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Federal Research and Development (R&D) Funding: FY2023

June 10, 2022

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SUMMARY

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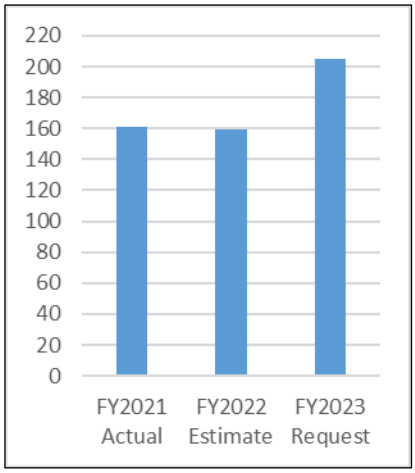
Federal Research and Development (R&D) Funding: FY2023

The U.S. government supports a broad range of scientific and engineering research and development (R&D). Its purposes include addressing national defense, health, safety, the environment, and energy security; advancing knowledge generally; developing the U.S. scientific and engineering workforce; strengthening the capacity of U.S. institutions and firms to conduct cutting-edge scientific research and develop innovative technologies; and enhancing the competitiveness of the United States in the global economy. Most of the R&D funded by the federal government is performed in support of the unique missions of individual funding agencies.

President Biden's budget request for FY2023 includes approximately $204.9 billion for R&D, $45.3 billion (28%) above the FY2021 estimated level of $159.6 billion. In constant FY2023 dollars (estimated), the FY2023 R&D request represents an increase of $41.8 billion (26%) above the FY2022 estimated level.

Funding for R&D is concentrated in a few federal departments and agencies. In FY2022, six agencies received nearly 95% of total federal R&D funding, with the Department of Defense (DOD, 41%) and the Department of Health and Human Services (HHS, 26%) combined accounting for more than two-thirds of all federal R&D funding. In the FY2023 request, the top six R&D agencies would account for just over 95%, with DOD accounting for 41% and HHS for 30%.

Federal Research and Development Funding, FY2021-FY2023
In billions of dollars



Source: CRS analysis of data from OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2023, Research and Development,* April 2022.

Under the President's FY2023 budget request, nearly all federal agencies would see their R&D funding increase relative to FY2022. The only exceptions are the Department of Homeland Security (DHS), which would decrease by $67 million (9%) in FY2023 to $681 million, and the Department of Education (ED), which would decrease by $3 million (1%) in FY2023 to $402 million. The largest dollar increases in R&D funding would be for HHS (up $19.8 billion, 47%), DOD (up $18.1 billion, 28%), the Department of Energy (up $2.7 billion, 13%), and the National Science Foundation (up $1.4 billion, 20%). The largest percentage increases in R&D funding would be at HHS (up 47%), DOD (up 28%), and the Department of the Interior (up 28%).

The President's FY2023 budget request would increase funding for basic research by $13.9 billion (33%), applied research by $11.7 billion (28%), development by $19.1 billion (27%), and R&D facilities and equipment by $563 million (13%).

Several multiagency R&D initiatives continue under the President's FY2023 budget request. Some activities supporting these initiatives are discussed in agency budget justifications. However, comprehensive aggregate budget information on these initiatives will likely not be available until budget supplements for each are released later in the year.

The request represents the President's R&D priorities. Congress may opt to agree with none, part, or all of the request, and it may express different priorities through the appropriations process. Congress provides annual R&D appropriations through 9 of the 12 regular appropriations bills.

In recent years, Congress has completed the annual appropriations process after the start of the fiscal year. Completing the process after the start of the fiscal year and the accompanying use of continuing resolutions can affect agencies' execution of their R&D budgets, including the delay or cancellation of planned R&D activities and acquisition of R&D-related equipment.

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Introduction

The 117th Congress continues its interest in U.S. research and development (R&D) and in evaluating funding for federal R&D activities. The federal government has played an important role in supporting R&D efforts that have led to scientific breakthroughs and new technologies, from jet aircraft and the internet to communications satellites and defenses against disease. In recent years, federal budget caps have driven executive and legislative branch decisions about the prioritization of R&D, both in the context of the entire federal budget and among competing needs within the federal R&D portfolio.

The U.S. government supports a broad range of scientific and engineering R&D. Its purposes include addressing national defense, health, safety, the environment, and energy security; advancing knowledge generally; developing the U.S. scientific and engineering workforce; strengthening the capacity of U.S. institutions and firms to conduct cutting-edge scientific research and develop innovative technologies; and enhancing the competitiveness of the United States in the global economy. Most of the R&D funded by the federal government is performed in support of the unique missions of individual funding agencies.

The federal R&D budget is an aggregation of the R&D activities of these agencies. There is no single, centralized source of R&D funds. Agency R&D budgets are developed internally as part of each agency's overall budget development process. R&D funding may be included either in accounts that are entirely devoted to R&D or in accounts that also include funding for non-R&D activities. Agency budgets are subjected to review, revision, and approval by the Office of Management and Budget (OMB) and become part of the President's annual budget submission to Congress. The federal R&D budget is then calculated by aggregating the R&D activities of each federal agency.

Congress plays a central role in defining the nation's R&D priorities as it makes decisions about the level and allocation of R&D funding—overall, within agencies, and for specific programs. As Congress acts to complete the FY2023 appropriations process, it faces two overarching issues: the amount of the federal budget to be spent on federal R&D and the prioritization and allocation of the available funding.

This report begins with a discussion of the overall level of R&D in President Biden's FY2023 budget request, followed by analyses of R&D funding in the request from a variety of perspectives and for selected multiagency R&D initiatives. The remainder of the report discusses and analyzes the R&D budget requests of selected federal departments and agencies that, collectively, account for approximately 99% of total federal R&D funding.

Selected terms associated with federal R&D funding are defined in the text box on the next page. **Appendix A** provides a list of acronyms and abbreviations. **Appendix B** lists the primary CRS experts on R&D funding for the agencies covered in this report.

Definitions Associated with Federal Research and Development Funding

Two key sources of definitions associated with federal research and development funding are the White House Office of Management and Budget and the National Science Foundation.

Office of Management and Budget. The Office of Management and Budget provides the following definitions of R&D-related terms in OMB Circular No. A-11, "Preparation, Submission, and Execution of the Budget."[1] This document provides guidance to agencies in the preparation of the President's annual budget and instructions on budget execution. In 2017, OMB adopted a refinement to the categories of R&D, replacing "development" with "experimental development," which more narrowly defines the set of activities to be included. This definition is used in the President's FY2023 budget. The new definition resulted in lower reported R&D by some agencies, including the Department of Defense (DOD) and the National Aeronautics and Space Administration (NASA). For FY2023, OMB has opted to include DOD budget activity 6.6 ("Management Support") funding as part of its R&D calculations (categorized as experimental development); historically, this funding had been included in the DOD R&D total and federal R&D total figures, but it was excluded in the FY2022 budget request. DOD R&D funding in **Table 1** and **Table 3** reflects this change for FY2021 and FY2022 (applied retroactively), as well as for FY2023.

Conduct of R&D. Research and experimental development (R&D) activities are defined as creative and systematic work undertaken in order to increase the stock of knowledge—including knowledge of people, culture, and society—and to devise new applications using available knowledge.

Basic Research. Basic research is defined as experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts. Basic research may include activities with broad or general applications in mind, such as the study of how plant genomes change, but excludes research directed towards a specific application or requirement, such as the optimization of the genome of a specific crop species.

Applied Research. Applied research is defined as original investigation undertaken in order to acquire new knowledge. Applied research is, however, directed primarily towards a specific practical aim or objective.

Experimental Development. Experimental development is defined as creative and systematic work, drawing on knowledge gained from research and practical experience, which is directed at producing new products or processes or improving existing products or processes. Like research, experimental development will result in gaining additional knowledge.

R&D Equipment. R&D equipment includes amounts for major equipment for research and development. It includes acquisition, design, or production of major movable equipment, such as mass spectrometers, research vessels, DNA sequencers, and other major movable instruments for use in R&D activities. It includes programs of $1 million or more that are devoted to the purchase or construction of major R&D equipment.

R&D Facilities. R&D facilities includes amounts for the construction of facilities that are necessary for the execution of an R&D program. This may include land, major fixed equipment, and supporting infrastructure such as a sewer line or housing at a remote location.

National Science Board/National Science Foundation. The National Science Board/National Science Foundation (NSB/NSF) provides the following definitions of R&D-related terms in its report *Science and Engineering Indicators: 2020*.[2]

Research and Development (R&D): Research and experimental development comprise creative and systematic work undertaken to increase the stock of knowledge—including knowledge of humankind, culture, and society—and its use to devise new applications of available knowledge.[3]

Basic Research: Experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view.

Applied Research: Original investigation undertaken to acquire new knowledge—directed primarily, however, toward a specific, practical aim or objective.

Development (or Experimental Development): Systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes.

[1] The White House, Office of Management and Budget, Circular No. A-11, "Preparation, Submission, and Execution of the Budget," August 2021, https://www.whitehouse.gov/wp-content/uploads/2018/06/a11.pdf.

[2] National Science Board/National Science Foundation, *Science and Engineering Indicators 2020*, January 2020, https://ncses.nsf.gov/pubs/nsb20201/glossary.

The President's FY2023 Budget Request

On March 28, 2022, President Biden released his proposed FY2023 budget. President Biden is proposing $204.9 billion for R&D for FY2023, an increase of $45.3 billion (28%) above the FY2022 estimated level of $159.6 billion. Adjusted for inflation to FY2023 dollars, the President's FY2023 R&D request represents a constant-dollar increase of 26% above the FY2022 estimated level.[4]

The President's request includes continued R&D funding for existing single-agency and multiagency programs and activities, as well as new initiatives. This report provides government-wide, multiagency, and individual agency analyses of the President's FY2023 request as it relates to R&D and related activities. More information will become available as the House and Senate act on the President's budget request through appropriations bills.

Factors Affecting Analysis of the FY2023 Budget Request

Certain factors complicate the analysis of changes in R&D funding for FY2023, both in aggregate and for selected agencies. Inconsistency among agencies in the reporting of R&D and the inclusion of R&D activities in accounts with non-R&D activities may result in different figures being reported by OMB and the White House Office of Science and Technology Policy (OSTP), including those shown in **Table 1**, and those in agency budget analyses that appear later in this report. Additionally, the data in this report include a combination of FY2022 estimates and FY2022 enacted appropriations, due to the late completion of the appropriations process.

Federal R&D Funding Perspectives

Federal R&D funding can be analyzed from a variety of perspectives that provide different insights. The following sections examine the data by agency, by the character of the work supported, and by a combination of these two perspectives.

Federal R&D by Agency

Congress makes decisions about R&D funding through the authorization and appropriations processes primarily from the perspective of individual agencies and programs. **Table 1** provides data on R&D funding by agency for FY2021 (actual), FY2022 (estimate), and FY2023 (request).[5]

Under the request, eight federal agencies would receive over 97% of total federal R&D funding in FY2023: the Department of Defense (DOD), 40.9%; Department of Health and Human Services (HHS), primarily the National Institutes of Health (NIH), 30.2%; Department of Energy (DOE), 11.6%; National Aeronautics and Space Administration (NASA), 6.6%; National Science Foundation (NSF), 4.1%; Department of Agriculture (USDA), 1.7%; Department of Commerce

[3] In the 2022 version of the *Science and Engineering Indicators* report, the definitions for R&D and experimental R&D are combined: "Research and [experimental] development (R&D): Creative and systematic work undertaken to increase the stock of knowledge—including knowledge of humankind, culture, and society—and its use to devise new applications of available knowledge"; NSF/NSB *Science and Engineering Indicators 2022*, January 2022, https://ncses.nsf.gov/pubs/nsb20221/glossary. In this CRS report, the definitions are kept separate for clarity and alignment with definitions in OMB Circular No. A-11.

[4] As calculated by CRS using the Gross Domestic Product (GDP) (chained) price index for FY2022-FY2023 in Table 10.1, "Gross Domestic Product and Deflators Used in the Historical Tables: 1940–2027," *Budget of the United States Government, Fiscal Year 2023*, https://www.whitehouse.gov/wp-content/uploads/2022/03/hist10z1_fy2023.xlsx.

[5] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2023, Research and Development*, April 2022, https://www.whitehouse.gov/wp-content/uploads/2022/04/ap_18_research_fy2023.pdf.

(DOC), 1.4%; and Department of Veterans Affairs (VA), 0.8%. This report provides an analysis of the R&D budget requests for these agencies, as well as for the Department of Homeland Security (DHS), Department of the Interior (DOI), Department of Transportation (DOT), and Environmental Protection Agency (EPA).

With the exception of DHS, all of these federal agencies would see their R&D funding increase under the President's FY2023 request compared with their FY2022 estimated levels. The agencies with the largest R&D funding increases (measured in dollars) in the FY2023 request compared with FY2022 estimated levels are HHS (up $19.79 billion), DOD (up $18.08 billion), and DOE (up $2.70 billion). DHS R&D funding would decline by $67 million (down 9%). The agencies with the largest percentage increases in R&D funding in the FY2023 request compared with the FY2022 estimated level are HHS (up 47%), DOC (up 46%), DOD (up 28%), DOI (up 28%), and NSF (up 20%). See **Table 1**.

Table 1. Federal Research and Development Funding by Agency, FY2021-FY2023

(budget authority, dollar amounts in millions)

				FY2022-FY2023	
Department/Agency	**FY2021 Actual**	**FY2022 Estimate**	**FY2023 Request**	**Dollar Change**	**Percentage Change**
Department of Defense	70,079[a]	65,691[a]	83,769[a]	18,078	28%
Dept. of Health and Human Services	42,226	42,023	61,816	19,793	47%
Department of Energy	17,788	21,027	23,731	2,704	13%
NASA	12,176	12,279	13,547	1,268	10%
National Science Foundation	7,515	7,065	8,448	1,383	20%
Department of Agriculture	3,031	3,193	3,579	386	12%
Department of Commerce	2,099	1,994	2,918	924	46%
Department of Veterans Affairs	1,445	1,436	1,655	219	15%
Department of Transportation	1,070	1,281	1,498	217	17%
Department of the Interior	1,009	1,123	1,443	320	28%
Department of Homeland Security	590	748	681	-67	-9%
Environmental Protection Agency	524	523	614	91	17%
Department of Education	364	405	402	-3	-1%
Smithsonian Institution	324	332	355	23	7%
Other	484	493	480	-13	-3%
Total	**160,724**	**159,613**	**204,936**	**45,323**	**28%**

Source: CRS analysis of data from EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2023, Research and Development,* April 2022, https://www.whitehouse.gov/wp-content/uploads/2022/04/ap_18_research_fy2023.pdf.

Notes: Components may not sum to totals due to rounding. The FY2022 Estimate column applies the main 2023 Budget approach of using annualized appropriations provided by the 2022 Continuing Resolution as well as including enacted legislation as of January 2022 (including P.L. 117-58, the Infrastructure Investment and Jobs Act).

a. Per the EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2023, Research and Development,* April 2022: "As part of the effort to refine DOD's contribution to overall Federal R&D, DOD Research, Development, Test, and Evaluation (RDT&E) Budget Activity 6.6 is now included as part of experimental development. This change is reflected across fiscal years 2021–2023 in the table and accounts for $8.3 billion in the FY 2023 Budget, which was not previously captured as R&D. Total experimental development spending includes DOD RDT&E Budget Activities 6.3 through 6.6 (Advanced Technology Development; Advanced Component Development and Prototypes; System Development and Demonstration; and Management Support)."

Federal R&D by Character of Work, Facilities, and Equipment

Federal R&D funding can also be examined by the character of work it supports—basic research, applied research, or development—and by funding provided for construction of R&D facilities and acquisition of major R&D equipment. (See **Table 2**.) President Biden's FY2023 request includes $564.544 billion for basic research, up $13.952 billion (33%) from the FY2022 estimated level; $54.311 billion for applied research, up $11.754 billion (28%); $89.226 billion for development, up $19.054 billion (27%); and $4.855 billion for R&D facilities and equipment, up $563 million (13%).

Table 2. Federal R&D Funding by Character of Work and Facilities and Equipment, FY2021-FY2023

(budget authority, dollar amounts in millions)

				Change, FY2022-FY2023	
Character of Work, Facilities, and Equipment	**FY2021 Actual**	**FY2022 Estimated**	**FY2023 Request**	**Dollars**	**Percentage**
Basic research	42,784	42,592	56,544	13,952	33%
Applied research	43,283	42,557	54,311	11,754	28%
Development	70,334	70,172	89,226	19,054	27%
Facilities and Equipment	4,323	4,292	4,855	563	13%
Total	**117,940**	**159,613**	**204,936**	**45,323**	**28%**

Source: CRS analysis of data from EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2023, Research and Development,* April 2022, https://www.whitehouse.gov/wp-content/uploads/2022/04/ap_18_research_fy2023.pdf.

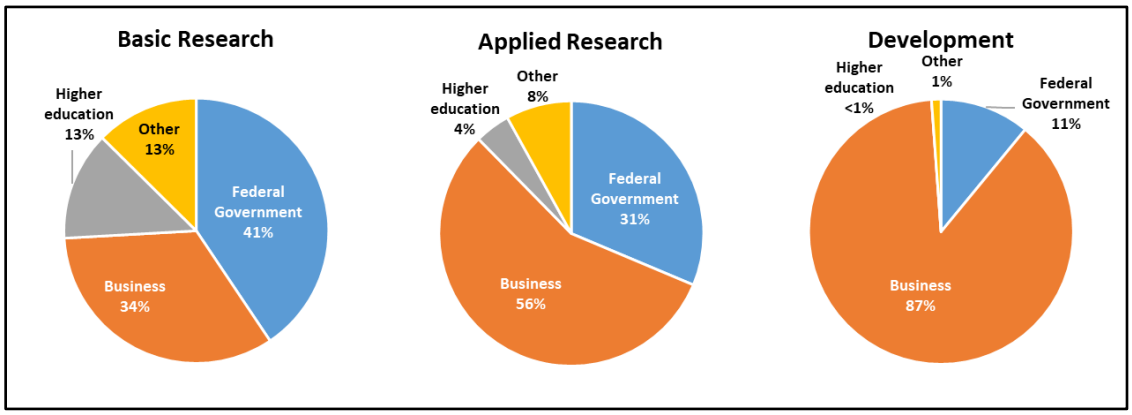
Note: Components may not sum to totals due to rounding.

Federal Role in U.S. R&D by Character of Work

A primary policy justification for public investments in basic research and for incentives (e.g., tax credits) for the private sector to conduct research is the view, widely held by economists, that the private sector will, left on its own, underinvest in basic research from a societal perspective. The usual argument for this view is that the social returns (i.e., the benefits to society at large) exceed the private returns (i.e., the benefits accruing to the private investor, such as increased revenues or higher stock value). Other factors that may inhibit corporate investment in basic research include long time horizons for achieving commercial applications (diminishing the potential returns due to the time value of money), high levels of technical risk and uncertainty, shareholder demands for shorter-term returns, and asymmetric and imperfect information.

The federal government is the nation's largest supporter of basic research, funding 41% of U.S. basic research in 2020 (the most recent year for which comprehensive data are available). Business funded 34% of U.S. basic research in 2020, with state governments, universities, and other nonprofit organizations funding the remaining 26%.[6] For U.S. applied research, business is the primary funder, accounting for an estimated 56% in 2020, while the federal government accounted for an estimated 31%. State governments, universities, and other nonprofit organizations funded the remaining 12%. Business also provides the vast majority of U.S. funding for development. Business accounted for 87% of development funding in 2020, while the federal government provided 11%. State governments, universities, and other nonprofit organizations funded the remaining 2% (see **Figure 1**).[7]

Figure 1. Composition of U.S. Basic Research, Applied Research, and Development by Funding Sector, 2020



Source: CRS analysis of National Science Foundation, *National Patterns of R&D Resources: 2019-20 Data Update*, NSF 22-320, Tables 7-9, February 22, 2022.

