheric research; coastal zone management; management of all civilian operational remote-sensing activities from space; acquisition and dissemination of environmental data; Sea Grant; research and development of data-buoy technology; ocean engineering.

National Science Foundation: Support of basic research in the areas of Earth, ocean, and atmospheric sciences; partial support of the academic research fleet; research in the Antarctic.

U.S. Navy: Collection and dissemination of ocean environmental data and prediction services; research and development to advance

knowledge of the physical, geological, chemical, and biological nature of the oceans; ocean engineering; diving medical research.

CURRENT PROGRAM AREAS

Technology Development

Historically, oceanography has relied on ships to explore the sea. In recent years, agencies have added aircraft, orbiting satellites, deep seabed stations, buoy networks, submersibles, and other equipment and instrumentation to their oceanographic capabilities. This technology has been essential for advancing ocean research, and its development has been supported by many agencies through individual programs.

Much of this technology development, particularly of sensors and recorders, has been done by individuals or groups of scientists from small Federal grants. As shown in table 2, technology development efforts do not seem to be emphasized in any one agency. Seven of the eight agencies have three or more technology areas where their programs have a focus.

A few Federal programs are working on new kinds of ship designs, such as DOE's ocean thermal test vessel; new underwater vehicles, such as Navy's deep submergence vehicle *Sea Cliff*; or new deep-sea drilling ships, such as that in NSF's Ocean Margin Drilling Program (OMDP). Four of the agencies in table 2 have technological efforts directed toward satellites.

Since high costs and long leadtime in the development of technology require planning, coordination, and sizable funding, technology development is perhaps the one area in which the greatest agency cooperation is needed. Some cooperation is evident; e.g., all activities given in table 2 which involve satellites are jointly sponsored, and many of the programs for developing sensors for installation on satellites are cooperative efforts. In another example, Coast Guard and NOAA have a formal agreement whereby the Coast Guard deploys and maintains NOAA's data-collecting buoys.

Ocean Science

Increased understanding of ocean processes and the effect of the ocean on the global environment is the basis of the Nation's ocean science program. While scientific purpose is evident to some degree in all Federal ocean research programs, whether basic or applied, the primary mission of several efforts — particularly in NSF, NOAA, and Navy— is basic research, which is defined here as ocean science.

In fiscal year 1980, NSF spent \$106 million on ocean-related projects out of a total science

Table 2.—Federal Programs Involved in Developing Ocean Technology

Agency	Types of technology						
	Ships	Underwater laboratories	Submersibles	Buoys	Satellites	Remote sensors	Instruments
Coast Guard	—	—	—	x	x	x	—
DOE	x	—	—	x	—	—	x
DOI	—	—	—	—	—	—	x
EPA	—	—	—	—	—	—	—
NASA	—	—	—	—	x	x	2
NOAA	—	x	—	x	x	x	x
NSF	x	—	x	—	—	x	x
Navy	—	—	x	—	x	x	x

SOURCE: Office of Technology Assessment

budget of almost \$1 billion. Of this amount, \$17 million supported the Deep-Sea Drilling Project (DSDP) and OMDP. An important NSF function is to provide partial support for the Nation's academic fleet, which accounts for about one-quarter of the budget. NSF-supported work is generally carried out through grants and contracts to individual scientists in universities, institutes, and industries.

NSF programs are focused in six fields:

- Earth sciences,
 . atmospheric sciences,
- polar programs,
 . environmental biology,
- applied research, and
- ocean sciences.

NOAA's ocean science efforts grow out of congressional assignments or from demands arising from NOAA operational components for increased information to meet mission objectives. The few NOAA programs that have basic science objectives are found at NOAA's Atlantic Oceanographic and Meteorological Laboratory and at the Pacific Marine Environmental Laboratory. Most of the other NOAA programs have some ocean science components. For example, the Hurricane Modification Program, conducted by NOAA's Environmental Research Laboratories, includes both atmospheric and ocean observations. The collected data provide a greater understanding of the ocean and atmosphere and have an immediate and direct application within the National Weather Service. Unlike NSF, whose cadre of scientific expertise extends to the academic community, NOAA's efforts are accomplished primarily through NOAA personnel.