Notes: Components may not add to total due to rounding. Data are preliminary and may be revised.

Federal R&D by Agency and Character of Work Combined

Federal R&D funding can also be viewed from the combined perspective of each agency's contribution to federal basic research, applied research, development, and facilities and equipment. **Table 3** lists the three agencies with the most funding in each of these categories as proposed in the President's FY2023 budget. The overall federal R&D budget reflects a wide range of national priorities, including supporting innovation in critical and emerging technologies, pandemic preparedness and prevention, STEM education and engagement, and understanding climate change and developing mitigation and adaptation solutions. These priorities and the mission of each individual agency contribute to the composition of that agency's R&D spending (i.e., the allocation of R&D funding among basic research, applied research, development, and facilities and equipment).

In President Biden's FY2023 budget request, the Department of Health and Human Services, primarily NIH, would account for more than half (56%) of all federal funding for basic research.

[6] Percentages may not sum to 100% due to rounding.

[7] CRS analysis of National Science Foundation, *National Patterns of R&D Resources: 2019-20 Data Update*, NSF 22-320, Tables 7-9, February 22, 2022. Data are preliminary and may be revised. Components may not add to total due to rounding.

HHS would also be the largest federal funder of applied research, accounting for about 54% of all federally funded applied research in the President's FY2023 budget request. DOD would be the primary federal funder of experimental development, accounting for 84% of total federal development funding in the President's FY2023 budget request. DOE would be the primary federal funder of R&D facilities and equipment, accounting for 58% of total federal R&D facilities and equipment funding in the President's FY2023 budget request.[8]

Table 3. Selected R&D Funding Agencies by Character of Work, Facilities, and Equipment, FY2021 Actual, FY2022 Estimated, and FY2023 Request

(budget authority, dollar amounts in millions)

				Change, FY2022-FY2023	
Character of Work/Agency	**FY2021 Actual**	**FY2022 Estimate**	**FY2023 Request**	**Dollars**	**Percentage**
Basic Research					
Health and Human Services	21,051	20,951	31,911	10,960	52%
NSF	5,974	5,664	6,787	1,123	20%
Energy	5,526	5,623	6,373	750	13%
Applied Research					
Health and Human Services	20,876	20,744	29,480	8,736	42%
Energy	6,360	6,130	7,129	999	16%
Defense	6,438	5,625	6,028	403	7%
Experimental Development					
Defense	61,101	57,750	75,325	17,575	30%
Energy	3,023	6,501	7,433	932	14%
NASA	4,306	4,048	4,323	275	7%
Facilities and Equipment					
Energy	2,879	2,773	2,796	23	1%
Commerce	296	357	642	285	80%
NSF	573	522	546	24	5%

Source: CRS analysis of data from EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2023, Research and Development,* April 2022, https://www.whitehouse.gov/wp-content/uploads/2022/04/ap_18_research_fy2023.pdf.

Note: This table shows only the top three funding agencies in each category, based on the FY2023 request.

Multiagency R&D Initiatives

For many years, presidential budgets have reported on multiagency R&D initiatives. Often, they have also provided details of agency funding for these initiatives. Some of these efforts have a statutory basis—for example, the Networking and Information Technology Research and

[8] CRS analysis of data from EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2021, Research and Development,* February 10, 2020, https://www.whitehouse.gov/wp-content/uploads/2020/02/ap_17_research_fy21.pdf.

Development (NITRD) program, the National Nanotechnology Initiative (NNI), and the U.S. Global Change Research Program (USGCRP). These programs generally produce annual budget supplements identifying objectives, activities, funding levels, and other information, usually published shortly after the presidential budget release. Other multiagency R&D initiatives have operated at the discretion of the President, without a specific statutory mandate, and may be eliminated at the discretion of the President. Some activities related to these initiatives are discussed in agency budget justifications and may be addressed in the agency analyses later in this report. This section provides available multiagency information on these initiatives and will be updated as additional information becomes available.

Networking and Information Technology Research and Development Program[9]

Established by the High-Performance Computing Act of 1991 (P.L. 102-194), the Networking and Information Technology Research and Development Program is the primary mechanism by which the federal government coordinates its unclassified networking and information technology R&D investments in areas such as supercomputing, high-speed networking, cybersecurity, software engineering, and information management. The NITRD National Coordination Office (NCO) coordinates the information technology R&D activities of 24 federal agency members and more than 45 other participating agencies with program interests and activities in IT R&D. NITRD efforts are further coordinated by the National Science and Technology Council (NSTC) NITRD Subcommittee.[10]

P.L. 102-194, as reauthorized by the American Innovation and Competitiveness Act of 2017 (P.L. 114-329), requires the director of the NITRD NCO to prepare an annual report to be delivered to Congress along with the President's budget request. This annual report, often referred to as a budget supplement, is to include, among other things, detailed information on the program's budget for the current and previous fiscal years and the proposed budget for the next fiscal year. The latest annual report was published in August 2020 and related to the FY2021 budget request. For additional information on the NITRD Program, see https://www.nitrd.gov.

[9] For additional information on the Networking and Information Technology Research and Development program, please contact Patricia Moloney Figliola, Specialist in Internet and Telecommunications Policy.

[10] The NSTC was established by Executive Order 12881 in 1993. According to the White House, "This Cabinet-level Council is the principal means within the Executive Branch to coordinate science and technology policy across the diverse entities that make up the Federal research and development enterprise. Chaired by the President, the membership of the NSTC is made up of the Vice President, Cabinet Secretaries and Agency Heads with significant science and technology responsibilities, and other White House officials. In practice, the Assistant to the President for Science and Technology Policy oversees the NSTC's ongoing activities." (Source: EOP, Office of Science and Technology Policy, "NSTC," https://www.whitehouse.gov/ostp/nstc/.) For more information on the NSTC, see https://www.whitehouse.gov/ostp/nstc/.

Table 4. Networking and Information Technology Research and Development Program Funding, FY2019-FY2023

(budget authority, in millions of current dollars)

	FY2019 Actual	FY2020 Enacted	FY2021 Enacted	FY2022 Request	FY2023 Request
Total, NITRD	6,472.1	7,092.7	7,175.4	7,777.3	n/a

Source: NITRD, *Supplement to the President's FY2021 Budget*, August 14, 2020, p. 9, https://www.nitrd.gov/pubs/FY2021-NITRD-Supplement.pdf; and NITRD and the National Artificial Intelligence Initiative Office (NAIIO), *Supplement to the President's FY2022 Budget*, December 2021, p. 15, https://www.nitrd.gov/fy2022-nitrd-naiio-supplement/.

Note: n/a = not available.

U.S. Global Change Research Program[11]

The U.S. Global Change Research Program coordinates and integrates federal research and investments to understand, assess, predict, and respond to human-induced and natural processes of global change. The program seeks to advance global climate change science and to "build a knowledge base that informs human responses to climate and global change through coordinated and integrated Federal programs of research, education, communication, and decision support."[12] In FY2021, 10 departments and agencies received appropriations for their USGCRP participation; in FY2022, the Administration requested increased funding for each department and agency. USGCRP efforts are coordinated by the NSTC Subcommittee on Global Change Research. Each agency develops and carries out its activities as its contribution to the USGCRP, and funds are appropriated to each agency for those activities; those activities may or may not be identified as associated with the USGCRP in agency budget justifications or other program materials available publicly. Complementing USGCRP activities are many federal climate change or global change-related activities with programmatic missions, not predominantly scientific. These are reported separately in budget justifications.

The Global Change Research Act of 1990 (GCRA, P.L. 101-606) requires each federal agency or department involved in global change research to report annually to Congress on each element of its proposed global change research activities, as well as the portion of its budget request allocated to each element of the program.[13] The President is also required to identify those activities and the annual global change research budget in the President's annual budget request. The President's budget requests for years later than FY2017 do not report these budget data required by the GCRA, although some agencies report their contributions in their budget justifications to Congress.

In addition, in the 20 years prior to FY2018, language in appropriations laws required the President to submit a comprehensive report to the appropriations committees "describing in detail all Federal agency funding, domestic and international, for climate change programs, projects, and activities … including an accounting of funding by agency…."[14] As these are no longer

[11] For additional information on the U.S. Global Change Research Program, please contact Jane A. Leggett, Specialist in Energy and Environmental Policy.

[12] U.S. Global Change Research Program website, http://www.globalchange.gov/about/mission-vision-strategic-plan.

[13] Directives to report annually to Congress on budget requests and spending occur in several sections of P.L. 101-606, including Sections 105(b) and (c) on Budget Coordination, and Section 107, Annual Report.

[14] See, most recently, P.L. 115-31, Consolidated Appropriations Act, 2017, Section 416.

reported by OMB, **Table 5** presents data compiled by CRS from the "Budget" section of the "About USGCRP" website for the USGCRP.[15] For additional information on the USGCRP, see http://www.globalchange.gov.

Table 5. U.S. Global Change Research Program Funding, FY2020-FY2023

(budget authority, in millions of current dollars)

	FY2020 Enacted	FY2021 Enacted	FY2022 Request	FY2023 Request
Total, USGCRP	2,461	3,270	4,822	n/a

Source: GlobalChange.gov, "Budget," https://www.globalchange.gov/about.

Notes: n/a = not available. Funding for activities that contribute to the USGCRP has been appropriated to more than a dozen federal departments and agencies in the past, and some spending of it is transferred or coordinated through interagency agreements. Almost all of the funding is spent directly by agencies on research and related activities; a small percentage is spent for interagency coordination and communications in the USGCRP program office.

National Nanotechnology Initiative[16]

Launched in FY2001, the National Nanotechnology Initiative is a multiagency R&D initiative to advance understanding and control of matter at the nanoscale, where the physical, chemical, and biological properties of materials differ in fundamental and sometimes useful ways from the properties of individual atoms or bulk matter.[17] In 2003, Congress enacted the 21st Century Nanotechnology Research and Development Act (P.L. 108-153), providing a legislative foundation for some of the activities of the NNI. NNI efforts are coordinated by the NSTC Subcommittee on Nanoscale Science, Engineering, and Technology (NSET). For FY2022, the President's request included NNI funding for 11 federal departments and independent agencies and commissions with budgets dedicated to nanotechnology R&D.[18] The federal organizations with the largest proposed FY2022 investments in nanoscale science, engineering, and technology R&D (representing 96% of the total) were HHS (including NIH), NSF, DOE, DOD, and NIST. The NSET membership includes other federal departments and independent agencies and commissions with responsibilities for health, safety, and environmental regulation; trade; education; intellectual property; international relations; and other areas that might affect or be affected by nanotechnology.

P.L. 108-153 requires the NSTC to prepare an annual report to be delivered to Congress at the time the President's budget request is sent to Congress. This annual report, often referred to as a budget supplement, is to include detailed information on the program's budget for the current fiscal year and the program's proposed budget for the next fiscal year, as well as additional information and data related to the performance of the program. The latest annual report was published in March 2022 and related to the FY2022 budget request. President Biden requested

[15] GlobalChange.gov, "Budget," https://www.globalchange.gov/about.

[16] For additional information on the National Nanotechnology Initiative, please contact John F. Sargent Jr., Specialist in Science and Technology Policy.

[17] In the context of the NNI and nanotechnology, the nanoscale refers to lengths of 1 to 100 nanometers. A nanometer is one-billionth of a meter, or about the width of 10 hydrogen atoms arranged side by side in a line.

[18] EOP, NSTC, *The Nanotechnology Initiative: Supplement to the President's 2022 Budget*, March 2022, p. 4, https://www.nano.gov/sites/default/files/NNI-FY22-Budget-Supplement.pdf.

$1.975 billion for NNI research in FY2022, a decrease of $3.101 billion (61%) from the enacted FY2021 level.[19] For additional information on the NNI, see http://www.nano.gov.

Table 6. National Nanotechnology Initiative Funding, FY2020-FY2023

(budget authority, in millions of current dollars)

	FY2020 Estimated	FY2021 Enacted	FY2022 Request	FY2023 Request
Total, NNI	3,465.4	5,076.1	1,975.4	n/a

Source: EOP, NSTC, *The National Nanotechnology Initiative: Supplement to the President's 2022 Budget,* March 2022.

Notes: n/a = not available.

FY2023 Appropriations Status

The remainder of this report provides a more in-depth analysis of R&D in 12 federal departments and agencies that, in aggregate, receive nearly 99% of total federal R&D funding. Agencies are presented in order of the size of their FY2023 R&D budget requests, with the largest presented first.

Annual appropriations for these agencies are provided through 9 of the 12 regular appropriations bills. For each agency covered in this report, **Table 7** shows the corresponding regular appropriations bill that provides primary funding for the agency, including its R&D activities.

Because of the way that agencies report budget data to Congress, it can be difficult to identify the portion that is R&D. Consequently, R&D data presented in the agency analyses in this report may differ from R&D data in the President's budget or otherwise provided by OMB.

Funding for R&D is often included in appropriations line items that also include non-R&D activities; therefore, in such cases, it may not be possible to identify precisely how much of the funding provided in appropriations laws is allocated to R&D specifically. In general, R&D funding levels are known only after departments and agencies allocate their appropriations to specific activities and report those figures.

In addition to this report, CRS produces individual reports on each of the appropriations bills and for a number of federal agencies. These reports can be accessed via the CRS website at http://www.crs.gov/iap/appropriations. Also, the status of each appropriations bill is available on the CRS web page "Appropriations Status Table," available at http://www.crs.gov/AppropriationsStatusTable/Index.

[19] Ibid. While this appears to be a substantial decrease, the NNI Supplement to the President's 2022 Budget document notes (p. 6), "A significant proportion of agencies' nanotechnology investments now come from "core" R&D programs, which makes it difficult to predict the number of and success rate of nanotechnology-related proposals. As a result, the actual investments reported are often higher than the previously published estimates or proposed values. For example, the actual NNI investment for 2020 (nearly $3.5 billion, including $1.4 billion from BARDA for COVID diagnostics and vaccine research) is much higher than the 2020 estimated level ($1.84 billion) published in the NNI Supplement to the President's 2021 Budget, or the 2020 requested value published in the 2020 supplement ($1.47 billion)."

Table 7. Alignment of Agency R&D Funding and Regular Appropriations Bills

Department/Agency	Regular Appropriations Bill
Department of Defense	Department of Defense Appropriations Act
Department of Health and Human Services - National Institutes of Health	(1) Departments of Labor, Health and Human Services, and Education, and Related Agencies Appropriations Act (2) Department of the Interior, Environment, and Related Agencies Appropriations Act
Department of Energy	Energy and Water Development and Related Agencies Appropriations Act
National Aeronautics and Space Administration	Commerce, Justice, Science, and Related Agencies Appropriations Act
National Science Foundation	Commerce, Justice, Science, and Related Agencies Appropriations Act
Department of Agriculture	Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act
Department of Commerce - National Institute of Standards and Technology - National Oceanic and Atmospheric Administration	Commerce, Justice, Science, and Related Agencies Appropriations Act
Department of Veterans Affairs	Military Construction and Veterans Affairs, and Related Agencies Appropriations Act
Department of the Interior	Department of the Interior, Environment, and Related Agencies Appropriations Act
Department of Transportation	Transportation, Housing and Urban Development, and Related Agencies Appropriations Act
Department of Homeland Security	Department of Homeland Security Appropriations Act
Environmental Protection Agency	Department of the Interior, Environment, and Related Agencies Appropriations Act

Source: CRS Report R40858, *Locate an Agency or Program Within Appropriations Bills*, by Justin Murray.

Department of Defense[20]

The mission of the Department of Defense is to provide "the military forces needed to deter war and ensure our nation's security."[21] Congress supports DOD R&D activities through the department's Research, Development, Test, and Evaluation (RDT&E) funding. These funds support the development of the nation's future military hardware and software and the science and technology base on which those products rely.

Most of what DOD spends on RDT&E is appropriated in Title IV (Research, Development, Test, and Evaluation) of the annual defense appropriations bill. Title IV RDT&E funds support activities such as R&D performed by academic institutions, DOD laboratories, and companies, as well as test and evaluation activities at specialized DOD facilities.

[20] This section was written by Marcy E. Gallo, Analyst in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[21] Department of Defense, https://www.defense.gov/Our-Story/.

However, RDT&E funds are also appropriated in other parts of the bill, including Title V (Revolving and Management Funds) and Title VI (Other Department of Defense Programs). For example:

- The Defense Health Program (DHP) supports the delivery of health care to DOD personnel and their families. DHP funds (including RDT&E funds) are requested through the Defense-wide Operations and Maintenance request. The program's RDT&E funds support congressionally directed research on breast, prostate, and ovarian cancer; traumatic brain injuries; orthotics and prosthetics; and other medical conditions. Congress appropriates funds for this program in Title VI.
- The Chemical Agents and Munitions Destruction Program supports activities to destroy the U.S. inventory of lethal chemical agents and munitions to avoid future risks and costs associated with storage. Funds for this program are requested through the Defense-wide Procurement request. Congress appropriates funds for this program also in Title VI.
- The National Defense Sealift Fund supports procurement, operation and maintenance, and R&D associated with the nation's naval reserve fleet as well as a U.S.-flagged merchant fleet that can serve in times of need. In some fiscal years, RDT&E funding for this effort is requested in the Navy's Procurement request and appropriated in Title V.

For more than a decade, RDT&E funds also have been requested and appropriated as part of DOD's separate funding for efforts known variously as the Global War on Terror (GWOT) and Overseas Contingency Operations (OCO). Typically, RDT&E funds appropriated for OCO/GWOT activities were directed toward specified Program Elements (PEs) in Title IV. President Biden's FY2023 request does not include separate OCO/GWOT funding.

For FY2023, the Biden Administration is requesting $130.097 billion for DOD's Title IV RDT&E PEs, $10.803 billion (9.1%) above the FY2022 enacted level. (See **Table 8**.) In addition, the FY2023 request includes $910 million in RDT&E through the Defense Health Program (down $1.724 billion, 65.4%, from FY2022), $975 million in RDT&E through the Chemical Agents and Munitions Destruction Program (down $25 million, 2.5%, from FY2022), and $2 million for the Inspector General for RDT&E-related activities (down less than $1 million, 21.2%, from FY2022). The FY2023 budget includes no RDT&E funding via the National Defense Sealift Fund (the same as FY2022).

DOD RDT&E funding can be characterized organizationally. Each military department requests and receives its own RDT&E funding. So, too, do various DOD agencies (e.g., the Missile Defense Agency and the Defense Advanced Research Projects Agency); these are aggregated in the Defense-wide account.

DOD RDT&E funding can also be characterized by budget activity, i.e., the type of RDT&E supported. The budget activities designated as 6.1, 6.2, and 6.3 (basic research, applied research, and advanced technology development, respectively) constitute what is called DOD's Science and Technology (S&T) program and represent the more research-oriented part of the RDT&E program. Budget activities 6.4 and 6.5 focus on the development of specific weapon systems or components for which an operational need has been determined and an acquisition program established. Budget activity 6.6 provides management support, including support for test and evaluation facilities. Budget activity 6.7 supports the development of system improvements in existing operational systems. A new budget activity, 6.8, was added in the FY2021 budget and

supports software and digital technology pilot programs.[22] Note that OMB data on R&D funding exclude budget activity 6.7.

Many congressional policymakers are particularly interested in DOD S&T program funding, since these funds support the development of new technologies and the science that underlies them. Some in the defense community see ensuring adequate support for S&T activities as imperative to maintaining U.S. military superiority into the future. The knowledge generated at this stage of development may also contribute to advances in commercial technologies. The FY2023 request for Title IV S&T funding is $16.457 billion, $2.379 billion (12.6%) below the FY2022 enacted level. Within the S&T program, basic research (6.1) receives special attention, particularly by the nation's universities, as over half of DOD's basic research budget is spent at universities. The Biden Administration is requesting $2.376 billion for DOD basic research for FY2023, $381.7 million (13.8%) below the FY2022 enacted level. The proposed FY2023 cuts in S&T are spread across a variety of program elements in the Army, Navy, Air Force, and Defense-wide accounts. The Army would see the largest cut in both dollars and percentage ($1.6 billion, 37%), followed by the Navy ($531 million, 17.9%), the Air Force ($415 million, 13.4%) and Defense-wide ($133 million, 1.7%). Among the proposed FY2023 program element cuts are the University Research Initiatives program elements in the Army ($20 million, 22.4%), Navy ($85 million, 48.5%), and Air Force ($16 million, 8.7%). Increases in S&T funding would be provided to the Space Force ($283 million, 53.9%).

While DOD is not the largest federal funder of basic research, it is a substantial source of federal funds for university R&D in certain fields, such as aerospace, aeronautical, and astronautical engineering (64%); industrial and manufacturing engineering (60%); electrical, electronic, and communications engineering (59%); mechanical engineering (50%); computer and information sciences (47%); metallurgical and materials engineering (42%); and materials science (39%).[23]

Table 8. Department of Defense RDT&E

(total obligational authority, in millions of dollars)

Budget Account	FY2022 Enacted[a]	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Title IV—Research, Development, Test, and Evaluation (by Organization)					
Army	14,528.3	13,710.3			
Navy	22,152.4	24,078.7			
Air Force	41,640.4	44,134.3			
Space Force	11,597.4	15,819.4			
Defense-wide	29,099.2	32,077.6			
Director, Operational Test and Evaluation	276.6	277.2			
Total Title IV	**119,294.3**	**130,097.4**			
Title IV—Research, Development, Test, and Evaluation (by Budget Activity)					
6.1 Basic Research	2,757.6	2,375.9			

[22] For additional information on the structure of Defense RDT&E, see CRS Report R44711, *Department of Defense Research, Development, Test, and Evaluation (RDT&E): Appropriations Structure*, by John F. Sargent Jr.

[23] CRS analysis of data from NSF, *Higher Education Research and Development Survey, Fiscal Year 2020*, Table 13, December 27, 2021, https://ncses.nsf.gov/pubs/nsf22311.

Budget Account	FY2022 Enacted[a]	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
6.2 Applied Research	6,906.0	5,791.1			
6.3 Advanced Technology Development	9,171.6	8,287.7			
Subtotal Defense S&T (6.1-6.3)	*18,835.2*	*16,454.7*			
6.4 Advanced Component Development and Prototypes	32,796.0	34,198.3			
6.5 Systems Dev. and Demonstration	15,080.3	23,426.6			
6.6 Management Support[b]	8,378.0	8,252.7			
6.7 Operational Systems Development[b]	43,462.9	45,980.3			
6.8 Software and Digital Technology Pilot Projects[b]	741.8	1,784.8			
Total Title IV	**119,294.3**	**130,097.4**			
Title V—Revolving and Management Funds					
National Defense Sealift Fund	0.0	0.0			
Title VI—Other Defense Programs					
Defense Health Program	2,633.5	910.0			
Chemical Agents and Munitions Destruction	1,000.1	975.2			
Inspector General	2.4	1.9			
Grand Total, RDT&E[c]	**122,930.3**	**131,984.5**			

Source: CRS analysis of *Department of Defense Budget, Fiscal Year 2023, RDT&E Programs (R-1)*, April 2022; P.L. 117-103 and joint explanatory statements accompanying the bill at https://docs.house.gov/floor/Default.aspx?date=2022-03-07.

Notes: n/a = not available. Figures for the columns currently blank may become available as action is completed. Totals may differ from the sum of the components due to rounding. According to DOD, "Total Obligation Authority (TOA) is the sum of (1) all budget authority (BA) granted (or requested) from the Congress in a given year, (2) amounts authorized to be credited to a specific fund, (3) BA transferred from another appropriation, and (4) Unobligated balances of BA from previous years which remain available for obligation. In practice, this term is used primarily in discussing the DOD budget, and most often refers to TOA as the 'direct program,' which equates to only (1) and (2) above." DOD defines "budget authority" as "the authority becoming available during the year to enter into obligations that result in immediate or future outlays of Government funds." See DOD 7000.14-R, "Department of Defense Financial Management Regulation," http://comptroller.defense.gov/fmr.aspx.

a. In addition to base funding, includes supplemental funding provided in Division N, Ukraine Supplemental Appropriations Act, 2022, of the Consolidated Appropriations Act, 2022 (P.L. 117-103).

b. Includes funding for Classified Programs.

c. The Grand Total, RDT&E amounts for FY2022 and FY2023 include funding for budget activity 6.7 that OMB no longer counts as R&D. For these and other reasons, these amounts do not align with the DOD totals in Table 1.

Department of Health and Human Services

The mission of the Department of Health and Human Services is "to enhance and protect the health and well-being of all Americans ... by providing for effective health and human services and fostering advances in medicine, public health, and social services."[24] This section focuses on HHS research and development funded through the National Institutes of Health, an HHS agency that accounts for nearly 97% of total HHS R&D funding.[25] Other HHS agencies that support R&D include the Centers for Disease Control and Prevention (CDC), Centers for Medicare and Medicaid Services (CMS), Food and Drug Administration (FDA), Agency for Healthcare Research and Quality (AHRQ), Health Resources and Services Administration (HRSA), and Administration for Children and Families (ACF); additional R&D funding is attributed to departmental management.[26]

National Institutes of Health[27]

NIH is the primary agency of the federal government charged with performing and supporting biomedical and behavioral research. It also has major roles in training biomedical researchers and disseminating health information. The NIH mission is "to seek fundamental knowledge about the nature and behavior of living systems and the application of that knowledge to enhance health, lengthen life, and reduce illness and disability."[28] The agency consists of the NIH Office of the Director (OD) and 27 institutes and centers (ICs), 25 of which manage research programs. Each IC plans and manages its own research programs in coordination with OD. FY2022 appropriations established a new entity that has been placed within NIH: the Advanced Research Projects Agency for Health (ARPA-H) as discussed further in this report.

According to NIH, about 10% of the NIH budget supports intramural research projects conducted by the nearly 6,000 NIH federal scientists, most of whom are located on the NIH campus in Bethesda, MD. All 25 research ICs have an intramural research program of varying sizes. More than 80% of NIH's budget goes to the extramural research community in the form of grants, contracts, and other awards. This funding supports research performed by more than 300,000 nonfederal scientists and technical personnel who work at more than 2,500 universities, hospitals, medical schools, and other research institutions.[29]

Funding for NIH comes primarily from the annual Labor, HHS, and Education (LHHS) appropriations act, with an additional amount for Superfund-related activities at the National Institute of Environmental Health Sciences from the Interior/Environment appropriations act.[30]

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[24] U.S. Department of Health and Human Services, "About," http://www.hhs.gov/about.

[25] Unpublished data provided to CRS by the Office of Management and Budget. Email communication, May 28, 2021.

[26] Ibid.

[27] This section was written by Kavya Sekar, Analyst in Health Policy, CRS Domestic Social Policy Division, with support from Isaac Nicchitta, Research Assistant, and John Gorman, Research Assistant, CRS Domestic Social Policy Division.

[28] HHS, National Institutes of Health, "About NIH, What We Do, Mission and Goals," http://www.nih.gov/about-nih/what-we-do/mission-goals.

[29] NIH, "What We Do: Budget," https://www.nih.gov/about-nih/what-we-do/budget.

[30] The Superfund program was created to carry out the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA; P.L. 96-510), which authorized the federal government to prioritize contaminated sites in the United States for cleanup in coordination with the states in which the sites are located and to make the "potentially responsible parties" connected to those sites financially liable for the cleanup costs. The Superfund program is administered by the Environmental Protection Agency. For more information on the Superfund program,

Those two appropriations acts provide NIH's discretionary budget authority. In addition, NIH has received mandatory funding of $150 million annually that is provided in Public Health Service Act (PHSA) Section 330B, for the Special Diabetes Program for type 1 diabetes, most recently extended through FY2023 by the Consolidated Appropriations Act, 2021 (P.L. 116-260; Division BB, Title III). NIH also receives some funding subject to unique transfer authorities (the PHS Evaluation set-aside)[31] and budget enforcement rules (21st Century Cures Act Innovation account).[32]

As shown in **Table 9**, separate appropriations are provided to 24 of the 27 ICs, as well as to OD, the Innovation Account (established by the 21st Century Cures Act in 2016, P.L. 114-255), and an intramural Buildings and Facilities account. The other three centers, which perform centralized support services, are funded through transfers from the other ICs.

FY2022 Enacted Appropriations

On March 15, 2022, Congress and President Biden finalized NIH FY2022 appropriations by enacting the Consolidated Appropriations Act, 2022 (P.L. 117-103), which includes final FY2022 LHHS appropriations in Division H and Interior/Environment appropriations in Division G. The enacted FY2022 NIH program level is made up of the following:

- $43.65 billion in discretionary LHHS budget authority;
- $1.309 billion pursuant to the PHS program evaluation transfer;
- $83 million for the Superfund research program and related activities from Interior/Environment appropriations; and
- $141 million in annual funding for the mandatory type 1 diabetes research program.[33]

In total, the NIH FY2022 program level as enacted is $45.183 billion. In addition, the law provided $1 billion for ARPA-H to a new account under the Office of the Secretary. The law

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see CRS Report R41039, *Comprehensive Environmental Response, Compensation, and Liability Act: A Summary of Superfund Cleanup Authorities and Related Provisions of the Act*, by David M. Bearden.

[31] The PHS Evaluation Set-Aside, also known as the PHS Evaluation Tap transfer authority, under Section 241 of the PHS Act (42 U.S.C. §238j). This provision allows the Secretary of HHS, with the approval of appropriators, to redistribute a portion of eligible PHS agency appropriations across HHS for program evaluation purposes. Although the PHS Act limits the tap to no more than 1% of eligible appropriations, in recent years, annual LHHS appropriations acts have specified a higher amount (2.5% in FY2022, P.L. 117-103, Division H). Those acts also have typically directed specific amounts of funding from the tap for transfer to a number of HHS programs, including at NIH, particularly for the National Institute of General Medical Sciences (NIGMS). Funding amounts in this report show amounts "transferred in" to NIH under the PHS evaluation set-aside, but do not show amounts "transferred out" under the same authority.

[32] Appropriations to the NIH Innovation Account created by the 21st Century Cures Act ("the Cures Act," P.L. 114-255) fund programs authorized by that act. Appropriations of funds in this account are, in effect, not subject to discretionary spending limits. The NIH Director may transfer these amounts from the NIH Innovation Account to other NIH accounts but only for the purposes specified in the Cures Act. All amounts authorized by the Cures Act have been fully appropriated to the Innovation Account since FY2017, including $496 million for FY2022. For FY2023, $1.085 billion is authorized to be appropriated. See section on 21st Century Cures Act in CRS Report R41705, *The National Institutes of Health (NIH): Background and Congressional Issues*, by Judith A. Johnson and Kavya Sekar.

[33] The FY2022 amount shown for the mandatory type 1 diabetes research program differs from the FY2022 amount authorized and appropriated by PHSA Section 330B of $150 million, as amended in P.L. 116-260, Division BB, Title III. According to the budget request, the FY2022 amount reflects sequestration of $8.55 million. See "Budget Mechanism Table," p. 44, at https://officeofbudget.od.nih.gov/pdfs/FY23/br/Overview%20of%20FY%202023%20Presidents%20Budget.pdf.

allowed the HHS Secretary to place the new agency anywhere within the department within 30 days of enactment. On March 30, 2022, HHS Secretary Xavier Becerra submitted a notice to the appropriations committees that ARPA-H is to reside within the National Institutes of Health (NIH). Accounting for the ARPA-H appropriation and other transfers, FY2023 budget documents show the enacted FY2022 NIH program level as $46.178 billion.[34]

FY2023 Budget Request

President Biden's FY2023 budget request proposes that NIH be provided with a total program level of $62.503 billion, an increase of $16.32 billion (+35.3%) from FY2022 enacted levels. The proposed FY2023 program level would be made up of[35]

- $48.957 billion in discretionary LHHS budget authority (nontransfer);
- $1.272 billion pursuant to the PHS program evaluation transfer;
- $83 million for the Superfund research program and related activities from Interior/Environment appropriations;
- $141 million in annual funding for the mandatory type 1 diabetes research program;[36] and
- $12.05 billion in new mandatory appropriations for pandemic preparedness.[37]

Under this request, approximately half of existing IC accounts would receive increases compared with FY2022 enacted levels (see **Table 9**). Funding for the National Institute on Minority Health and Health Disparities (NIMHD) would increase by the greatest percentage amount (+$201 million, +43.7%) and funding for OD would decrease by the greatest amount (-$319 million, -12.2%). In addition, the full amount ($1.085 billion) authorized by the 21st Century Cures Act for FY2023 (P.L. 114-255) would be appropriated to the Innovation Account. The FY2023 budget request also proposes $5 billion for ARPA-H, an increase of $4 billion from the FY2022-enacted level.[38]

Under the pandemic preparedness proposal, NIH would be provided $12.05 billion in new mandatory appropriations over five years. This new appropriation makes up 73.8% of the proposed increase of $16.32 billion relative to the FY2022 enacted program level. The pandemic preparedness proposal generally does not designate specific amounts for NIH ICs, but describes a number of activities the new funding would support, including vaccine and therapeutic

[34] HHS, *Budget in Brief: FY2023*, pp. 53-54, https://www.hhs.gov/sites/default/files/fy-2023-budget-in-brief.pdf.

[35] NIH, *Congressional Justification: FY2023*, "Budget Request by IC (Summary Table)," March 28, 2022, p. 86, https://officeofbudget.od.nih.gov/pdfs/FY23/br/Overview%20of%20FY%202023%20Presidents%20Budget.pdf.

[36] This proposed amount for the mandatory type 1 diabetes research program differs from the $150 million for FY2023 that was authorized and appropriated in PHSA Section 330B, as amended in P.L. 116-260, Division BB, Title III. According to the budget request, the FY2023 amount reflects sequestration of $8.55 million. See "Budget Mechanism Table," p. 44, https://officeofbudget.od.nih.gov/pdfs/FY23/br/Overview%20of%20FY%202023%20Presidents%20Budget.pdf.

[37] The FY2023 budget request proposes an HHS-wide total of $81.7 billion for pandemic preparedness to "transform U.S. capabilities to prepare for and respond rapidly and effectively to future pandemics and other high consequence biological threats." The $12.05 billion directed to NIH is for "NIH research and development of vaccines, diagnostics, and therapeutics against high priority viral families, biosafety and biosecurity, and to expand laboratory capacity and clinical trial infrastructure." See HHS, *Budget in Brief: FY2023*, p. 55, https://www.hhs.gov/sites/default/files/fy-2023-budget-in-brief.pdf.

[38] NIH, *Congressional Justification: FY2023*, "Budget Request by IC (Summary Table)," March 28, 2022, p. 86, https://officeofbudget.od.nih.gov/pdfs/FY23/br/Overview%20of%20FY%202023%20Presidents%20Budget.pdf.

development; diagnostic test development and innovation; research infrastructure for clinical trials; and laboratory biosafety and biosecurity.[39] If enacted, these mandatory appropriations generally would be controlled outside the annual appropriations process by authorizing law.

Advanced Research Projects Agency for Health (ARPA-H) in the FY2022 Budget Request

President Biden's FY2022 budget request to Congress proposed the creation of an Advanced Research Projects Agency for Health (ARPA-H) within the National Institutes of Health (NIH). The budget request included $6.5 billion for ARPA-H "to build platforms and capabilities to deliver cures for cancer, Alzheimer's disease, diabetes, and other diseases." Funding was requested for a period of three years to "allow for both scale-up in FY 2022 and redeployment of resources in the next two years if projects fail to meet performance milestones." The vast majority of funding was intended to support extramural research, with a small amount reserved for staffing and administrative functions. Unlike NIH Institutes and Centers (ICs), ARPA-H would not have its own intramural research program.

The Consolidated Appropriations Act, 2022 (P.L. 117-103) provides $1 billion to HHS to establish ARPA-H. The law created a new ARPA-H account at HHS, with funding available until September 30, 2024, and allowed the HHS Secretary to place the new agency anywhere within the department within 30 days of enactment. On March 30, 2022, HHS Secretary Xavier Becerra submitted a notice to the appropriations committees that ARPA-H is to reside within the National Institutes of Health (NIH), while the ARPA-H Director is to report directly to the HHS Secretary.

As proposed in the FY2022 request, ARPA-H is modeled after the Defense Advanced Research Projects Agency (DARPA), which primarily works with the Department of Defense (DOD), and would contain several "DARPA model" characteristics, including a flat and nimble organizational structure staffed by tenure-limited program managers with a high degree of autonomy to select and fund projects using a milestone-based contract approach. While this organizational structure would be "operationally unique" from NIH ICs, ARPA-H would still coordinate research and activities with NIH ICs and other HHS agencies.

The FY2022 budget request described four broad project areas that ARPA-H would fund:

- tackling bold challenges requiring large scale, sustained, cross-sector coordination;
- creating new capabilities (e.g., technologies, data resources, disease models);
- supporting high-risk exploration that could establish entirely new paradigms; and
- overcoming market failures through critical solutions, including financial incentives.

Most ARPA-H awards would be given to industry, universities, and nonprofit research institutions, and may involve some agreements with other federal agencies.

For further information and analysis regarding ARPA-H, see CRS Report R47074, *Advanced Research Projects Agency for Health (ARPA-H): Congressional Action and Selected Policy Issues*, by Kavya Sekar and Marcy E. Gallo.

Table 9. National Institutes of Health Funding

(budget authority, in millions of dollars)

Institutes/Centers	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Final
Cancer Institute (NCI)	$6,913	$6,714			
Heart, Lung, and Blood Institute (NHLBI)	$3,808	$3,823			
Dental/Craniofacial Research (NIDCR)	$501	$513			
Diabetes/Digestive/Kidney (NIDDK)[a]	$2,204	$2,206			
Neurological Disorders/Stroke (NINDS)	$2,611	$2,768			

[39] NIH, *Congressional Justification: FY2023*, pp. 17-20, https://officeofbudget.od.nih.gov/pdfs/FY23/br/Overview%20of%20FY%202023%20Presidents%20Budget.pdf.