More than 80 percent of Navy's ocean science effort is associated with basic research in support of future Navy missions. The programs are managed or funded by the Office of Naval Research, and research is conducted by Navy personnel and outside contractors. Primary program emphasis is on underwater acoustics. Basic biomedical research associated with underwater diving and divers is also a part of Navy's program.

Weather and Climate

The ocean contributes significantly to the world's weather and climate because it is a major energy source for the atmosphere. Better understanding of heat storage in the ocean and heat transfer between the ocean and the atmosphere will improve the ability to forecast weather and climate.

The equatorial and polar regions of the globe are particularly important in understanding ocean/atmosphere exchange and interaction processes. Several major new studies in the equatorial Pacific and Atlantic are now underway by NOAA and NSF. Sea-ice studies are conducted by NOAA, NSF, Navy, and Coast Guard; and NASA has some plans for a program to provide satellite sensors and ground-truth stations to study the relationship of polar ice to climate.

With the research studies, it is important to maintain a long-term and consistent ocean climate-monitoring program. Some data-collecting programs are carried out, primarily through NOAA, but they do not result in a sustained ocean climate-monitoring program. NOAA has been designated as the lead agency for coordinating such a national climate-related program under the National Climate Program Act. At the same time, an international effort to monitor ocean climate is planned by the World Climate Research Program with U.S. participation.

Energy and Mineral Resources

Substantial petroleum resources are found under the ocean's continental shelf. Other potential energy sources may include the harnessing of energy from ocean waves, currents, winds, and thermal energy. The Federal effort in this area is focused in two agencies. The U.S. Geological Survey (USGS) of DOI is concerned with the evaluation of the potential oil and gas resources to be found in federally owned submerged lands. DOE is concerned with the development of new technologies to exploit both oil and gas resources and other ocean energy potentials.

Of the almost \$87 million spent in fiscal year 1980 by these two agencies, \$40 million was directed toward a major program to develop and commercialize OTEC by DOE. This program would take advantage of the vast amounts of thermal energy in the ocean and is presently focused on an upcoming decision to build and test a *pilot* plant of 10 to 40 megawatts of electrical output. Other research at DOE includes developing techniques to extract energy from ocean waves and currents and developing deep-drilling technology for future offshore oil and gas production. Oil and gas are now being produced in many areas offshore of U.S. coasts. Selection of the offshore tracts which will be offered for lease to industry by the Government is the responsibility of DOI. USGS surveys and determines the market value of submerged lands and recommends to the Department those tracts which should be offered for lease.

Recent legislation on OTEC and Deep Seabed Mining has given new responsibilities to NOAA in the mineral and energy resources field. These acts task NOAA to perform a licensing function for OTEC and offshore mining.

Environmental Quality

The 17 Federal programs which attempt to improve the environmental quality of the oceans, the Great Lakes, and the coastal regions account for approximately \$207 million in Federal funds. Although the majority of these programs are within EPA, the bulk of Federal funds are in other agencies, such as NOAA, DOI, DOE, and Coast Guard. The Corps of Engineers also supports marine environmental programs.

Pollution problems of the immediate coastal zone, and particularly the toxicological effects of various pollutants on estuarine species, is the focus of much of EPA's work. EPA also coordinates all Federal cleanup activities when there is a discharge of a hazardous substance in inland waters. Research programs investigating the source, fate, and effects of pollutants in the Great Lakes, in an effort to protect and enhance the

water quality of the region and to prevent deterioration of the water resources, are conducted by NOAA and EPA. Surveillance and monitoring activities are carried out by both agencies.

The fate and effects of petroleum and other hazardous materials on the marine ecosystem is investigated by DOE, NOAA, and EPA. DOE has an ongoing program to investigate the feasibility of deep seabed disposal of radioactive waste. Baseline surveys and a permitting program for the designation of ocean dump sites are housed within EPA, although permitting and enforcement is carried out by the Corps of Engineers and Coast Guard.

Fisheries and Living Resources

In recent years, fishermen, sportsmen, environmentalists, and marine enthusiasts have used their collective influence to activate a substantial interest in fisheries resources at the Federal level. The result has been a steady flow of Federal programs concentrating on living resources of the sea.

Part of the present interest in fisheries research stems from the demand for better information needed to manage the fishery resources which were extended by the Fishery Conservation and Management Act of 1976 (FCMA) to include a 200-mile-wide zone bordering the coastlines. Federal activities in commercial and recreational fisheries, fish cultivation, marine mammal research and protection, and other living resources of the sea are focused in the National Marine Fisheries Service (NMFS) of NOAA and in the Fish and Wildlife Service of DOI.

NMFS programs are directed toward the conservation and management of all fisheries in offshore Federal waters between the State jurisdiction limit of 3 miles offshore to the Federal jurisdiction limit of 200 miles offshore. The programs include those to improve habitats as well as those to establish appropriate levels of harvesting by both U.S. and foreign fishermen.

DOI programs involve management of ocean fish that spawn in freshwater. A number of other Federal agencies, whose major emphasis is elsewhere, conduct programs that are closely related to fisheries, especially in managing resources and enforcing regulations governing fish catch and in protecting marine mammals and other endangered species.

Public Service

Programs with public service as a major focus serve as channels for information from the Federal Government to the general public. In many instances, these programs work closely with research and technology development programs.

The most visible public service program is NOAA's Public Weather Service, which issues warnings and forecasts about the weather. Another NOAA program of public interest includes the Environmental Data and Information Service, which is the national data bank for oceanic information and includes the National Oceanic Data Center, the National Climatic Center, the National Geophysical and Solar-Terrestrial Data Center, the Environmental Science Information Center, and the Center for Environmental Assessment Services. These centers provide computer-stored data and publications to Federal agencies, scientists, and other users. NOAA's National Ocean Survey provides charts, maps, tide and current data, and other types of marine information for public use. DOI's USGS produces some maps of coastal lands and islands. NOAA and DOI cooperatively interchange data for their coastal area publications.

The Coast Guard's public service components include the search-and-rescue service for mariners and a program to construct and maintain navigational aids to ensure safe passage of marine traffic in coastal and inland waterways and in harbors.

Other public service programs are public granting services, including the National Sea Grant College Program, the Marine Extension Services, Federal Aid for Fish and Wildlife Restoration, and the Fisheries Financial Support Services. Sea Grant is a matching-grant program

for conducting research, education, and public service related to marine resources development; socioeconomic and legal aspects of marine resources; marine technology research and development; and environmental research. Applied research projects are generally directed toward the solution of specific problems identified by the States and regions in which the program operates. The most visible public service aspect of Sea Grant is the marine advisory services effort. Its objectives are to assist industry and Government in marine resource development and protection and to inform the public of problems, opportunities, and progress in marine affairs.

In a number of agencies, the public service ocean programs are large, and 16 programs in three agencies or departments of the Government directed more than \$900 million toward public service in fiscal year 1980.

Management and Enforcement

Federal involvement in the management of marine resources and in enforcement of laws and regulations related to marine activities is extensive. Resource management includes managing public coastal and offshore lands in oil and gas production, allocating fishery stocks and assigning optimum yield, and overseeing the development of the coastal zone. NOAA's Coastal Zone Management Program (CZMP) is carried out through cost-sharing grants with States. The States or other organizations plan resource use and development, while the Federal Government evaluates the plans. The assignment of planning responsibility to regional managers occurs in both CZMP and the Regional Fisheries Councils called for by FCMA.

In USGS, the Outer Continental Shelf Lease Management Program regulates OCS oil and gas production and reservoir shut-in operations, sets up natural gas-pricing categories, verifies drilling platform safety, and conducts some research and development in support of OCS activities.

The Coast Guard regulates recreational boating and licenses offshore terminals, merchant vessels, marine personnel, and floating drilling platforms.