Institutes/Centers	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Final
Allergy/Infectious Diseases (NIAID)	$6,323	$6,268			
General Medical Sciences (NIGMS)[b]	$1,783	$1,826			
Child Health/Human Development (NICHD)	$1,683	$1,675			
National Eye Institute (NEI)	$864	$853			
Environmental Health Sciences (NIEHS)[c]	$842	$932			
National Institute on Aging (NIA)	$4,220	$4,011			
Arthritis/Musculoskeletal/Skin Diseases (NIAMS)	$656	$676			
Deafness/Communication Disorders (NIDCD)	$515	$509			
Alcohol Abuse/Alcoholism (NIAAA)	$574	$567			
Nursing Research (NINR)	$181	$199			
National Institute on Drug Abuse (NIDA)	$1,595	$1,843			
National Institute of Mental Health (NIMH)	$2,217	$2,211			
Human Genome Research Institute (NHGRI)	$639	$629			
Biomedical Imaging/Bioengineering (NIBIB)	$425	$419			
Complementary/Integrative Health (NCCIH)	$159	$183			
Minority Health/Health Disparities (NIMHD)	$459	$660			
Fogarty International Center (FIC)	$87	$96			
National Library of Medicine (NLM)	$479	$472			
Advancing Translational Sciences (NCATS)	$882	$874			
Office of Director (OD)[d]	$2,629	$2,310			
Innovation Account[e]	$150	$419			
Buildings and Facilities (B&F)	$250	$300			
Advanced Research Projects Agency for Health (ARPA-H)	$1,000[f]	$5,000			
Subtotal, NIH (LHHS Discretionary BA)	**$44,650**	**$48,957**			
PHS Program Evaluation (provided to NIGMS)	$1,309	$1,272			
Superfund (Interior approp. to NIEHS)[g]	$83	$83			
Mandatory type 1 diabetes funds (to NIDDK)[h]	$141	$141[i]			
Pandemic Preparedness[j]	—	$12,050			
NIH Program Level	**$46,183**	**$62,503**			

Sources: The FY2023 Request program levels are from NIH, *Congressional Justification: FY2023*, "Budget Request by IC (Summary Table)," March 28, 2022, p. 86, https://officeofbudget.od.nih.gov/pdfs/FY23/br/Overview%20of%20FY%202023%20Presidents%20Budget.pdf. The FY2022 program levels are from Rep. Nancy Pelosi, "Explanatory Statement Submitted by Ms. DeLauro, Chair of the House Committee on Appropriations, Regarding the House Amendment to the Senate Amendment to H.R. 2471, Consolidated Appropriations Act, 2022," House of Representatives, *Congressional Record*, daily edition, vol. 168, part No. 42—Book IV (March 9, 2022), pp. H2862-H2865.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns currently blank may become available as action is completed. Amounts in table may differ from actuals in many cases. By convention, budget tables such as **Table 9** do not subtract the amount of transfers to the evaluation tap from the agencies' appropriation. In general, amounts provided to NIH for emergency requirements are excluded from these totals.

a. Amounts for the NIDDK do not include mandatory funding for type 1 diabetes research (see note i).

b. Amounts for NIGMS do not include funds from PHS Evaluation Set-Aside (§241 of the PHS Act).

c. Amounts for NIEHS do not include Interior/Environment Appropriations amount for Superfund research (see note g).

d. Includes $12.6 million transfer from the Pediatric Research Initiative Fund (PRIF) as authorized by the Gabriella Miller Kids First Research Act.

e. The amount shown for the NIH Innovation Account in each column represents only a portion of the total appropriation to the account ($496 million for FY2022; $1.085 billion for FY2023). The remaining funds for this account are reflected, where applicable, in the totals for other ICs. For FY2022, this includes $194 to NCI for cancer research and $76 million to each of NINDS and NIMH for the BRAIN Initiative ($152 million total). For FY2023, this includes $216 million to NCI for cancer research and $225 million to each of NINDS and NIMH for the BRAIN Initiative ($450 million total).

f. Funding for ARPA-H in P.L. 117-103 was provided to a new ARPA-H account under the HHS Office of the Secretary. A proviso accompanying the appropriation gave HHS Secretary Becerra the ability to transfer the new agency anywhere within the department within 30 days of enactment. On March 30, 2022, HHS Secretary Xavier Becerra submitted a notice to the appropriations committees that ARPA-H is to reside within the NIH, therefore the ARPA-H appropriation is shown within NIH in this table presentation.

g. This is a separate account in the Interior/Environment appropriations for National Institute of Environmental Health Sciences (NIEHS) research activities related to Superfund research.

h. Mandatory funds are available to NIDDK for type 1 diabetes research under PHSA Sec. 330B, which was most recently extended through FY2023 by the Consolidated Appropriations Act, 2021 (P.L. 116-260, Division BB, Title III).

i. The FY2022 and FY2023 proposed amounts for the type 1 diabetes research program ($141 million) are lower than the funding level authorized and appropriated in PHSA 330B for FY2022 and FY2023 ($150 million). According to the budget request, the FY2022 and FY2023 amounts reflect sequestration of $8.55 million. See "Budget Mechanism Table," p. 44 in https://officeofbudget.od.nih.gov/pdfs/FY23/br/Overview%20of%20FY%202023%20Presidents%20Budget.pdf.

j. The FY2023 request proposes new mandatory funding for pandemic preparedness to be available for five years. The request proposes an HHS-wide total of proposes an HHS-wide total of $81.7 billion for pandemic preparedness with $12.05 billion of the total designated for NIH.

Department of Energy[40]

The Department of Energy was established in 1977 by the Department of Energy Organization Act (P.L. 95-91), which combined energy-related programs from a variety of agencies, particularly defense-related nuclear programs that dated back to the Manhattan Project. Today, DOE conducts basic scientific research in fields ranging from nuclear physics to the biological and environmental sciences; basic and applied R&D relating to energy production and use; and R&D on nuclear weapons, nuclear nonproliferation, and defense nuclear reactors. The department

[40] This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

has a system of 17 national laboratories around the country, mostly operated by contractors, that together account for about 40% of all DOE expenditures.

The Administration's FY2023 budget request for DOE includes about $21.233 billion for R&D and related activities, including programs in three broad categories: science, national security, and energy. This request is about 11.1% more than the comparable enacted FY2022 amount of $19.108 billion. (See **Table 10** for details.)

The request for the DOE Office of Science is $7.799 billion, an increase of 4.3% from the FY2022 appropriation of $7.475 billion. Funding would increase for all of the office's major research programs, led by Basic Energy Sciences (up $112 million, 4.9%) and Biological and Environmental Research (up $89 million, 10.9%). In Fusion Energy Sciences, the U.S. contribution to construction of the International Thermonuclear Experimental Reactor (ITER), a fusion energy demonstration and research facility in France, would be $240 million (down from $242 million in FY2022).

The request for DOE national security R&D is $5.724 billion, an increase of 3.6% from $5.523 billion in FY2022. In the Weapons Activities account, funding for Stockpile Research, Technology, and Engineering would increase overall by $52 million (1.8%), including increases for Assessment Science ($855 million, up from $769 million) and Engineering and Integrated Assessments ($366 million, up from $342 million) and a decrease for Inertial Confinement Fusion ($544 million, down from $580 million). Funding for Naval Reactors would increase overall by $163 million (8.5%), including increases for Development ($799 million, up from $641 million) and Operations and Infrastructure ($695 million, up from $594 million) and a decrease for refueling of the land-based S8G prototype submarine reactor ($20 million, down from $126 million) as that project nears completion.

The request for DOE energy R&D is $7.710 billion, an increase of 26.2% from $6.110 billion in FY2022.[41] Funding for energy efficiency and renewable energy R&D would increase overall by 44.9%, including increases in nearly all major research areas. An 8.3% increase for the Fossil Energy and Carbon Management account would be focused on climate-centric activities such as carbon capture, utilization, and storage ($335 million, up from $225 million). The Advanced Research Projects Agency–Energy (ARPA-E), which is intended to advance high-impact energy technologies that have too much technical and financial uncertainty to attract near-term private-sector investment, would receive $700 million (up 55.6%). The Advanced Research Projects Agency–Climate (ARPA-C), proposed in the FY2022 budget but not funded by Congress, does not appear in the FY2023 budget.

[41] DOE energy R&D received substantial additional appropriations for FY2022 and FY2023 in the Infrastructure Investment and Jobs Act (P.L. 117-58).

Table 10. Department of Energy R&D and Related Activities

(budget authority, in millions of dollars)

	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Science	**7,475**	**7,799**			
Basic Energy Sciences	2,308	2,420			
High Energy Physics	1,078	1,122			
Biological and Environmental Research	815	904			
Nuclear Physics	728	739			
Advanced Scientific Computing Research	1,035	1,069			
Fusion Energy Sciences	713	723			
Isotope R&D and Production	82	97			
Accelerator R&D and Production	18	27			
Other	698	697			
National Security	**5,523**	**5,724**			
Weapons Activities Stockpile RT&E	2,843	2,895			
Naval Reactors	1,918	2,081			
Defense Nuclear Nonproliferation R&D	729	720			
Def. Environmental Cleanup Tech. Dev.	33	28			
Energy	**6,110**	**7,710**			
Energy Efficiency and Renewable Energy	2,773[a]	4,019			
Fossil Energy and Carbon Management	825	893			
Nuclear Energy	1,655	1,675			
Electricity	277	297			
CESER Risk Management Technology and Tools	130	125			
Advanced Research Projects Agency–Energy	450	700			
DOE, Total	**19,108**	**21,233**			

Sources: FY2022 enacted from P.L. 117-103 and explanatory statement, *Congressional Record*, March 9, 2022, Book III. FY2023 request from DOE FY2023 congressional budget justification, https://www.energy.gov/cfo/articles/fy-2023-budget-justification.

Notes: Totals may differ from the sum of the components due to rounding. RT&E = Research, Technology, and Engineering. CESER = Cybersecurity, Energy Security, and Emergency Response. Figures for the columns currently blank may become available as action is completed.

a. Excluding Weatherization and Intergovernmental Activities.

National Aeronautics and Space Administration[42]

The National Aeronautics and Space Administration was created in 1958 by the National Aeronautics and Space Act (P.L. 85-568) to conduct civilian space and aeronautics activities. NASA has research programs in planetary science, Earth science, astrophysics, heliophysics, the biological and physical sciences, aeronautics, and astronaut health and performance, as well as development programs for future human spacecraft and for multipurpose space technology such as advanced propulsion systems. In addition, NASA operates the International Space Station (ISS) as a facility for R&D and other purposes.

The Administration has requested $25.974 billion for NASA in FY2023. This would be 8.0% more than the FY2022 level of $24.041 billion.[43] For a breakdown of these amounts, see **Table 11**. About half of NASA funding supports R&D. Some accounts (such as Science and Space Technology) fund R&D almost exclusively, while others (such as Exploration and Space Operations) fund a mix of R&D, testing and demonstration, operations, and other activities. The table indicates the estimated R&D share of each account, based on OMB data for the FY2023 request. Those shares may be different for FY2022 and for FY2023 appropriations provided by Congress.

The FY2023 request for Science is $7.988 billion, an increase of 4.9% from $7.614 billion in FY2022. A requested 17% increase for Earth Science includes $212 million for early work on a system of future satellites known as the Earth System Observatory, based on recommendations from the 2018 National Academies decadal survey of Earth science; and $107 million for the Sustainable Land Imaging program, which supports the development of the next generation of Landsat satellites.[44] The request for Astrophysics includes $173 million for operation of the James Webb Space Telescope, launched in December 2021, which was previously budgeted separately. Also in Astrophysics, the request proposes to terminate the Stratospheric Observatory for Infrared Astronomy (SOFIA), with $10 million requested for closeout costs versus FY2022 funding of $85 million. SOFIA was also proposed for termination in the FY2021 and FY2022 budgets, but Congress continued to fund it.

The FY2023 request for Aeronautics is $972 million, an increase of 10.3% from $881 million in FY2022. The request for the Integrated Aviation Systems program includes $107 million for continued development of a full-scale demonstrator aircraft with an electrified powertrain.

The FY2023 request for Space Technology is $1.438 billion, an increase of 30.7% from $1.100 billion in FY2022. The bulk of the requested increase would be for the Technology Maturation program ($472 million). In the Technology Demonstration program, the request proposes $45 million for space nuclear technologies, including $15 million for nuclear propulsion (versus $110 million for nuclear thermal propulsion in FY2022).

The FY2023 request for Deep Space Exploration Systems (currently Exploration) is $7.478 billion, an increase of 10.1% from $6.792 billion in FY2022. Within this account, the request for Common Exploration Systems Development (currently Exploration Systems Development) includes $1.339 billion for the Orion crew capsule (down from $1.407 billion in FY2022) and

[42] This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[43] This FY2022 amount does not include a supplemental appropriation of $321 million to repair hurricane damage at NASA facilities.

[44] Here and elsewhere in this section, where FY2022 amounts are not stated, they were not specified by Congress in the FY2022 appropriations act or explanatory statement. NASA's spending plan for FY2022 was not yet available when the FY2023 budget request was released.

$2.580 billion for the Space Launch System heavy-lift rocket (SLS, down from $2.600 billion in FY2022). As the Orion and SLS programs mature, they are focusing more on testing and production of flight hardware, with less R&D content than in previous years. The proposed 18.5% increase for Artemis Campaign Development (currently Exploration R&D) would support continued development of the Gateway outpost in lunar orbit ($779 million, down from $785 million in FY2022) and the lunar Human Landing System (HLS, $1.486 billion, up from $1.195 billion in FY2022). The Deep Space Exploration Systems request includes separate funding for Human Exploration Requirements and Architecture and for Mars Campaign Development, both previously included in Exploration R&D.

In the Space Operations account, requests for R&D-related activities include $1.308 billion for the ISS; $118 million for the Commercial Crew program (in Space Transportation); $151 million for the Human Research Program (in Space and Flight Support); and $224 million for Commercial LEO Development (up from $101 million in FY2022). Commercial crew transport activities have largely transitioned from development to operations (which is funded separately). SpaceX launched its first post-certification crewed flight to the ISS in November 2020; a crewed test flight of Boeing's competing commercial crew system is planned for late 2022 or early 2023.

Table 11. National Aeronautics and Space Administration R&D

(budget authority, in millions of dollars)

	Est. R&D Share	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Science	**99%**	**7,614**	**7,988**			
Earth Science		2,065	2,412			
Planetary Science		3,120	3,160			
Astrophysics		1,394	1,556			
James Webb Space Telescope		175	—[a]			
Heliophysics		778	760			
Biological and Physical Sciences		83	100			
Aeronautics	**79%**	**881**	**972**			
Space Technology	**98%**	**1,100**	**1,438**			
Exploration / Deep Space Exp. Systems	**22%**	**6,792**	**7,478**			
(Common) Exploration Systems Development		4,597	4,668			
Exp. R&D / Artemis Campaign Development		2,195	2,600			
Human Exp. Requirements and Architecture		—	48			
Mars Campaign Development		—	161			
Space Operations	**34%**	**4,041**	**4,266**			
International Space Station		n/s	1,308			
Space Transportation		n/s	1,760			
Space and Flight Support		n/s	975			
Commercial LEO Development		101	224			
STEM Engagement	**0%**	**137**	**150**			
Safety, Security, and Mission Services	**7%**	**3,021**	**3,209**			

	Est. R&D Share	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Construction and Environmental C&R	**25%**	**410**[b]	**424**			
Inspector General	**0%**	**45**	**48**			
NASA, Total	**52%**	**24,041**[b]	**25,974**			

Sources: Estimated R&D share calculated by CRS based on OMB data for R&D and R&D-related facilities and equipment funding in the FY2023 request. FY2022 enacted from P.L. 117-103 and explanatory statement, *Congressional Record*, March 9, 2022, pp. H1796-H1799. FY2023 request from NASA FY2023 congressional budget justification, http://www.nasa.gov/news/budget/.

Notes: Totals may differ from the sum of the components due to rounding. n/s = not specified. LEO = Low Earth Orbit. C&R = Compliance and Remediation. Figures for the columns currently blank may become available as action is completed.

a. Included in Astrophysics.

b. Does not include supplemental $321 million for hurricane repairs provided in P.L. 117-43.

National Science Foundation[45]

The National Science Foundation supports basic research and education in the nonmedical sciences and engineering. Congress established the foundation as an independent federal agency in 1950 to "promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes."[46] The NSF is a major source of federal support for U.S. university research, especially in the social sciences, mathematics, and computer science. It is also responsible for significant shares of the federal science, technology, engineering, and mathematics (STEM) education program portfolio and federal STEM student aid and support.

NSF has six appropriations accounts: Research and Related Activities (RRA, the main research account), STEM Education (EDU, the main education account),[47] Major Research Equipment and Facilities Construction (MREFC), Agency Operations and Award Management (AOAM), the National Science Board (NSB), and the Office of Inspector General (OIG). Appropriations are generally provided at the account level, while program-specific direction may be included in appropriations acts, or accompanying conference reports or explanatory statements.

Funding for R&D is included in the RRA, EDU, and MREFC accounts. (The RRA and EDU accounts also include non-R&D funding.) Together, these three accounts comprise over 95% of the total requested funding for NSF. Actual R&D obligations for each account are known after NSF allocates funding appropriations to specific activities and reports those figures.[48] The budget

[45] This section was written by Laurie Harris, Analyst in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[46] The National Science Foundation Act of 1950 (P.L. 81-507).

[47] In the FY2023 budget request, NSF proposed changing the name of the Directorate for Education and Human Resources (EHR) to the Directorate for STEM Education (EDU). For consistency with the budget request, this report refers to the directorate and associated appropriations account as EDU.

[48] R&D actual (FY2021) and requested (FY2023) amounts are reported in the "Quantitative Data Tables" section of the NSF *FY2023 Budget Request to Congress*, March 28, 2022, pp. QDT-1 – QDT-7. R&D estimated (FY2022) amounts at the account level are from data provided by email to CRS from OMB as of April 1, 2022; per OMB, the FY2022 data use "annualized appropriations provided by the 2022 Continuing Resolution as well as including enacted legislation as of January 2022."

request specifies R&D funding for the conduct of research, including basic and applied research, and for physical assets, including R&D facilities and major equipment. Funding amounts for FY2020 actual, FY2021 enacted (or estimated, for subaccount and R&D amounts as noted), and FY2023 requested levels are reported by account, including amounts for R&D conduct and physical assets where applicable, in **Table 12**.

Funding for NSF for FY2022 was enacted on March 15, 2022.[49] Additionally, NSF received $600 million in supplemental two-year appropriations in the American Rescue Plan Act of 2021 (ARP Act; P.L. 117-2) "to fund or extend new and existing research grants, cooperative agreements, scholarships, fellowships, and apprenticeships, and related administrative expenses to prevent, prepare for, and respond to coronavirus."[50] Funding details for FY2022 enacted amounts below the account level were not available at the time the FY2023 budget request was prepared. Therefore, at the account level, the FY2023 request amounts are compared with the FY2022 enacted amounts in this analysis; below the account level, the FY2023 request amounts are compared with FY2021 actual amounts for subaccounts and R&D amounts. FY2022 enacted/estimated and FY2023 requested amounts are reported by account and for R&D conduct and facilities and equipment in **Table 12**.

Overall. The Administration is requesting $10.5 billion for the NSF in FY2023, $1.65 billion (18.7%) more than the FY2022 enacted amount. The request would increase budget authority in two of three R&D accounts relative to the FY2022 enacted level: RRA by $1.27 billion (17.7%) and EDU by $371 million (36.9%); the request would decrease budget authority in the remaining R&D account relative to the FY2022 enacted level: MREFC by $61.8 million (-24.8%). Overall, NSF estimates that, under the FY2023 request, agency-wide funding rates for competitive awards (i.e., the percentage of submitted proposals that are successfully awarded funding after competitive review) would increase slightly from 26% to 27%, with an estimated 13,500 awards.

For FY2023, $8.45 billion is requested for R&D activities, a $1.38 billion (19.6%) increase from FY2021 actual funding for R&D. R&D activities account for approximately 80% of NSF's total funding. The total request for R&D activities includes $7.90 billion (94%) for the conduct of R&D, and $545 million (6%) for R&D facilities and major equipment. Of funding requested for the conduct of R&D, 86% is requested for basic research, and 14% for applied research. Overall funding for R&D facilities and major equipment supports not only the construction and acquisition phases, funded through MREFC ($187 million requested), but also planning, design, and post-construction operations and maintenance, funded through RRA ($358 million requested).

Research. The Administration seeks $8.43 billion for RRA in FY2023, a $1.33 billion (18.7%) increase compared to the FY2021 actual funding. Within the RRA account, the FY2023 request includes $7.56 billion for R&D, an increase of $1.15 billion (17.9%) compared with the FY2021 actual amount. Of this amount, the majority ($7.20 billion, 95%) is requested for the conduct of research, including $6.52 billion for basic research and $682 million for applied research.

Compared with the FY2021 actual amounts, the FY2023 request includes funding increases for all 11 RRA subaccounts. This includes a request of $880 million for the newly created Directorate

[49] The Consolidated Appropriations Act, 2022 (P.L. 117-103); H.Rept. 117-97; and Explanatory Statement, Consolidated Appropriations Act, 2022, Division B (Commerce, Justice, Science, and Related Agencies Appropriations Act, 2022), *Congressional Record*, vol. 168, no. 42—Book III (March 9, 2022), pp. H1799-H1800.