Enforcement authority over foreign fishing in the 200-mile U.S. coastal fisheries zone rests with the Coast Guard, which also enforces international treaties. NMFS (NOAA) has a related responsibility to enforce any Federal ocean fishing regulation of U.S. fishermen operating in the 200-mile zone. The Fish and Wildlife Service manages coastal wildlife refuges and enforces laws to protect certain fish and wild life, particularly those that are endangered

Agency Support

Several Federal marine programs provide supporting operations for the agency in which they are located or for other agencies. Typically, these programs offer centralized services which other agency components use, such as equipment, ships, aircraft, satellites, and facilities.

Stations for oceanographic observations are maintained by NOAA, NASA, NSF, DOE, EPA, and Navy. NSF, NOAA, and Navy have support programs for ships and ship bases while NOAA and NSF maintain centralized facilities for research aircraft. Satellites and services are provided by NASA and through NOAA's environmental satellite services.

A network for collecting and distributing weather data, primarily for the Public Weather Service, is operated within NOAA. Surveys to support charting and mapping services are provided by support programs in NOAA, Navy, and USGS.

Another form of support are studies that provide information needed by agencies. The Fish and Wildlife Service, e.g., conducts a fish and wild life research program that provides scientific and technical planning support for the operations of agencies and other organizations. The Environmental Studies Program of the Bureau of Land Management (BLM) supports the Federal OCS oil and gas leasing program by examining possible environmental effects of offshore production. NOAA manages BLM's program off Alaska and provides ship support for the project. The Strategic Petroleum Reserve Program of DOE provides the information needed to satisfy EPA requirements for the use of salt domes to store crude oil.

These and other support activities accounted for \$284 million in fiscal year 1980 and included 13 programs in all agencies.

BUDGETS AND PERSONNEL

Estimated Expenditures for Federal Ocean Programs

The Federal ocean programs of eight agencies and departments had expenditures of \$2.5 billion in fiscal year 1980. The charts and graphs that follow show the distribution of these funds. Because some programs operated from income accounts, such as the Pollution Fund of the Coast Guard and the Fisherman's Contingency Fund, and others operated from prior-year carryover funds, such as NOAA's Coastal Energy Impact Fund (\$132.6 million), the totals presented do not reflect just appropriated funds.

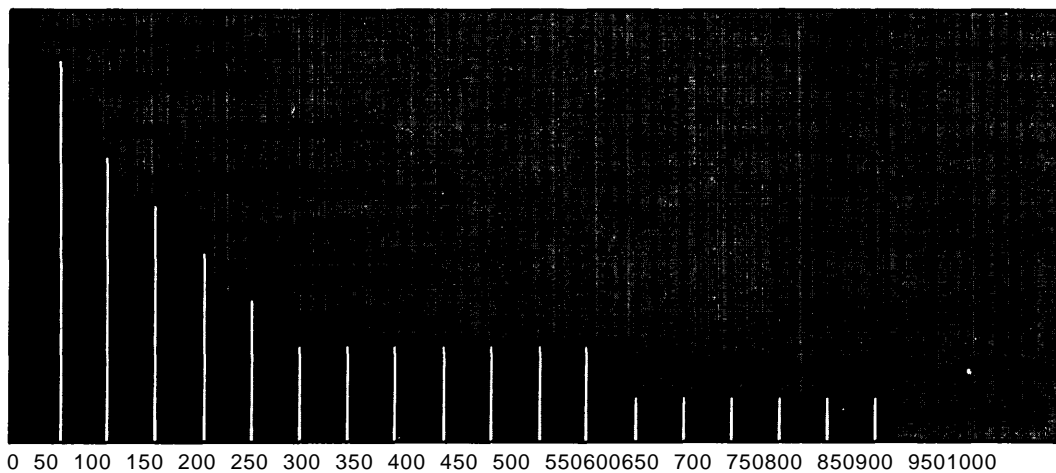
Figure 1 delineates the estimated amount of money spent in each ocean-related program category in fiscal year 1980. As shown, programs in

the public service category accounted for the largest expenditures and represented an outlay of \$919 million. Management and enforcement programs accounted for \$647 million. Weather and climate programs received the least amount of support. There were, however, basic science programs of NSF which were directed toward weather and climate but which are categorized under ocean science for this report.

A review of the estimated expenditures of each agency, presented in figure 2, reveals that Coast Guard reported the greatest expenditure, that of \$1.358 billion, in fiscal year 1980. This was more than the combined expenditures of all the *other* agencies.

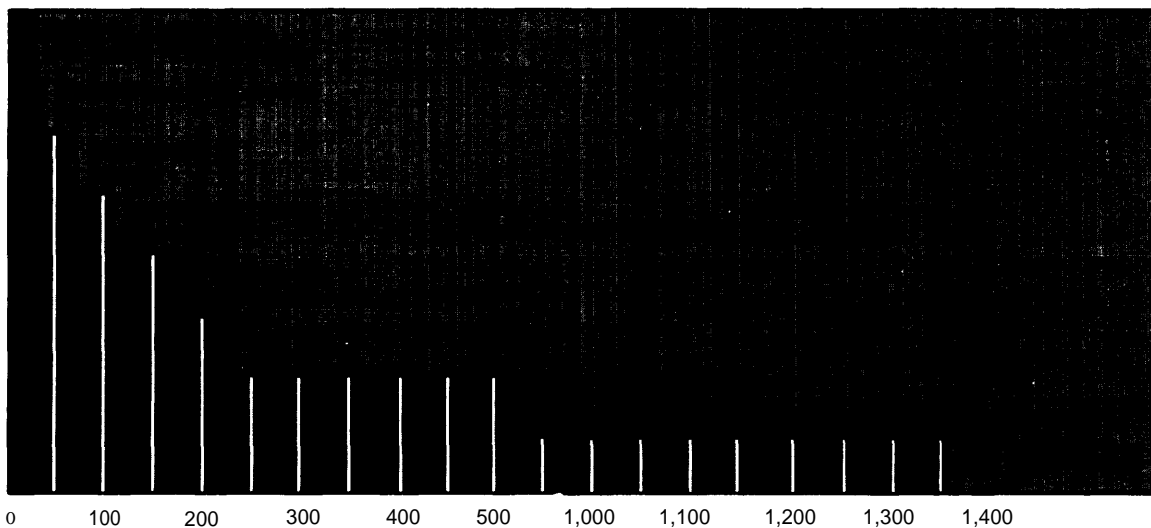
When expenditures are charted into program categories for each agency (table 3), it can be

**Figure 1.— Estimated Expenditures of Federal Marine Programs, Fiscal Year 1980
(in millions of dollars)**



SOURCE: Office of Technology Assessment

**Figure2.— Estimated Expenditures of Federal Marine Programs, Fiscal Year 1980,by Agency
(in millions of dollars)**



SOURCE: Office of Technology Assessment.

Table 3.—Estimated Expenditures of Federal Marine Programs: by Agency—by Category—Fiscal Year 1980
(in millions of dollars)

Category	Agency								Total
	Coast Guard	DOE	DOI	EPA	NASA	NOAA	NSF	Navy	
Agency support	—	\$ 2	\$ 70	\$ 4	—	\$ 68	—	\$139	\$283
Energy and mineral resources	—	—	44	—	—	—	—	—	87
Environmental quality	\$ 136	18	4	28	—	20	—	—	206
Fishery resources	—	—	12	—	—	45	—	—	57
Management and enforcement	477	—	41	—	—	130	—	—	648
Ocean science	—	—	—	—	—	4	\$ 106	88	198
Public service	686	—	19	—	—	214	—	—	919
Technology development	59	—	—	—	\$ 24	13	—	10	106
Weather and climate	—	—	—	—	—	20	—	—	20
Total	\$1,358	\$ 63	\$190	\$ 32	\$ 24	\$514	\$106	\$237	\$2,524

SOURCE: Office of Technology Assessment

seen that over one-half of Coast Guard's expenditures (\$686 million) were in public service programs. NOAA, second in overall expenditures, also spent the greatest portion of its funds in public service efforts. In addition, NOAA had the widest spread of activities, with expenditures in all program categories.

It is interesting to note in table 4 that the three agencies with the greatest expenditures — Coast Guard, NOAA, and Navy—account for over 80 percent of the total Federal marine program funds. The three largest categories — public service, management and enforcement, and agency support — accounted for over 70 percent of the total. Technology development accounted for

only 4.1 percent of the total even though four agencies had technology development efforts.