[50] ARP Act amounts are included in the FY2021 actual amounts; these funds are not included in the FY2022 enacted/estimated funding amounts because they are two-year funds allocated over FY2021 and FY2022; for further information, see NSF *FY2023 Budget Request to Congress*, p. Performance and Management-41.

for Technology, Innovation, and Partnerships (TIP), meant to support crosscutting programs and activities, accelerate the translation of research to market, and catalyze partnerships across academia, industry, government, investors, and civil society.[51] The FY2023 request also includes $247 million for the Established Program to Stimulate Competitive Research (EPSCoR), a $47.1 million (23.5%) increase compared with FY2021 actual funding.

Education. The FY2023 request for the EDU account is $1.38 billion, $371 million (37%) more than the FY2022 enacted amount. By program division, in terms of both dollars and percent, the Division of Equity for Excellence in STEM would receive the largest increase, $110 million (51%) over the FY2021 actual level.[52] EDU programs of particular interest to congressional policymakers include the Graduate Research Fellowship Program (GRFP) and National Research Traineeship (NRT) programs. The FY2023 request for GRFP is $355 million, an increase of $71.1 million (25%) from the FY2021 actual level.[53] The FY2023 request for NRT is $62.5 million, an increase of $4.5 million (7.8%) from the FY2021 actual level.

Within EDU, requested funding for R&D is $698 million, which is $217 million (45%) more than the FY2021 actual funding amount and accounts for approximately 10% of the agency's total R&D request. All of the requested funding would support the conduct of R&D, including $265 million for basic research and $433 million for applied research.

Construction. The MREFC account supports large construction projects and larger mid-scale research infrastructure, with all of the funding supporting R&D facilities. The construction phases of such large-scale projects tend to span multiple years; therefore, NSF provides out-year estimates of funding for major facilities for the duration of the anticipated timeline, which are updated annually. This section of the analysis includes comparisons with FY2022 requested funding for specific projects, based on these projections. The Administration is seeking $187 million for MREFC in FY2023, $62 million (16%) less than the FY2022 enacted amount.

Requested MREFC funding would support continued construction on four ongoing major facility projects:[54]

- the Antarctic Infrastructure Recapitalization program (AIR; $60.0 million requested)[55];
- upgrades to the High Luminosity-Large Hadron Collider (HL-LHC; $33.0 million requested)[56];

[51] For more information on the TIP Directorate, see NSF, *FY2023 Budget Request to Congress*, pp. TIP-1 – TIP-10, https://www.nsf.gov/about/budget/fy2023/pdf/75_fy2023.pdf.

[52] This division was formerly named the Division of Human Resource Development (HRD); NSF proposed to change the name in the *FY2023 Budget Request to Congress*, pp. EDU-1, EDU-8 – EDU-9.

[53] The subset of GRFP funds provided through RRA in prior years was consolidated within EDU beginning in FY2022. The FY2023 budget request restates prior year funding for FY2021 within EDU for comparability across fiscal years. See NSF, *FY2023 Budget Request to Congress*, p. Cross-Theme Topics – 49.

[54] NSF has addressed timeline and funding impacts to MREFC projects from the COVID-19 pandemic, stating, "Funding for FY 2022, the FY 2023 Request, and out-year forecasts for all projects have been adjusted from previous estimates based on NSF's current assessment of COVID-19 impacts. As appropriate, re-baselining of several projects will continue to take place, as cost and schedule impacts become better known." See NSF, *FY2023 Budget Request to Congress*, p. Research Infrastructure – 10.

[55] The FY2023 funding for AIR is requested as part of re-baselining of the Antarctic Infrastructure Modernization for Science (AIMS) program, which encountered significant disruptions and delays due to COVID-19 restrictions as field work and on-ice construction work was in the early stages; NSF, *FY2023 Budget Request to Congress*, p. Research Infrastructure – 12.

[56] NSF's HL-LHC upgrade program represents about 7% of the global high luminosity upgrade effort at the LHC,

- the Vera C. Rubin Observatory ($15.0 million requested)[57]; and
- Regional Class Research Vessels (RCRV; $1.98 million requested).[58]

Additionally, $76.2 million is requested for Mid-scale Research Infrastructure projects (those projects with funding amounts in the $20 million to $100 million range), equal to the FY2022 request; this was a new funding line-item in the MREFC account as of FY2020, meant to manage support for upgrades to major facilities and stand-alone projects in this range as a portfolio.

Other Initiatives. The FY2023 NSF budget request includes funding for multiple agency-wide investments, including the Big Ideas, as well as multiagency initiatives. This funding is included in multiple NSF appropriations accounts, and R&D amounts are not separately provided.

For FY2023, NSF requests funding for eight Big Ideas, including five Research and three Enabling Big Ideas. The Big Ideas were first proposed in 2016 as an "endeavor to break down the silos of conventional scientific research … to define and push the frontiers of global science and engineering leadership and to invest in fundamental research."[59] Requested funding amounts for each of the Big Ideas compared with the FY2021 actual amounts include the following:[60]

- Harnessing the Data Revolution for 21st-Century Science and Engineering (HDR): $182 million requested, down $9.7 million (-5%) from FY2021.
- The Future of Work at the Human Technology Frontier (FW-HTF): $176 million requested, up $2.9 million (2%) from FY2021.
- Navigating the New Arctic (NNA): $35.2 million requested, down $4.9 million (-12%) from FY2021.
- Understanding the Rules of Life (URoL): Predicting Phenotype: $94 million requested, down $20 million (-18%) from FY2021.
- Windows on the Universe (WoU): $62 million requested, down $13 million (-17%) from FY2021.
- Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (NSF INCLUDES): $51 million requested, up $30 million (143%) from FY2021.
- Growing Convergence Research at NSF (GCR): $16 million requested, equal to the FY2021 actual amount.
- Mid-Scale Research Infrastructure: $126 million requested, up $20 million (19%) from FY2021.[61]

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which is being supported by 45 funding agencies internationally, including the U.S. Department of Energy; see NSF, *FY2023 Budget Request to Congress*, pp. Research Infrastructure – 21.

[57] The Rubin Observatory is a joint program between NSF and DOE. FY2023 represents the 10th year construction, originally planned to last 99 months. This project is currently being rebaselined to account for impacts of the COVID-19 pandemic, which have shifted expectations for completion to FY2024. See *FY2023 Budget Request to Congress*, p. Research Infrastructure – 38.

[58] The FY2023 request of $1.98 million is the current estimated amount needed to address the remaining impacts due to COVID-19; see *FY2023 Budget Request to Congress*, p. Research Infrastructure – 35.

[59] NSF, *FY2021 Budget Request to Congress*, February 10, 202, pp. Overview-9 – Overview-10.

[60] For more information on the Big Ideas, see NSF, *FY2023 Budget Request to Congress*, pp. Cross-Theme Topics 15 – Cross-Theme Topics-20.

[61] This total includes Mid-scale Research Infrastructure-1, funded through RRA, for projects costing $6 million-$20 million, as well as Mid-scale Research Infrastructure-2, funded through MREFC, for projects costing $20 million-$100 million.

The budget request also includes multi-agency initiatives. The National Nanotechnology Initiative would receive $435 million, $177 million (29%) less than the FY2021 actual amount. The Networking and Information Technology Research and Development program would receive $2.11 billion, an increase of $393 million (23%). The U.S. Global Change Research Program would receive $913 million, $345 million (61%) more than the FY2021 actual amount.

Table 12. National Science Foundation Funding

(budget authority, in millions of dollars)

Account	FY2021 Actual[a]	FY2022 Enacted/ Estimated	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Research and Related Activities (RRA)	**7,099.1**	**7,159.4**	**8,426.0**			
R&D, RRA Total	6,413.1	6,239.0	7,561.6			
Conduct of R&D	*6,150.4*	*5,983.0*	*7,203.6*			
R&D Facilities and Major	*262.6*	*256.0*	*358.0*			
Education and Human Resources (EDU)	**992.7**	**1,006.0**	**1,377.2**			
R&D, EDU Total	480.8	560.0	698.2			
Conduct of R&D	*480.8*	*560.0*	*698.2*			
R&D Facilities and Major	*0.0*	*0.0*	*0.0*			
Major Research Equipment and Facilities Construction (MREFC)	**170.2**	**249.0**	**187.2**			
R&D, MREFC Total	170.2	249.0	187.2			
Conduct of R&D	*0.0*	*0.0*	*0.0*			
R&D Facilities and Major	*170.2*	*249.0*	*187.2*			
Agency Operations and Award Management (AOAM)[b]	**396.5**	**400.0**	**473.2**			
Office of the Inspector General (OIG)[b]	**17.6**	**19.0**	**23.4**			
National Science Board (NSB)[b]	**4.4**	**4.6**	**5.1**			
NSF, Total Discretionary[c]	**8,680.5**	**8,838.0**	**10,492.1**			
R&D, NSF Total	7,064.1	7,048.0	8,447.0			
Total, Conduct of R&D	*6,631.3*	*6,543.0*	*7,901.8*			
Total, R&D Facilities & Major Equipment	*432.9*	*505.0*	*545.3*			

Sources: Data in the columns titled "FY2021 Actual," "FY2022 Enacted/Estimated," and "FY2023 Request" are from P.L. 117-103; email communications from OMB to CRS as of April 1, 2022; and the NSF *FY2023 Budget Request to Congress*.

Notes: n/a = not available. Appropriations accounts are in bold. NSF total may differ from the sum of the accounts due to rounding. Nonbold R&D funding amounts are a subset of funding for the specified accounts. Figures for the columns currently blank may become available as action is completed.

a. FY2022 account funding amounts (bold) are as enacted (P.L. 117-103). FY2021 R&D funding amounts (nonbold) are as reported in the NSF *FY2023 Budget Request to Congress*; these amounts include a portion of

$600 million in two-year appropriations for NSF as enacted in the American Rescue Plan Act of 2021 (P.L. 117-2) "to fund or extend new and existing research grants, cooperative agreements, scholarships, fellowships, and apprenticeships, and related administrative expenses to prevent, prepare for, and respond to coronavirus."

b. The AOAM, NSB, and OIG accounts have no reported R&D funding.

c. In addition to discretionary funding, NSF reports mandatory funding from H-1B visa and donation sources, which are not included in this total.

Department of Agriculture[62]

The U.S. Department of Agriculture (USDA) was created in 1862 to support agricultural research in an expanding, agriculturally dependent country. Today, USDA conducts intramural research at federal facilities with federally employed scientists, and supports extramural research at universities and other facilities through competitive grants and capacity (formula-based) funding. The breadth of contemporary USDA research spans traditional agricultural production practices, as well as organic and sustainable agriculture, bioenergy, nutritional needs and food composition, food safety, animal and plant health, pest and disease management, economic decisionmaking, and other social sciences affecting consumers, farmers, and rural communities.

The four agencies of USDA's Research, Education, and Economics (REE) mission area carry out the Department's research and education activities.[63] These agencies are the Agricultural Research Service (ARS), the principal intramural research agency; the National Institute of Food and Agriculture (NIFA), the principal extramural research agency; the National Agricultural Statistics Service (NASS), which undertakes a variety of surveys to capture relevant data; and the Economic Research Service (ERS), which applies economic analysis to a wide range of topics related to food and agriculture. In addition to the four REE agencies, the Office of the Chief Scientist (OCS), a staff office within the Office of the Under Secretary for REE, coordinates science activities across the department.

USDA's FY2022 enacted discretionary appropriations and the Administration's FY2023 budget request for the four REE agencies and OCS are discussed below, with funding amounts presented in **Table 13**. In annual agriculture appropriations acts, Title I (Agricultural Programs) provides regular discretionary appropriations for USDA, including the REE agencies and OCS. REE agencies and programs receive additional funding from sources other than this title, including discretionary funding from Title VII (General Provisions), mandatory funding authorized by the 2018 farm bill (P.L. 115-334 and the Consolidated Appropriations Act, 2021 (P.L. 116-260), nonfederal matching contributions, and private donations and grants.[64] Funding from these other sources is discussed separately in the text, and is not presented in **Table 13**.

FY2022 enacted appropriations (P.L. 117-103 Consolidated Appropriations Act, 2022 provide a total of $3,676.1 million in discretionary spending for the REE agencies through Division A (Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2022), Title I.[65] Title VII (General Provisions) of P.L. 117-103 provides an

[62] This section was written by Genevieve K. Croft, Analyst in Agricultural Policy, CRS Resources, Science, and Industry Division.

[63] For additional information, see CRS Report R40819, *Agricultural Research: Background and Issues*, by Genevieve K. Croft.

[64] Ibid.

[65] FY2022 enacted appropriations and related congressional directives presented in this report section derive from P.L. 117-103; the accompanying *Explanatory Statement, Division A—Agriculture, Rural Development, Food and Drug Administration, and Related Agencies Appropriations Act, 2022*; H.Rept. 117-182 (to accompany the House-reported

additional $13.7 million. The Administration is requesting a total of $4,042.0 million for these agencies in FY2023, a 10% increase ($365.9 million), including increases of 8% to 14% for each agency.

Agricultural Research Service

ARS is USDA's in-house basic and applied research agency, and has major responsibilities for conducting and leading the national agricultural research effort. ARS operates approximately 90 laboratories, with about 5,300 permanent employees, including approximately 2,000 research scientists. ARS laboratories include a focus on efficient and sustainable food and fiber production, development of new products and uses for agricultural commodities, development of effective controls for pest management, and support of USDA regulatory and technical assistance programs. ARS also operates the National Agricultural Library (NAL). NAL is the world's largest agricultural research library, and is a primary information repository for food, agriculture, and natural resource sciences.

For FY2022, P.L. 117-103 provides $1,633.5 million for ARS salaries and expenses, and $127.8 million for buildings and facilities. For FY2023, the Administration is requesting $1,858.7 million for ARS salaries and expenses, an increase of $225.2 million (13.8%) above the FY2022 discretionary appropriation. This request includes increases of $101.0 million for clean energy research and $109.0 million for climate science. The FY2023 request for buildings and facilities is $45.4 million, a decrease of $82.4 million (-64.5%) from the FY2022 appropriation.

ARS continues to coordinate with the Department of Homeland Security (DHS) on the new National Bio and Agro-Defense Facility (NBAF), which DHS is constructing to replace the outdated Plum Island Animal Disease Center (PIADC).[66] In January 2019, USDA and DHS signed a Memorandum of Agreement to govern the transition of NBAF from DHS to USDA, with ownership to transfer upon its completion and commissioning.[67] USDA projects the transfer of the operations from PIADC to NBAF will be completed by December 2023, a date delayed from earlier projections, including most recently due to the COVID-19 pandemic.[68] FY2022 enacted appropriations for ARS Salaries and Expenses provide an additional $49.0 million for initial costs, operation, and maintenance of NBAF. For FY2023, the Administration is requesting a total of $47.5 million for NBAF within ARS salaries and expenses, and an increase of $10.6 million for NBAF capital improvement and maintenance within the ARS buildings and facilities account.

National Institute of Food and Agriculture

NIFA is USDA's principal extramural research agency. It provides federal funding for research, education, and extension projects conducted in partnership with land-grant colleges and universities (LGUs), State Agricultural Experiment Stations, the Cooperative Extension System,

FY2022 agriculture appropriations bill, H.R. 3456); and S.Rept. 117-34 (to accompany the Senate-reported agriculture appropriations bill, S. 2599).

[66] For additional information, see CRS In Focus IF11492, *National Bio and Agro-Defense Facility: Purpose and Status*, by Genevieve K. Croft.

[67] USDA and DHS, *Memorandum of Agreement Between the U.S. Department of Agriculture Marketing and Regulatory Programs, the U.S. Department of Agriculture Research, Education, and Economics, and the Department of Homeland Security Science and Technology Directorate*, June 20, 2019, https://www.usda.gov/sites/default/files/documents/usda-dhs-moa.pdf.

[68] USDA, "USDA and DHS S&T Revise NBAF Project Timeline," press release, December 15, 2020, https://www.usda.gov/nbaf/media/press-releases/2020/usda-dhs-st-revise-nbaf-project-timeline.

other research and education institutions, private organizations, and individuals. NIFA partnerships include the three types of LGUs—1862 (original) Institutions, 1890 (historically Black) Institutions, and 1994 (tribal) Institutions—as well as other higher education institutions.[69] Federal funds awarded through NIFA capacity (formula-based) and competitive grants enhance research capacity at these institutions.[70] While NIFA is headquartered in Washington, DC, USDA relocated the majority of NIFA staff positions to Kansas City, MO, in 2019.[71]

For FY2022, P.L. 117-103 provides $1,636.9 million in discretionary funds for NIFA activities. For FY2023, the Administration requests $1,820.9 million, an increase of $184.0 million (11.2%). In the explanatory notes for NIFA, the Administration proposes a change in appropriations language that would combine three separate NIFA funding accounts—for research and education, extension, and integrated activities—into one agency account that includes all programs.[72] The Administration argues that the existing three NIFA accounts are artifacts of the 1994 consolidation of two separate USDA agencies into the single agency now known as NIFA, and the subsequent establishment of an integrated activities program in 1998.[73] The Administration argues that consolidating the accounts would "mirror the organization as a National Institute with a unified mission and offer opportunities to streamline administration of funds."[74] Further, the Administration proposes no-year spending authority for certain programs, including several that provide funds to minority-serving institutions.[75]

Research and Education. Hatch Act and Evans-Allen Act funds support capacity grants for research and education activities at 1862 and 1890 Institutions, respectively. For Hatch Act programs, the enacted P.L. 117-103 provides $260.0 million, and the Administration is requesting $265.0 million for FY2023, a 1.9% increase. For Evans-Allen programs, the FY2022 appropriation provides $80.0 million, and for FY2023 the Administration is requesting $92.8 million, a 16.0% increase. The McIntire-Stennis program provides capacity funds for forestry research. For FY2022, P.L. 117-103provides $36.0 million for this program, and for FY2023 the Administration is requesting $43.3 million, a 20.2% increase.

The Agriculture and Food Research Initiative (AFRI) is USDA's flagship competitive research grants program, and currently represents about 31.0% of NIFA's total discretionary budget. The FY2022 enacted bill provides $445.0 million for AFRI, and the Administration is requesting $564.0 million for FY2023, a 26.7% increase and $136 million less than the $700 million authorized by the 2018 farm bill. NIFA also funds the Sustainable Agriculture Research and

[69] 1862, 1890, and 1994 refer to the years of enactment of the laws that created these institutional classifications. For more information on LGUs and other NIFA-funded institutions, see CRS Report R45897, *The U.S. Land-Grant University System: An Overview*, by Genevieve K. Croft; CRS In Focus IF11847, *1890 Land-Grant Universities: Background and Selected Issues*, by Genevieve K. Croft; and CRS In Focus IF12009, *1994 Land-Grant Universities: Background and Selected Issues*, by Genevieve K. Croft.

[70] The National Agricultural Research, Extension, and Teaching Policy Act of 1977 (P.L. 95-113) designated USDA as the lead federal agency for higher education in the food and agricultural sciences.

[71] For further information, see CRS In Focus IF11527, *Relocation of the USDA Research Agencies: NIFA and ERS*, by Genevieve K. Croft.

[72] Similar consolidations in NIFA have been proposed in six of the past seven President's Budget Requests, but were not adopted by Congress.

[73] USDA, "National Institute of Food and Agriculture," *2023 USDA Budget Explanatory Notes for Committee on Appropriations*, 2022, pp. 29-30.

[74] Ibid., p. 30.

[75] No-year spending authority refers to authority that does not expire, unlike regular appropriations that are typically for the one year of the appropriation.