Based on the funding, the principal program area emphasis for each agency appears to be as follows:

- Coast Guard —public service and management /enforcement,
- DOE —energy and environment,
- DOI —energy/mineral, management and support,
- EPA —environmental quality,
- NASA — technology,
- NOAA — public service and management,
- NSF—ocean sciences, and
- Navy—ocean science and support.

Table 4.—Relative Estimated Expenditures for Federal Ocean Programs: by Agency—by Category—Fiscal Year 1980 (percentage of grand total of \$2.5 billion)

Agency	Technology development	Ocean sciences	Weather/ climate	Energy/ mineral	Environmental quality	Fishery resource	Public service	Management enforcement	Agency support	Total
Coast Guard". .	2.3	0	0	0	5.4	0	27.1	18.9	0	53.7
DOE	0	0	0	1.7	0.7	0	0	0	0.1	2.5
DOI	0	0	0	1.7	0.2	0.5	0.8	1.6	2.8	7.6
EPA	0	0	0	0	1.1	0	0	0	0.1	1.2
NASA	1.0	0	0	0	0	0	0	0	0	1.0
NOAA	0.5	0.1	0.8	0	0.8	1.9	8.5	5.1	2.7	20.4
NSF	0	4.2	0	0	0	0	0	0	0	4.2
Navy	0.4	3.5	0	0	0	0	0	0	5.5	9.4
Totals	4.2	7.8	0.8	3.4	8.2	2.4	36.4	25.6	11.2	100

SOURCE: Office of Technology Assessment

Future Expenditures

Projecting expenditures is part of the planning cycle of program development. For this report, (during 1980) NOAA, NASA, NSF, and Navy provided OTA with information on their projected funding levels for the categories listed in table 3. In fiscal year 1980 these four agencies accounted for expenditures of \$881.6 million. All of the agencies except NOAA predicted increased expenditures through fiscal year 1984 (table 5). NOAA projected a sharp drop followed by a leveling off of expenditures after fiscal year 1982.

The greatest percentage of increase appeared in NASA's proposed spending levels; from fiscal year 1980 to fiscal year 1981, NASA planned an increase of almost 50 percent. A portion of this increase was earmarked for the National Oceanic Satellite System (NOSS), with the rest proposed for two other ocean satellite programs beginning after fiscal year 1982. Not reflected in table 5 is NASA's Ocean Research Mission which was planned in conjunction with the launching of NOSS. Over the 1980 to 1984 timespan, NASA's proposed funding level increases more than six-fold.

NSF planned increases of 13 percent in fiscal year 1981 and 17 percent in fiscal year 1982, followed by a decrease of 8 percent in fiscal year 1983 and an increase of 10 percent in fiscal year 1984.

Increases in Navy expenditures were expected to be approximately 14 percent in fiscal year 1981 and 12 percent in fiscal year 1982, leveling off at about 9 percent for the following 2 years.

NOAA had not planned any increases of ocean programs during the next few years. Most programs show slight increases or decreases or appear as level-funded for the term. The only increase in NOAA's projections was for the Global Atmospheric Research Program, expected to more than double in funding from fiscal year 1980 to fiscal year 1984. NOAA states that its projections have an "implicit downward bias" because no inflationary factors were included and no program increases were formally approved.

Two agencies, Navy and Coast Guard, provided information on expected expenditures for technology development in some programs.

The Navy's capital investment in oceanographic operations, amounting to \$9.6 million in fiscal year 1980, is used mainly for modification and replacement of shipboard survey equipment. In fiscal year 1985, Navy expects to spend \$25.7 million for capital expenses in oceanographic operations.

Although Coast Guard does not normally develop new technology, a considerable amount of its planned expenditures is dedicated to "acquisitions, construction, and improvements," and in every program area such capital investment expenditures are found. The funds are used variously: to construct small boats; to purchase surveillance aircraft; to replace, renovate, or construct shore facilities, such as coastal and air stations; and to upgrade equipment. In all, Coast Guard estimated that approximately \$280.8 million was used for these purposes.