Education (SARE) program. For FY2022, P.L. 117-103provides $45.0 million for SARE, and the Administration requests $60.0 million for FY2023, a 33.3% increase.

Extension. Smith-Lever 3(b) and 3(c) programs provide capacity grants to 1862 Institutions to support cooperative extension. The FY2022 enacted appropriation provides $320.0 million for these programs, and the Administration requests the same funding level for FY2023. For extension capacity grants for 1890 Institutions, FY2022 appropriations provide $65.0 million, and the Administration requests the same funding level for FY2023.

Smith-Lever Act 3(d) programs provide competitive grants to LGUs to support cooperative extension. These programs include grants for food and nutrition education; new technologies for agricultural extension; federally recognized tribes; children, youth, and families at risk; and farm safety education. For FY2022, P.L. 117-103provides $90.4 million for Smith-Lever 3(d) programs. For FY2023, the Administration is requesting $90.1 million. Of this total, $70.0 million would support the Expanded Food and Nutrition Education Program (EFNEP), and $7.7 million would support the Federally-Recognized Tribes Extension Program.

Integrated Activities. Integrated activities are those activities that include some combination of teaching, education, and research. The Administration is requesting $39.0 million for integrated activities in FY2023, $1.0 million less than the FY2022 appropriation.

Other appropriations. In addition to those sums discussed above, Title VII (General Provisions) of the enacted FY2022 agriculture appropriations bill includes $13.3 million for certain NIFA programs and activities. These include appropriations for continuation of a pilot program to enhance farming and ranching activities for military veterans ($5.0 million), to support the Farm of the Future test site ($5.0 million), and a provision providing $5.0 million for Farming Opportunities Training and Outreach (FOTO), of which half is for NIFA and half is for the USDA Office of Partnerships and Public Engagement. For FY2023, the Administration proposes appropriations language in the General Provisions providing $5.0 million for FOTO.

National Agricultural Statistics Service

The National Agricultural Statistics Service (NASS) conducts the five-yearly Census of Agriculture and provides official statistics on agricultural production and farm sector indicators. It is one of the 13 principal statistical agencies of the U.S. Federal Statistical System.

For FY2022, P.L. 117-103 provides $190.2 million for NASS, of which up to $46.9 million is reserved to support the Census of Agriculture. The Administration is requesting $217.5 million for NASS in FY2023, of which up to $66.4 million is for the Census of Agriculture. This request includes funding for mailing and processing the 2022 Census of Agriculture. The Administration's request for FY2023 proposes increases for some programs, including an additional $8.0 million to support climate science activities through NASS's existing geospatial program.

Economic Research Service

The Economic Research Service supports economic and social science analysis about agriculture, rural development, food, commodity markets, and the environment. It also collects and disseminates data concerning USDA programs and policies. Like NASS, ERS is one of the principal statistical agencies of the U.S. Federal Statistical System. While ERS is headquartered

in Washington, DC, USDA relocated the majority of ERS staff positions to Kansas City, MO, in 2019.[76]

For FY2022, P.L. 117-103provides $87.8 million for ERS activities. The Administration is requesting $99.6 million for FY2023, a 13.4% increase. This includes a proposed increase of $2.1 million for climate science research and $6.5 million to conduct a second round of the USDA National Household Food Purchase and Acquisition Survey—an activity to be conducted in coordination with the USDA Food and Nutrition Service.

Office of the REE Under Secretary and Office of the Chief Scientist

Congress created the Office of the Chief Scientist (OCS) in 2008 when it established the dual role of the Under Secretary for REE as the USDA Chief Scientist (7 U.S.C. §6971). OCS coordinates research programs and activities across USDA. Administratively, it is a component of the Office of the Under Secretary for REE.

In recent years, congressional appropriations for the Office of the Under Secretary for REE have included funds for the Under Secretary and a partial staff.[77] Congress has not provided direct appropriations for OCS staff since its establishment. As such, OCS has been funded via interagency agreement among the REE agencies. FY2022 appropriations provide $3.3 million for the Office of the Under Secretary for REE, which does not include direct funding for OCS staff. Of the $3.3 million, $1.0 million is for planning and staffing of the Agriculture Advanced Research and Development Authority (AGARDA), and $1.0 million is to fund a study by the National Academies of Sciences, Engineering, and Medicine on links between soil health and human health.[78] In addition to those funds provided through Title I (Agricultural Programs) of P.L. 117-103, Title VII (General Provisions) provides $400,000 for pollinator research coordination within OCS. The President's budget request for FY2023 includes $6.3 million for the Office of the Under Secretary for REE, of which $4.9 million is for OCS. In concert with this request, each REE agency's FY2023 budget request includes a funding decrease equal to the amount the agency contributed for OCS operations in FY2022.

Table 13. U.S. Department of Agriculture R&D

(budget authority, in millions of dollars)

Agency or Major Program	FY2022 Enacted P.L. 117-103	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Agricultural Research Service (ARS)					
Salaries and Expenses	1,633.5	1,858.7			
Buildings and Facilities	127.8	45.4			
Subtotal, ARS	**1,761.3**	**1,904.1**			
National Institute of Food and Agriculture (NIFA)					
Research and Education					

[76] See CRS In Focus IF11527, *Relocation of the USDA Research Agencies: NIFA and ERS*, by Genevieve K. Croft.

[77] For example, Table OSEC-5 of USDA's FY2023 explanatory notes identifies $809,000 and three staff years for the Office of the Under Secretary for REE in FY2022. USDA, "Office of the Secretary," *2023 USDA Budget Explanatory Notes for Committee on Appropriations*, 2022, p. 8.

[78] The 2018 farm bill established the AGARDA pilot program as a component of OCS (7 U.S.C. §3319k).

Agency or Major Program	FY2022 Enacted P.L. 117-103	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
AFRI (competitive grants)	445.0	564.0			
Hatch Act (1862 Institutions)	260.0	265.0			
Evans-Allen (1890 Institutions)	80.0	92.8			
McIntire-Stennis (forestry)	36.0	43.3			
Other	225.2	248.2			
Subtotal, Research and Education	**1,046.2**	**1,213.3**			
Extension					
Smith-Lever 3(b) and 3(c)	320.0	320.0			
Smith-Lever 3(d)	90.4	90.1			
1890 Extension Activities	65.0	65.0			
1994 Extension Activities	9.5	19.0			
Other	65.7	74.4			
Subtotal, Extension	**550.6**	**568.6**			
Integrated Activities	**40.0**	**39.0**			
Subtotal, NIFA	**1,636.8**	**1,820.9**			
National Agricultural Statistics Service (NASS)	**190.2**	**217.5**			
Economic Research Service (ERS)	**87.8**	**99.6**			
Total, USDA Research, Education, and Economics Agencies	**3,676.1**	**4,042.0**			
Office of the Under Secretary for REE	**3.3**	**6.4**			
Office of the Chief Scientist	1.0	5.0			

Sources: CRS, compiled from P.L. 117-103 *Consolidated Appropriations Act, 2022, FY2022 Explanatory Statement, Division A;* and *FY2023 USDA Budget Justification Notes.*

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns currently blank may become available as action is completed. FY2022 enacted amounts do not include $13.7 million in discretionary appropriations for NIFA and OCS programs and activities allocated via P.L. 117-103, Division A, Title VII (General Provisions).

Department of Commerce

Two agencies of the Department of Commerce have major R&D programs: the National Institute of Standards and Technology (NIST) and the National Oceanic and Atmospheric Administration (NOAA).

National Institute of Standards and Technology[79]

The mission of the National Institute of Standards and Technology is "to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in

[79] This section was written by Emily G. Blevins, Analyst in Science and Technology Policy, and John Sargent, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

ways that enhance economic security and improve our quality of life."[80] NIST research provides measurement, calibration, and quality assurance methods and techniques that support U.S. commerce, technological progress, product reliability, manufacturing processes, and public safety. NIST's responsibilities include the development, maintenance, and custodial retention of the national standards of measurement; providing the means and methods for making measurements consistent with those standards; and ensuring the compatibility of U.S. national measurement standards with those of other nations.[81]

Regular appropriations for NIST are provided through the annual Commerce, Justice, Science, and Related Agencies Appropriations Act (CJS Act). President Biden is requesting $1,467.6 million for NIST in FY2023, an increase of $237.5 million (19.3%) from the FY2022 enacted appropriation of $1,230.1 million.[82] (See **Table 14**.)

NIST discretionary funding is provided through three accounts: Scientific and Technical Research and Services (STRS), Industrial Technology Services (ITS), and Construction of Research Facilities (CRF).

The President's FY2023 request includes $974.9 million for laboratory R&D programs, corporate services, and standards coordination and special programs in the STRS account, an increase of $124.9 million (14.7%) from the FY2022 enacted level.[83] Program increases include

- Climate and Energy Measurements, Tools, and Testbeds, $68.2 million (up $18.5 million);[84]
- Cybersecurity—Supply Chain, 5G and Beyond, and Identity Management, $99.9 million (up $18.0 million);[85]
- Quantum Information Science, Engineering, and Metrology, $61.8 million (up $15.0 million);[86]
- Artificial Intelligence (AI)-Centric Challenges, $45.4 million (up $15.0 million);[87]
- Supporting the American Bioeconomy/Measurements for the Bioeconomy, $33.1 million (up $12.6 million);[88]

[80] NIST website, "General Information," http://nist.gov/public_affairs/general_information.cfm.

[81] 15 U.S.C. §272.

[82] The FY2023 request is up $400.7 million (37.6%) from the FY2022 enacted levels when the congressionally directed spending totals are removed. CRS analysis of data from U.S. Department of Commerce, National Institute of Standards and Technology, National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2023 Budget Submission to Congress, https://www.commerce.gov/sites/default/files/2022-03/FY2023-NIST-NTIS-Congressional-Budget-Submission.pdf; Fiscal Year 2022 enacted levels extracted from CRS analysis of P.L. 117-103 and *Explanatory Statement*, H.R. 2471, 117th Cong., 2nd sess., *Congressional Record* 168 (March 9, 2022): H1774, available at: https://www.congress.gov/117/crec/2022/03/09/168/42/CREC-2022-03-09-bk3.pdf.

[83] Ibid., p. NIST-3. The FY22 enacted total for the STRS account includes $37.6 million for Congressionally-directed External Projects, *Explanatory Statement*, H.R. 2471, 117th Cong., 2nd sess., Congressional Record 168 (March 9, 2022): H1775.

[84] *National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2023, Budget Submission—Rebased, NIST-23,* provided to CRS by NIST by email correspondence on May 12, 2022. Increases are from the FY2023 base.

[85] Ibid., p. NIST-28.

[86] Ibid., p. NIST-33.

[87] Ibid., p. NIST-38.

[88] Ibid., p. NIST-43.

- Advanced Communications Research and Standards, $36.7 million (up $11.8 million);[89]
- NIST Center for Neutron Research (NCNR) Controls and Corrective Actions, $67.2 million (up $5.0 million);[90]
- Public Safety Communications Research and Advanced Technology Accelerator, $10.0 million (up $8.5 million);[91]
- Measurement Service Modernization, $76.0 million (up $8.0 million);[92]
- Measurements and Data to Enable the Circular Economy, $13.5 million (up $4.0 million);[93]
- iEdison System-Federal Inventions and Patent Applications, $3.4 million (up $2.0 million);[94]
- Standards for Critical and Emerging Technologies, $10.4 million (up $8.0 million);[95] and
- Building Equity and Diversity in the NIST Workforce, $17.3 (up $5.8 million).[96]

The FY2023 request would provide $372.3 million for the ITS account, up $197.8 million (113.4%) from the FY2022 enacted level.[97] Within the ITS account, the request would provide $275.3 million for the Manufacturing Extension Partnership (MEP) program, an increase of $117.3 million (57.4%) from the FY2022 enacted level, and $97.5 million for Manufacturing USA, up $81 million (590.9%) from the FY2022 enacted level of $16.5 million.[98]

According to NIST, the funding requested for MEP would, among other things, enable new investments to strengthen supply chains, support workforce training, and promote technology adoption.[99]

Funding for Manufacturing USA would support the first year of an additional four Manufacturing USA Institutes, one of which would focus on the design and manufacture of semiconductors.[100]

The President is requesting $120.3 million for the CRF account for FY2023, down $85.3 million (41.5%) from the FY2022 enacted level.[101] The FY2023 request represents an increase of $40.3

[89] Ibid., p. NIST-48.

[90] Ibid., p. NIST-53.

[91] Ibid., p. NIST-58.

[92] Ibid., p. NIST-63.

[93] Ibid., p. NIST-68.

[94] Ibid., p. NIST-72.

[95] Ibid., p. NIST-87.

[96] Ibid., p. NIST-92.

[97] CRS analysis of P.L. 117-103; and *Explanatory Statement*, H.R. 2471, 117th Cong., 2nd sess., *Congressional Record* 168 (March 9, 2022): H1774, available at: https://www.congress.gov/117/crec/2022/03/09/168/42/CREC-2022-03-09-bk3.pdf.

[98] National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2023 Budget Submission to Congress, NIST-105; and *Explanatory Statement*, H.R. 2471, 117th Cong., 2nd sess., *Congressional Record* 168 (March 9, 2022): H1775, available at: https://www.congress.gov/117/crec/2022/03/09/168/42/CREC-2022-03-09-bk3.pdf.

[99] Ibid., p. NIST-112.

[100] Ibid., p. NIST-119 – NIST-120.

[101] National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2023 Budget

million (66.7%) over FY2022 enacted levels when congressionally directed spending projects are removed from CRF account totals. This funding would support repair and revitalization of facilities to address NIST's major utility infrastructure maintenance backlog and to modernize its IT networking infrastructure.[102]

Table 14. National Institute of Standards and Technology Funding

(budget authority, in millions of dollars)

	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Scientific and Technical Research and Services	**850.0**	**975.0**			
Laboratory Programs	705.7	*855.4*			
Corporate Services	17.5	*18.5*			
Standards Coordination and Special Programs	*89.2*	*101.1*			
Congressionally-directed External Projects	*37.6*	*0.0*			
Industrial Technology Services	**174.5**	**372.3**			
Manufacturing Extension Partnership	*158.0*	*275.3*			
Manufacturing USA	*16.5*	*97.0*			
Construction of Research Facilities	**205.6**	**120.3**			
Construction and Major Renovations	*0.0*	*0.0*			
Safety, Capacity, Maintenance and Major Repairs	*80.0*	*120.3*			
Congressionally-directed Extramural Construction	*125.6*	*0.0*			
NIST, Total	**1,230.1**	**1,467.6**			

Source: U.S. Department of Commerce, National Institute of Standards and Technology, National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2023 Budget Submission to Congress, 2021, [May 29, 2022.], https://www.commerce.gov/sites/default/files/2022-03/FY2023-NIST-NTIS-Congressional-Budget-Submission.pdf.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns currently blank may become available as action is completed.

National Oceanic and Atmospheric Administration[103]

The National Oceanic and Atmospheric Administration conducts scientific research in areas such as ecosystems, atmosphere, global climate change, weather, and oceans; collects and disseminates data on the oceans and atmosphere; and manages coastal and marine species and environments. NOAA was created in 1970 by Reorganization Plan No. 4.[104]

Submission to Congress, NIST-105; and *Explanatory Statement*, H.R. 2471, 117th Cong., 2nd sess., *Congressional Record* 168 (March 9, 2022): H1775, available at: https://www.congress.gov/117/crec/2022/03/09/168/42/CREC-2022-03-09-bk3.pdf.

[102] National Institute of Standards and Technology/National Technical Information Service, Fiscal Year 2023 Budget Submission to Congress, p. NIST-149 and NIST-157.

[103] This section was written by Eva Lipiec, Analyst in Natural Resources Policy, CRS Resources, Science, and Industry Division.

[104] "Reorganization Plan No. 4 of 1970," 35 *Federal Register* 15627-15630, October 6, 1970.

NOAA's administrative structure is organized into six line offices: the National Environmental Satellite, Data, and Information Service (NESDIS); National Marine Fisheries Service (NMFS); National Ocean Service (NOS); National Weather Service (NWS); Office of Oceanic and Atmospheric Research (OAR); and the Office of Marine and Aviation Operations (OMAO). The line offices are supported by an additional office, Mission Support, which provides cross-cutting administrative functions related to education, planning, information technology, human resources, and infrastructure. Congress provides most of the discretionary funding for the line offices and Mission Support through two accounts: (1) Operations, Research, and Facilities, and (2) Procurement, Acquisition, and Construction.

In 2010, NOAA published its *Next Generation Strategic Plan*.[105] The strategic plan is organized into four categories of long-term goals: (1) climate adaptation and mitigation, (2) a weather-ready nation, (3) healthy oceans, and (4) resilient coastal communities and economies.[106] The strategic plan also lists cross-agency objectives related to (1) stakeholder engagement, (2) data and observations, and (3) integrated environmental modeling.[107] The strategic plan serves as a guide for NOAA's R&D plan. The most recent R&D plan was published in June 2020, and identifies R&D priorities within three vision areas: (1) reducing societal impacts from hazardous weather and other environmental phenomena, (2) sustainable use and stewardship of ocean and coastal resources, and (3) a robust and effective research, development, and transition enterprise.[108]

For FY2023, President Biden requested $1.335 billion for NOAA R&D funding, including R&D-related equipment and facilities, $147.9 million (12.5%) above the FY2022 enacted level of $1.187 billion.[109] According to OMB, direct obligations include annual appropriations, transfers, and recoveries from prior-year obligations.[110] **Table 15** provides R&D amounts enacted in FY2022 and requested by the Administration for FY2023.

The President's FY2023 request for NOAA R&D is 18.4% of the requested FY2023 NOAA total direct obligations of $7.264 billion.[111] The FY2023 request includes $785.9 million for research

[105] National Oceanic and Atmospheric Administration (NOAA), *NOAA's Next-Generation Strategic Plan*, Silver Spring, MD, December 2010, https://oceanexplorer.noaa.gov/about/what-we-do/program-review/next-gen-str-plan.pdf. Hereinafter NOAA, *Strategic Plan*, 2010.

[106] According to NOAA, a weather-ready nation is envisioned as a society that is prepared for and responds to weather-related events.

[107] NOAA defines the enterprise objectives as "cross-cutting requirements for addressing NOAA's strategic goals as a whole" (NOAA, *Strategic Plan*, 2010, p. 32).

[108] NOAA, *NOAA Research and Development Vision Areas: 2020-2026*, June 2020, https://sciencecouncil.noaa.gov/Home/fileticket/z4iHSl3P4KY/portalid.

[109] Email correspondence with the NOAA Budget Office, May 12, 2022. R&D funding amounts in the annual agency appropriation bill are estimated by NOAA because neither the legislative text nor the explanatory statement provide a breakout of R&D funding and only include discretionary direct obligations (telephone conversation with NOAA Budget Office, September 3, 2020).

[110] Congressional documents sometimes refer to direct obligations as program levels ("Regarding the House Amendment to the Senate Amendment to H.R. 2471, Consolidated Appropriations Act, 2022," Explanatory Statement Submitted by Ms. DeLauro, Chair of the House Committee on Appropriations, *Congressional Record*, vol. 168 (March 9, 2022), pp. H1775 and H1781. Hereinafter FY2022 Explanatory Statement). For further descriptions of what types of obligations are direct versus reimbursable, see Office of Management and Budget, *Circular No. A-11, Preparation, Submission, and Execution of the Budget*, July 2016, p. 3 of Section 83, https://obamawhitehouse.archives.gov/sites/default/files/omb/assets/a11_current_year/a11_2016.pdf.

[111] NOAA, *Budget Estimates Fiscal Year 2023*, 2022, p. Control Table-15, at https://www.noaa.gov/sites/default/files/2022-04/FY23_NOAAPresidents_Budget_508Compliant.pdf. Hereinafter NOAA, *Budget Estimates Fiscal Year 2023*.

(58.9% of the total requested for NOAA R&D), $176.2 million for development (13.2%), and $373.4 million (28.0%) for R&D equipment and facilities.[112]

OAR accounts for the majority of NOAA R&D requests and enacted amounts in most years, including FY2023. The Administration requested $735.9 million for OAR R&D in FY2023, which is $107.6 million (17.1%) above the FY2022 enacted funding level of $628.3 million.[113] OAR conducts research in three major areas: (1) weather and air chemistry; (2) climate; and (3) oceans, coasts, and the Great Lakes. A portion of these efforts is implemented through OAR's laboratories and cooperative research institutes. The President requested $236.3 million for OAR labs and cooperative institutes in FY2023, $22.6 million (10.6%) more than the FY2022 enacted amount of $213.8 million.[114]

Another OAR program, the National Sea Grant College Program (NSGCP), is composed of 33 university-based state programs and supports scientific research and stakeholder engagement to identify and solve problems faced by coastal communities. For FY2023, the Administration requested $76.3 million for NSGCP, an increase of $0.3 million (0.4%) from the FY2022 enacted amount of $76.0 million, and $13.2 million for its related Aquaculture Research program, a decrease of $0.3 million (2.0%) from the FY2022 enacted amount of $13.5 million.[115]

Table 15. National Oceanic and Atmospheric Administration R&D

(in millions of dollars)

	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
National Environmental Satellite, Data, and Information Service (NESDIS)	$41.9	$69.8			
National Marine Fisheries Service (NMFS)	$76.9	$71.9			
National Ocean Service (NOS)	$108.0	$128.6			
National Weather Service (NWS)	$21.3	$36.0			
Office of Marine and Aviation Operations (OMAO)	$278.1	$234.2			
Office of Oceanic and Atmospheric Research (OAR)	$628.3	$735.9			

[112] Email correspondence with the NOAA Budget Office, May 12, 2022.

[113] Email correspondence with the NOAA Budget Office, May 12, 2022.

[114] NOAA, *Budget Estimates Fiscal Year 2023*, and FY2022 Explanatory Statement, p. H1778.

[115] Ibid.

	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Mission Support	$33.0	$59.0			
Total R&D	**$1,187.5**	**$1,335.4**			
NOAA Total Direct Obligations, Total R&D and Non-R&D	$6,109.5	$7,264			

Sources: Line office amounts provided by the NOAA Budget Office via email correspondence on May 12, 2022. NOAA Total R&D and non-R&D are from P.L. 117-103, Division B, Title I (CRS calculated from enacted NOAA Operations, Research, and Facilities and Procurement, Acquisition, and Construction account direct obligations amounts) and NOAA, *Budget Estimates Fiscal Year 2023*, 2022, p. Control Table-15.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns currently blank may become available as action is completed. Direct obligations include annual appropriations, transfers, and recoveries from prior-year obligations. Congress and NOAA use several different budgetary terms, such as direct obligations, budget authority, and appropriations. For more information, see CRS In Focus IF11914, *National Oceanic and Atmospheric Administration (NOAA) FY2022 Budget Request and Appropriations*, by Eva Lipiec.

Department of Veterans Affairs[116]

The Department of Veterans Affairs (VA) provides health care and health-related services to eligible veterans through the Veterans Health Administration (VHA). VHA's primary mission is to provide health care services to eligible veterans and some family members.[117] The VHA is also statutorily required to conduct medical research into the special healthcare needs of veterans.[118]

The President is requesting $1.695 billion for VA R&D in FY2023, an increase of $32.9 million (2%) from FY2022 enacted levels. (See **Table 16**.) According to the President's request, FY2023 strategic priorities for VA R&D include increasing veterans' access to clinical trials; increasing real-world impact of VA research; the effective use of VA data for veterans; promoting diversity, equity, and inclusion within the VA sphere of influence; and building community through VA research.[119] In addition, the VA plans to increase funding for research on environmental exposures, traumatic brain injury/brain health, cancer and precision oncology, and implementation of the Commander John Scott Hannon Mental Health Care Improvement Act (P.L. 116-171).[120]

VA R&D is funded through two major funding streams—the Medical and Prosthetic Research account and Medical Support.[121] The funding that will be allocated from Medical Support to support R&D is generally unclear unless Congress provides funding at the precise level of the request. In general, R&D funding levels from Medical Support are known only after the VA

[116] This section was written by Jared S. Sussman, Analyst in Health Policy, CRS Domestic Social Policy Division.

[117] 38 U.S.C. §7301.

[118] 38 U.S.C. §7303(a)(3).

[119] Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY2023*, pp. VHA-619-621.

[120] Ibid., p. VHA-574. For a summary of research initiatives required by P.L. 116-171, see CRS Report R46848, *Commander John Scott Hannon Veterans Mental Health Care Improvement Act of 2019 (P.L. 116-171) and Veterans COMPACT Act of 2020 (P.L. 116-214)*, coordinated by Victoria R. Green.

[121] The funding for Medical Support is derived from the Medical Services, Medical Support and Compliance, and Medical Facilities appropriations accounts. For more information, see CRS Report R46964, *Department of Veterans Affairs FY2022 Appropriations*, by Sidath Viranga Panangala, Jared S. Sussman, and Heather M. Salazar.

allocates its appropriations to specific activities and reports those figures. Medical Support appropriations fund a range of activities across VHA; R&D is one of those activities.

The FY2023 request includes $916 million for VA's Medical and Prosthetic Research account, an increase of $34 million (4%) compared to FY2022 enacted levels. The request includes $779 million in funding for research supported by the agency's Medical Care Support account, an increase of $29 million (4%) compared to FY2022. The Medical Care Support account provides administrative and other support for VA researchers and R&D projects, including infrastructure maintenance.

The Medical and Prosthetics R&D program is an intramural program. In general, each Principal Investigator (PI) and any Co-Principal Investigator (Co-PI) must be VA employees with at least a five-eighths appointment (25 hours per week) in the VA.[122] The R&D program is managed by the VHA Office of Research and Development (ORD) and conducted at VA Medical Centers and VA-approved sites nationwide. According to ORD, the mission of VA R&D includes "improv[ing] Veterans' health and well-being via basic, translational, clinical, health services, and rehabilitative research and apply[ing] scientific knowledge to develop effective individualized care solutions for Veterans."[123] ORD consists of four main research services, each headed by a director:

- Biomedical Laboratory R&D conducts preclinical research to understand life processes at the molecular, genomic, and physiological levels.
- Clinical Science R&D supports clinical trials and other human subjects research to determine the feasibility and effectiveness of new treatments such as drugs, therapies, or devices; compare existing therapies; and improve clinical care and practice.
- Health Services R&D conducts studies to identify and promote effective and efficient strategies to improve the quality and accessibility of the VA health system and patient outcomes, and to minimize health care costs.
- Rehabilitation R&D conducts research and develops novel approaches to improving the quality of life of impaired and disabled veterans.

In addition to intramural support, VA researchers are eligible to obtain funding for their research from extramural sources, including other federal agencies, private foundations and health organizations, and commercial entities. According to the President's FY2023 budget request, these additional R&D resources are estimated at $540 million in FY2023.

Table 16 summarizes R&D program funding for VA in the Medical and Prosthetic Research and the Medical Care Support accounts. **Table 17** details amounts to be spent in Designated Research Areas (DRAs), which VA describes as "areas of importance to our veteran patient population."[124] Funding for research projects that span multiple areas may be included in several DRAs; thus, the amounts in **Table 17** total to more than the appropriation or request for VA R&D.

[122] Department of Veterans Affairs, Veterans Health Administration, *Department of Veterans Affairs Office of Research & Development Program Guide 1200.15: Eligibility for VA Research Support* July 13, 2018, p. 1.

[123] Department of Veterans Affairs, "Office of Research and Development," https://www.research.va.gov/about/default.cfm.

[124] Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY2023*, p. VHA-621.

Table 16. Department of Veterans Affairs R&D

(budget authority, in millions of dollars)

Account	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Medical and Prosthetic Research	882.0	916.0			
Veterans Medical Care and Health Fund	30.0[a]	0			
Medical Care Support	749.7	778.6			
Veterans Affairs, Total R&D	**$1,661.7**	**$1,694.6**			

Source: Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY2023*, p. VHA-569, https://www.va.gov/budget/docs/summary/fy2023VAbudgetVolumeIImedicalProgramsAndInformationTechnology.pdf.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns currently blank may become available as action is completed. VA researchers also receive grants from other federal and nonfederal resources, including the National Institutes of Health, the Department of Defense, and the Centers for Disease Control and Prevention; these resources are estimated at $540 million in FY2022 and $540 million in FY2023. In addition, the VA estimates reimbursements associated with agency R&D at $61 million in FY2022 and $61 million in FY2023, increasing the total amount of R&D performed at VA to $2.26 billion in FY2022 and $2.30 billion in the FY2023 request.

a. The American Rescue Plan Act of 2021 (P.L. 117-2, Section 8002) included $14.482 billion for medical care and health needs. VA established the Veterans Medical Care and Health Fund (VMCHF) to execute Section 8002. VA estimates allocating $30 million of the provided funding for research in FY2022.

Table 17. Department of Veterans Affairs R&D by Designated Research Area

(in millions of dollars)

Designated Research Area	FY2022 Estimate	FY2023 Request
Acute and Traumatic Injury	26.0	26.0
Aging	147.7	151.3
Autoimmune, Allergic, and Hematopoietic Disorders	38.9	39.6
Cancer	69.3	81.3
Central Nervous System Injury and Associated Disorders	127.1	140.8
Degenerative Diseases of Bones and Joints	41.1	41.6
Dementia and Neuronal Degeneration	41.6	42.3
Diabetes and Major Complications	47.1	47.7
Digestive Diseases	26.1	26.3
Emerging Pathogens/Bio-Terrorism	3.0	2.8
Gulf War Veterans Illness	15.5	15.2
Health Systems	69.9	71.1
Heart Disease/Cardiovascular Health	71.6	73.0
Infectious Disease	57.1	58.2
Kidney Disorders	18.2	18.2
Lung Disorders	27.9	28.2

Designated Research Area	FY2022 Estimate	FY2023 Request
Mental Illness	121.6	130.1
Military Occupations and Environmental Exposures	30.5	51.4
Other Chronic Diseases	7.6	7.4
Prosthetics	25.5	25.6
Sensory Loss	23.2	23.4
Special Populations	42.8	43.3
Substance Abuse	29.9	30.1

Source: Department of Veterans Affairs, *Volume II: Medical Programs and Information Technology Programs, Congressional Submission, FY2023*, p. VHA-622, https://www.va.gov/budget/docs/summary/fy2023VAbudgetVolumeIImedicalProgramsAndInformationTechnology.pdf.

Notes: Projects that span multiple areas may be included in several Designated Research Areas (DRAs); therefore, the amounts depicted in this table total to more than the FY2022 amount and the FY2023 request for Medical and Prosthetic Research. Columns for "FY2022 House," "FY2022 Senate," and "FY2022 Enacted" are not included in this table as these figures will only be available after Congress completes the appropriations process and VA determines how much of the appropriated funds will be allocated to each DRA.

Department of Transportation[125]

The Department of Transportation was established by the Department of Transportation Act (P.L. 89-670) on October 15, 1966. The primary purposes of DOT research and development activities as defined by Congress[126] are improving mobility of people and goods; reducing congestion; promoting safety; improving the durability and extending the life of transportation infrastructure; preserving the environment; and preserving the existing transportation system.

Funding for DOT R&D is generally included in appropriations line items that also include non-R&D activities. The amount of funding provided by appropriations legislation that is allocated to R&D is unclear unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after DOT agencies allocate their final appropriations to specific activities and report those figures.

For FY2023, the Administration is requesting a total of $1.4 billion (an increase of 14.9% over FY2022) for DOT R&D activities and facilities in the Federal Aviation Administration (FAA), the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), the Federal Railroad Administration (FRA), the Federal Transit Administration (FTA), the Pipeline and Hazardous Materials Safety Administration (PHMSA), the Office of the Secretary (OST), and the Federal Motor Carrier Safety Administration (FMCSA) (see **Table 18**). The bulk of DOT R&D funding goes to FAA and FHWA.

Federal Aviation Administration

The President's FY2023 request of $534.5 million for R&D activities and facilities at FAA would be an increase of 13.7% ($64.3 million) from the FY2022 enacted amount. The request includes $260.5 million for the agency's Research, Engineering, and Development (RE&D) account, an

[125] This section was written by D. Randy Peterman, Analyst in Transportation Policy, CRS Resources, Science, and Industry Division.

[126] 49 U.S.C. §6501, Note, "Findings."

increase of 31.6% ($62.5 million) from FY2022. Funding within the RE&D account seeks to improve aircraft safety through research in fields such as fire safety, advanced materials, propulsion systems, aircraft icing, and continued airworthiness, in addition to safety research related to unmanned aircraft systems and the integration of commercial space operations into the national airspace. The RE&D account also supports research to reduce the environmental impacts of aviation (i.e., noise and emissions). Much of the proposed increase to the RE&D account ($40.5 million) would support research in the areas of sustainable aviation fuels for jet engines; unleaded fuel alternatives for piston-engine aircraft; and alternate aircraft technologies, including electric propulsion.

Federal Highway Administration

According to the President's budget request,

> FHWA's contributions to researching and implementing transformative innovations and technologies are changing the way roads, bridges, and other facilities are planned, designed, built, managed, and maintained across the country to be more responsive to current and future needs.[127]

The President's request of $518 million for R&D activities and facilities at FHWA would be an increase of 8.8% ($42.1 million) from the FY2022 enacted amount. The request includes $147 million for FHWA's Highway Research and Development program, which seeks to improve safety, foster innovation, accelerate projects, enhance the design and construction of transportation infrastructure, provide data and analysis for decisionmaking, and reduce congestion. The request also includes $110 million for the deployment of technology to enhance the safety, efficiency, and convenience of surface transportation under the agency's Intelligent Transportation Systems program.

National Highway Traffic Safety Administration

The President is requesting $141.0 million in R&D and R&D facilities funding for FY2023 for NHTSA, 10.5% ($13.4 million) above the FY2022 enacted amount. NHTSA R&D focuses on automation and the study of human machine interfaces, advanced vehicle safety technology, improving vehicle crashworthiness and crash avoidance, and reducing unsafe driving behaviors.

Other DOT Components

R&D activities are also supported by several other DOT components or agencies (see **Table 18**). The President's FY2023 request includes DOT R&D activities and facilities funding for

- the Federal Railroad Administration, totaling $58.0 million, 41.5% ($17.0 million) above the FY2022 enacted level of $41.0 million;
- the Federal Transit Administration, totaling $67.6 million, 38.5% ($18.8 million) above the FY2022 enacted level of $48.8 million;
- the Pipeline and Hazardous Materials Safety Administration, totaling $24.8 million, 30.5% ($5.8 million) above the FY2022 enacted level of $19.0 million;
- the Office of the Secretary, totaling $46.1 million, 78% ($20.2 million) above the FY2022 enacted level of $25.9 million; and

[127] Department of Transportation, Federal Highway Administration, *FHWA FY2023 Budget*, p. I-10, https://www.transportation.gov/sites/dot.gov/files/2022-03/FHWA_Budget_Estimates_FY23.pdf.

- the Federal Motor Carrier Safety Administration, totaling $14.1 million, the same amount as FY2022.

Table 18. Department of Transportation R&D Activities and Facilities

(budget authority, in millions of dollars)

	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Federal Aviation Administration	470.2	534.5			
Research, Engineering, and Development	*198.0*	*260.5*			
Federal Highway Administration	475.9	518.0			
Highway Research and Development	*134.2*	*147.0*			
Intelligent Transportation Systems	*100.0*	*110.0*			
National Highway Traffic Safety Administration	127.6	141.0			
Federal Railroad Administration	41.0	58.0			
Federal Transit Administration	48.8	67.6			
Pipeline and Hazardous Materials Safety Administration	19.0	24.8			
Office of the Secretary	25.9	46.1			
Federal Motor Carrier Safety Administration	14.1	14.1			
DOT, R&D Total	**1,222.5**	**1,404.1**			

Source: U.S. Department of Transportation, *Fiscal Year 2023 Budget Estimate* for pertinent administrations, Exhibit IV-1 Research, Development and Technology Budget table, https://www.transportation.gov/mission/budget/fiscal-year-2023-budget-estimates.

Note: Figures reported here are the totals for each administration's research, development and technology budget table, except for those administrations for which the budget tables listed administrative expenses separately; in those cases, the administrative expenses were subtracted from the totals reported here. Components may not add to total due to rounding. Lines in italics are components of the agency lines above them and are not counted separately in the total.

Department of the Interior[128]

The Department of the Interior (DOI) is a federal executive department responsible for the conservation and use of approximately two-thirds of the estimated 640 million acres of federal land.[129] DOI defines its mission as to protect and manage the nation's natural resources and cultural heritage for the benefit of the American people; to provide scientific and scholarly information about those resources and natural hazards; and to exercise the country's trust responsibilities and special commitments to American Indians, Alaska Natives, and island

[128] This section was written by Mark K. DeSantis, Analyst in Natural Resources Policy, CRS Resources, Science, and Industry Division.

[129] For more information on the Department of the Interior, see CRS Report R45480, *U.S. Department of the Interior: An Overview*, by Mark K. DeSantis.

territories under U.S. administration.[130] DOI has a wide range of responsibilities, including, among other things, mapping; geological, hydrological, and biological science; migratory bird, wildlife, and endangered species conservation; surface-mined lands protection and restoration; and historic preservation.

The Administration is requesting $17.46 billion in net discretionary funding for DOI in FY2023.[131] Of that amount, $1.44 billion is proposed for R&D, $320 million (29%) above the FY2022 estimated level of $1.12 billion.[132] Funding for DOI R&D is generally included in appropriations line items that also include non-R&D activities. How much of the funding provided in appropriations legislation is allocated to R&D specifically is unclear unless funding is provided at the precise level of the request. In general, R&D funding levels are known only after DOI components allocate their appropriations to specific activities and report those figures.

U.S. Geological Survey

The U.S. Geological Survey typically accounts for more than two-thirds of all DOI R&D funding. A single appropriations account, Surveys, Investigations, and Research (SIR), provides all USGS funding. USGS R&D is conducted under seven SIR activity/program areas: Ecosystems; Energy and Mineral Resources; Natural Hazards; Water Resources; Core Science Systems; Science Support; and Facilities.[133]

The President's total FY2023 budget request for USGS is $1.71 billion, up $317 million (23%) from the FY2022 enacted level of $1.39 billion.[134] Of the proposed FY2023 total, $1.04 billion would be for R&D, an increase of $270 million (35%) from the FY2022 estimated level of $772 million.[135]

Other DOI Components

The President's FY2023 request also includes R&D funding for the following DOI components:

- Bureau of Reclamation (BOR): $125 million for FY2023, up $8 million (7%) from the FY2022 estimate.
- Bureau of Ocean Energy Management (BOEM): $120 million for FY2023, up $36 million (43%) from the FY2022 estimate.
- Fish and Wildlife Service (FWS): $57 million for FY2023, equal to the FY2022 estimate.

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[130] Department of the Interior, *Strategic Plan for Fiscal Years 2018-2022* and *Strategic Plan for Fiscal Years 2014-2018*, available at https://www.doi.gov/performance/strategic-planning.

[131] Department of the Interior, *Fiscal Year 2023: The Interior Budget in Brief*, April 2022, p. DH-3.

[132] EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2023, Research and Development*, April 2022, p. 253. FY2022 figures reflect annualized appropriations provided by the 2022 Continuing Resolution as well as including enacted legislation as of January 2022.

[133] In FY2022, Congress also included funding for a Congressionally Directed Spending (CDS) item for the USGS under a "Special Initiatives" line item. For more information, see CRS In Focus IF11850, *The U.S. Geological Survey (USGS): FY2022 Appropriations and Background*, by Anna E. Normand.