Table 5.—Estimated Expenditures in Selected Agencies, Fiscal Years 1980-84 (in millions of dollars)

Agency	1980	1981	1982	1983	1984	Total
NASA	\$23.7	\$ 35.4 ^f	\$ 68.8 ^b	\$106.0 ^f	\$ 147.2	\$ 381.1
NOAA	513.9 ^d	444.4 ^e	382.0	381.9	381.8	2,104.0
NSF ^f	106.4	120.0	140.49	129.1	142.6	638.5
Navy	237.6	270.6	303.9	331.0	361.0	1,504.1
Total	\$881.6	\$870.4	\$895.1	\$948.0	\$1,032.6	\$4,627.7

^aFunding for NOSS begins.

^bFunding for NASA's Ice Experiment (ICEX) begins.

^cFunding for NASA's Topographical Experiment (TOPEX) begins.

^dIncludes \$1344 million in prior-year carryover funds

^eIncludes \$62.4 million in prior-year carryover funds.

^fIncludes support for deep-sea drilling and ocean margin drilling programs

^gIncludes construction cost for ice-strengthened ship.

SOURCE: Office of Technology Assessment, 1980.

In 1981 the new administration proposed substantial reductions in most nonmilitary programs for fiscal years 1981 and 1982. These proposals have not been analyzed for this report. However, they will undoubtedly have the most significant effect on major new and costly programs such as those noted in table 5.

Personnel

Seven agencies—Coast Guard, Navy, NOAA, DOI, NSF, DOE, and NASA—responded to OTA's request for staff allocations for fiscal year 1980. In these agencies, the number of personnel involved in Federal ocean-related programs is estimated to be about 56,000. Because each agency operates in a different manner, a comparison or evaluation of the staff level and the level of expenditures for staff is not possible. However, these estimates do provide a sense of personnel effort involved in ocean research in general and in each agency in particular.

It is of interest to note there are three different composition groups based on staffing levels within these agencies. The Coast Guard is in a group by itself with the largest number of personnel—43,757 (38,384 military and 5,373 civilian) and a very large portion of its budget allocated to direct agency-operated and staffed programs. This is because Coast Guard's work takes place mainly in the field; in ports, harbors, and at sea; and aboard its own ships or in its own

facilities. The figures provided by Coast Guard represent the estimated number of people associated with all Coast Guard operating programs. In addition, Coast Guard is a multimission service; its personnel are generally not dedicated to one particular program, but may in fact support several programs.

A second group that includes NOAA, Navy, and DOI has a total of 11,000 staff working on its ocean-related programs—NOAA (4,704), Navy (3,972), DOI (2,324). These three have a mixture of work conducted by agency people at agency facilities and work conducted by contractors. The three are similar in total staff level and amount of money expended per staff person, and each has some major field operations and laboratory facilities. Table 6 shows the approximate allocations of these personnel to program categories.

The third group has very small staffs and includes NASA, NSF, and DOE. Each agency has 25 people or less working on ocean programs—NASA (9), NSF (25), DOE (24). Unlike the other agencies surveyed, these agencies maintain small core staffs and use contractors or grantees to perform all work. NSF and DOE rely on their staffs to evaluate proposals and to monitor contracts. NASA's ocean-related staff remains small, but if NOSS is funded, its Oceanic Processes Branch is expected to increase. This branch contracts out the majority of its research.

Table 6.—Approximate Personnel Allocations to Program Categories for Three Agencies—NOAA, Navy, DOI — Fiscal Year 1980

Agency	Technology development	Ocean sciences	Weather/ climate	Energy/ mineral	Environmental quality	Fishery resource	Public service	Management enforcement	Agency support	Total
DOI.....	0	3	0	300	150	300	300	875	396	2,324
NOAA.....	141	26	294	0	143	1,509	641	635	1,315	4,704
Navy.....	70	672	0	0	0	0	0	0	3,230	3,972
Total.....	211	701	294	300	293	1,809	941	1,510	4,941	11,000

SOURCE Off Ice of Technology Assessment