[134] FY2023 figures are taken from Department of the Interior, *Fiscal Year 2023: The Interior Budget in Brief*, April 2022, p. USGS-6. FY2022 figures are from P.L. 117-103. For more information on USGS FY2023 appropriations, see CRS In Focus IF12097, *The U.S. Geological Survey (USGS): FY2023 Appropriations and Background*, by Anna E. Normand.

[135] Email communications between CRS and OMB, April 2022.

- National Park Service (NPS): $34 million for FY2023, up $6 million (21%) from the FY2022 estimate.
- Bureau of Safety and Environmental Enforcement (BSEE): $32 million for FY2023, equal to the FY2022 estimate.
- Bureau of Land Management (BLM): $21 million for FY2023, equal to the FY2022 estimate.
- Wildland Fire Management (WFM): $6 million for FY2023, equal to the FY2022 estimate.
- Bureau of Indian Affairs (BIA): $5 million for FY2023, equal to the FY2022 estimate.
- Office of Surface Mining Reclamation and Enforcement (OSMRE): $1 million for FY2023, equal to the FY2022 estimate.

Table 19 summarizes FY2022 estimated R&D funding and the President's FY2023 R&D funding request for DOI components.

Table 19. Department of the Interior R&D

(budget authority, in millions of dollars)

	FY2022 Estimate	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
U.S. Geological Survey (USGS)	772	1,042			
Bureau of Reclamation (BOR)	117	125			
Bureau of Ocean Energy Management (BOEM)	84	120			
Fish and Wildlife Service (FWS)	57	57			
National Park Service (NPS)	28	34			
Bureau of Safety and Environmental Enforcement (BSEE)	32	32			
Bureau of Land Management (BLM)	21	21			
Bureau of Indian Affairs (BIA)	5	5			
Wildland Fire Management (WFM)	6	6			
Office of Surface Mining Reclamation and Enforcement (OSMRE)	1	1			
Department of the Interior, R&D Total	**1,123**	**1,443**			

Sources: EOP, OMB, *Analytical Perspectives, Budget of the United States Government, Fiscal Year 2023, Research and Development,* p. 253; and email communications between CRS and OMB, April 2022.

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns currently blank may become available as action is completed.

Department of Homeland Security[136]

The Department of Homeland Security has identified five core missions: to prevent terrorism and enhance security, to secure and manage the borders, to enforce and administer immigration laws, to safeguard and secure cyberspace, and to ensure resilience to disasters. New technology resulting from research and development can contribute to achieving all these goals. The Directorate of Science and Technology (S&T) has primary responsibility for establishing, administering, and coordinating DHS R&D activities. Other components, such as the Countering Weapons of Mass Destruction Office and the Transportation Security Administration, conduct R&D relating to their specific missions.

The President's FY2023 budget request for DHS includes $590 million for activities identified as R&D. This would be a decrease of 11.2% from $664 million in FY2022. The requested total includes $459 million for the R&D account in the S&T Directorate and smaller amounts for five other DHS components. (See **Table 20**.)

The S&T Directorate performs R&D in several laboratories of its own and funds R&D performed by the DOE national laboratories, industry, universities, and others. It also conducts testing and other technology-related activities in support of acquisitions by other DHS components. The Administration's FY2023 request of $459 million for the S&T Directorate R&D account would be a decrease of 15.5% from $543 million in FY2022. Within the R&D account, the Research, Development, and Innovation budget line would decrease by $70 million, including decreases for Border Security (down $32 million); First Responder/Disaster Resilience (down $22 million); Cyber Security/Information Analysis (down $12 million); Chemical, Biological, and Explosives Defense (down $11 million); and Counter Terrorist (down $8 million); and increases for Innovative Research and Foundational Tools (up $14 million) and Physical Security and Critical Infrastructure Resilience (up $2 million). In the University Programs budget line, the request for university centers of excellence is $46 million, down from $58 million in FY2021.

In addition to its R&D account, the S&T Directorate receives funding for laboratory facilities and other R&D-related expenses through two other accounts (not shown in the table). The total request for the directorate is $901 million, an increase of 1.7% from $886 million in FY2022. The directorate's Procurement, Construction, and Improvements account would receive $89 million under the Administration's request (versus $13 million in FY2022), including $40 million in new funding for design and construction of a detection sciences facility at the Transportation Security Laboratory; $36 million in new funding for critical repairs and replacements at multiple S&T Directorate laboratories; and $13 million (up less than $1 million from FY2022) to continue preparations for the closure of the Plum Island Animal Disease Center—which is being replaced by the National Bio and Agro-Defense Facility—and the sale of Plum Island itself.[137]

[136] This section was written by Daniel Morgan, Specialist in Science and Technology Policy, CRS Resources, Science, and Industry Division.

[137] The S&T Directorate is building NBAF using previously appropriated funds and is to transfer the facility to the USDA once it becomes operational. For more information, see CRS In Focus IF11492, *National Bio and Agro-Defense Facility: Purpose and Status*, by Genevieve K. Croft.

Table 20. Department of Homeland Security R&D Accounts

(budget authority, in millions of dollars)

	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Science and Technology Directorate	543	459			
Countering Weapons of Mass Destruction Office	66	83			
Transportation Security Administration	36	34			
Cybersecurity and Infrastructure Security Agency	10	4			
U.S. Coast Guard	7	7			
U.S. Secret Service	2	4			
Total, DHS R&D	**664**	**590**			

Sources: FY2022 enacted from P.L. 117-103. FY2023 request from DHS congressional budget justification, https://www.dhs.gov/publication/congressional-budget-justification-fiscal-year-fy-2023.

Notes: Table includes accounts titled "Research and Development" in each DHS component. Some other accounts may also fund R&D-related activities. Some amounts may not add to totals due to rounding. Figures for the columns currently blank may become available as action is completed.

Environmental Protection Agency[138]

The U.S. Environmental Protection Agency (EPA) administers multiple environmental pollution control laws, many of which are carried out under a delegated framework with states and tribes (and local governments for certain authorities). To carry out this mission, EPA funds a broad range of R&D activities intended to provide scientific tools and knowledge that inform decisions relating to preventing, regulating, and abating environmental pollution. Since FY2006, Congress has funded EPA's discretionary budget through the Interior, Environment, and Related Agencies annual appropriations acts.

Appropriations for EPA R&D are generally included in programs and activities that also include non-R&D functions. Annual appropriations bills and the accompanying committee reports do not identify precisely how much funding is allocated to EPA R&D alone. EPA determines R&D funding levels for its operations by allocating the agency's appropriations for authorized activities and reporting those amounts.

The agency's Science and Technology (S&T) appropriations account[139] funds much of EPA's scientific research activities, which include R&D conducted by the agency at its own laboratories and facilities, and R&D and related scientific research conducted by universities, foundations, and other nonfederal entities that receive EPA grants. The S&T account generally receives a base

[138] This section was written by Angela C. Jones, Analyst in Environmental Policy, CRS Resources, Science, and Industry Division. For an overview of FY2022 appropriations for Interior, Environment, and Related Agencies, which includes EPA, see CRS Report R46908, *Interior, Environment, and Related Agencies: Overview of FY2022 Appropriations*, by Carol Hardy Vincent.

[139] In 1995, Congress established eight statutory accounts for EPA, including the S&T account. The S&T account incorporates elements of the former EPA Research and Development account, as well as portions of the former Salaries and Expenses and Program Operations accounts, which were in place until FY1996. Currently, discretionary funding is annually appropriated to EPA among 10 statutory accounts established by Congress over time in annual appropriations acts. Because of the differences in the scope of the activities included in these accounts, a comparable breakout of funding for these same activities before FY1996 is not readily available.

appropriation and a transfer from the Hazardous Substance Superfund (Superfund) account for research on more effective methods for remediating contaminated sites.[140]

EPA's Office of Research and Development (ORD) is the primary manager of R&D at EPA headquarters and laboratories around the country, as well as EPA-supported R&D external to the agency. A large portion of the S&T account funds EPA R&D activities managed by ORD, including research grants. Programs implemented by other offices within EPA also may have a research component, but the research component is not necessarily the primary focus of the particular program.

Enacted on March 15, 2022, Division G of the Consolidated Appropriations Act, 2022 (P.L. 117-103) includes the Department of the Interior, Environment, and Related Agencies appropriations for FY2022. Division G, Title II of P.L. 117-103 provides $781.2 million for EPA's S&T account, which includes a $31.0 million transfer from the Superfund account.

For FY2023, the President requested a total of $895.5 million for EPA's S&T account, including a $31.4 million transfer from the Superfund account.[141] The FY2023 requested amount is $114.3 million (14.6%) more than the FY2022 enacted amount for the S&T account, which included a $31.0 million transfer from the Superfund account.

Table 21 presents a comparison of the FY2022 enacted appropriations and the President's FY2023 request for program areas and activities funded within EPA's S&T account. The program areas and activities listed in **Table 21** are only those identified in funding tables presented in explanatory statements accompanying annual appropriations bills that fund EPA. The explanatory statements include additional breakouts of funding and directive language for certain activities within these broader program areas. EPA's annual budget justification also identifies specific amounts of funding for various subprogram activities not listed in these explanatory statements.

Table 21. U.S. Environmental Protection Agency Science and Technology Account

(appropriations, in millions of dollars)

S&T Program Areas and Activities	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Clean Air[a]	134.3	181.6			
Atmospheric Protection Program[b]	*8.0*	*10.2*			
Enforcement	14.0	15.5			
Homeland Security	35.7	40.9			
Indoor Air and Radiation	5.3	6.9			
Information Technology/Data Management/Security	3.1	3.2			
Operations and Administration	67.5	68.9			
Pesticide Licensing	5.9	6.2			
Research: Air and Energy[c]	95.4	132.9			
Research: Chemical Safety and Sustainability	127.4	140.4			

[140] See footnote 30 for more information on Superfund.

[141] EPA, *Fiscal Year 2023 Justification of Appropriation Estimates for the Committee on Appropriations*, EPA-190-R-22-001, April 2022, https://www.epa.gov/system/files/documents/2022-04/fy-2023-congressional-justification-all-tabs.pdf.

S&T Program Areas and Activities	FY2022 Enacted	FY2023 Request	FY2023 House	FY2023 Senate	FY2023 Enacted
Research: Computational Toxicology	*21.4*	*22.5*			
Research: Endocrine Disruptor	*16.3*	*17.1*			
Research: National Priorities[d]	11.4	0.0			
Research: Safe and Sustainable Water Resources	112.6	119.3			
Research: Sustainable and Healthy Communities	133.2	141.5			
Water: Human Health Protection[e]	4.4	6.8			
Subtotal Base S&T Account	**750.2**	**864.2**			
Transfer from Hazardous Substance Superfund Account to the S&T Account	**31.0**	**31.4**			
Total, S&T Account (Net Appropriations)	**781.2**	**895.5**			

Source: Prepared by CRS. Amounts in the table are generally as presented in P.L. 117-103; the explanatory statement accompanying H.R. 2471, as printed in the *Congressional Record,* vol. 168, no. 42—Book IV (March 9, 2022), pp. H2632-H2633 (funding tables); EPA, *Fiscal Year 2023 Justification of Appropriation Estimates for the Committee on Appropriations*, EPA-190-R-22-001, April 2022, https://www.epa.gov/system/files/documents/2022-04/fy-2023-congressional-justification-all-tabs.pdf; pp. 3 and 1112-1113 (pp. 18 and 1127-1128 of the PDF).

Notes: Totals may differ from the sum of the components due to rounding. Figures for the columns headed "FY2023 House," "FY2023 Senate," and "FY2023 Final" will be added, if available, as action is completed.

a. EPA's FY2023 budget justification refers to this program area as "Clean Air and Climate."

b. EPA's FY2023 budget justification refers to this program area as "Climate Protection."

c. EPA's FY2023 budget justification refers to this program area as "Research: Air, Climate, and Energy."

d. The President's annual budget request typically does not include funding for "Research: Congressional Priorities." The House and Senate refer to this program area as "Research: National Priorities" for which the House or Senate allocates funding for specific research activities.

e. EPA's FY2023 budget justification refers to this program area as "Ensure Safe Water."

Appendix A. Acronyms and Abbreviations

Acronym/ Abbreviation	Organization/Term
ACF	Administration for Children and Families
AFRI	Agriculture and Food Research Initiative
AGARDA	Agriculture Advanced Research and Development Authority
AHRQ	Agency for Healthcare Research and Quality
AI	Artificial Intelligence
AIMS	Arctic Infrastructure Modernization for Science
AOAM	Agency Operations and Award Management
ARPA-C	Advanced Research Projects Agency-Climate
ARPA-E	Advanced Research Projects Agency-Energy
ARPA-H	Advanced Research Projects Agency-Health
ARS	Agricultural Research Service
B&F	Buildings and Facilities
BA	Budget Authority
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOEM	Bureau of Ocean Energy Management
BOR	Bureau of Reclamation
BSEE	Bureau of Safety and Environmental Enforcement
CA	Convergence Accelerator
CDC	Centers for Disease Control and Prevention
CJS	Commerce, Justice, Science, and Related Agencies
CLARREO	Climate Absolute Radiance and Refractivity Observatory
CMS	Centers for Medicare and Medicaid Services
CR	Continuing Resolution
CRF	Construction of Research Facilities
DARPA	Defense Advanced Research Projects Agency
DHP	Defense Health Program
DHS	Department of Homeland Security
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
DRA	Designated Research Area
EFNEP	Expanded Food and Nutrition Education Program

Acronym/ Abbreviation	Organization/Term
EDU	Education and Human Resources
EOP	Executive Office of the President
EPA	Environmental Protection Agency
EPSCoR	Established Program to Stimulate Competitive Research
ERS	Economic Research Service
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FHWA	Federal Highway Administration
FIC	Fogarty International Center
FMCSA	Federal Motor Carrier Safety Administration
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FW-HTF	Future of Work at the Human Technology Frontier
FWS	Fish and Wildlife Service
FY	Fiscal Year
GCR	Growing Convergence Research
GCRA	Global Change Research Act of 1990 (P.L. 101-606)
GDP	Gross Domestic Product
GRFP	Graduate Research Fellowship Program
GWOT	Global War on Terror
HBCU	Historically Black Colleges and Universities
HDR	Harnessing the Data Revolution (for 21st-Century Science and Engineering)
HHS	Department of Health and Human Services
HLS	Human Landing System
HRSA	Health Resources and Services Administration
ICs	Institutes and Centers
INCLUDES	Inclusion across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science
ISS	International Space Station
IT	Information technology
ITER	International Thermonuclear Experimental Reactor
ITS	Industrial Technology Services
LEO	Low Earth Orbit
LGUs	Land-Grant Colleges and Universities
LHHS	Labor, HHS, and Education
LSST	Large Synoptic Survey Telescope
MEP	Manufacturing Extension Partnership

Acronym/ Abbreviation	Organization/Term
MREFC	Major Research Equipment and Facilities Construction
MSI	Minority Serving Institutions
NAL	National Agricultural Library
NASA	National Aeronautics and Space Administration
NASS	National Agricultural Statistics Service
NBAF	National Bio and Agro-Defense Facility
NCATS	National Center for Advancing Translational Sciences
NCI	National Cancer Institute
NCO	National Coordinating Office (NITRD)
NEF	Nonrecurring Expenses Fund
NEI	National Eye Institute
NESDIS	National Environmental Satellite, Data, and Information Service
NHGRI	National Human Genome Research Institute
NHLBI	National Heart, Lung, and Blood Institute
NHTSA	National Highway Traffic Safety Administration
NIA	National Institute on Aging
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NIAID	National Institute of Allergy and Infectious Diseases
NIAMS	National Institute of Arthritis and Musculoskeletal and Skin Diseases
NIBIB	National Institute of Biomedical Imaging and Bioengineering
NICHD	National Institute of Child Health and Human Development
NIDA	National Institute on Drug Abuse
NIDCD	National Institute on Deafness and Other Communication Disorders
NIDCR	National Institute of Dental and Craniofacial Research
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIEHS	National Institute of Environmental Health Sciences
NIFA	National Institute of Food and Agriculture
NIGMS	National Institute of General Medical Sciences
NIH	National Institutes of Health
NIIMBL	National Institute for Innovation in Manufacturing Biopharmaceuticals
NIMH	National Institute of Mental Health
NIMHD	National Institute on Minority Health and Health Disparities
NINDS	National Institute of Neurological Disorders and Stroke
NINR	National Institute of Nursing Research
NIST	National Institute of Standards and Technology
NITRD	Networking and Information Technology Research and Development

Acronym/ Abbreviation	Organization/Term
NLM	National Library of Medicine
NMFS	National Marine Fisheries Service
NNA	Navigating the New Arctic
NNI	National Nanotechnology Initiative
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NPS	National Park Service
NRT	National Research Traineeship
NSB	National Science Board
NSET	Nanoscale Science, Engineering, and Technology (NSTC Subcommittee)
NSF	National Science Foundation
NSTC	National Science and Technology Council
NWS	National Weather Service
OAR	Oceanic and Atmospheric Research
OCO	Overseas Contingency Operations
OCS	Office of the Chief Scientist (USDA)
OD	NIH Office of the Director
OIG	Office of the Inspector General
OMAO	Office of Marine and Aviation Operations
OMB	Office of Management and Budget
ORD	Office of Research and Development
OSMRE	Office of Surface Mining Reclamation and Enforcement
OST	Office of the Secretary of Transportation
OSTP	Office of Science and Technology Policy
PACE	Pre-Aerosol, Clouds, and Ocean Ecosystem
PE	Program Element
PHMSA	Pipeline and Hazardous Materials Safety Administration
PHSA	Public Health Service Act
PIADC	Plum Island Animal Disease Center
PRIF	Pediatric Research Initiative Fund
QIS	Quantum Information Science
R&D	Research and Development
RDT&E	Research, Development, Test, and Evaluation
RE&D	Research, Engineering, and Development
REE	Research, Education, and Economics
RRA	Research and Related Activities

Acronym/ Abbreviation	Organization/Term
SARE	Sustainable Agriculture Research and Education
S&T	Science and Technology
SIR	Surveys, Investigations, and Research
SLS	Space Launch System
SOFIA	Stratospheric Observatory for Infrared Astronomy
STEM	Science, Technology, Engineering, and Mathematics
STRS	Scientific and Technical Research and Services
TIP	Technology, Innovation, and Partnerships (NSF Directorate)
TOA	Total Obligational Authority
URoL	Understanding the Rules of Life
USDA	Department of Agriculture
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
VA	Department of Veterans Affairs
VHA	Veterans Health Administration
WFIRST	Wide Field Infrared Space Telescope
WFM	Wildland Fire Management
WoU	Windows on the Universe

Appendix B. CRS Contacts for Agency R&D

The following table lists the primary CRS experts on R&D funding for the agencies covered in this report.

Agency	CRS Contact
Department of Agriculture	Genevieve K. Croft Analyst in Agricultural Policy
Department of Commerce	
National Institute of Standards and Technology	John F. Sargent Specialist in Science and Technology Policy Emily G. Blevins Analyst in Science and Technology Policy
National Oceanic and Atmospheric Administration	Eva Lipiec Analyst in Natural Resources Policy
Department of Defense	Marcy E. Gallo Analyst in Science and Technology Policy
Department of Energy	Daniel Morgan Specialist in Science and Technology Policy
Department of Health and Human Services National Institutes of Health	Kavya Sekar Analyst in Health Policy
Department of Homeland Security	Daniel Morgan Specialist in Science and Technology Policy
Department of the Interior	Mark K. DeSantis Analyst in Natural Resources Policy
Department of Transportation	David Randall Peterman Analyst in Transportation Policy
Department of Veterans Affairs	Jared S. Sussman Analyst in Health Policy
Environmental Protection Agency	Angela C. Jones Analyst in Environmental Policy
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