14. RESEARCH AND DEVELOPMENT

Investments in research and development (R&D) are necessary to help spur innovation across the economy and renew America's global leadership. R&D is also critical to tackling the climate crisis and driving the emerging technologies that will power future industries and create good-paying jobs across the nation. The 2022 Budget proposes $171.26 billion, a 9 percent increase, in total research and development across the Federal Government. A breakdown of the request by the major funding Department or agency is shown in the table at the end of this chapter. In addition to the 2022 Budget figures discussed in this chapter, the American Jobs Plan includes major R&D investments, including $50 billion in the National Science Foundation, $30 billion in additional funding for R&D that spurs innovation and job creation and $40 billion to upgrade research infrastructure in laboratories across the country.

FEDERAL R&D DATA

R&D is the collection of efforts directed toward gaining greater knowledge or understanding and applying knowledge toward the production of useful materials, devices, and methods. R&D investments can be characterized as basic research, applied research, experimental development, R&D equipment, or R&D facilities. The Office of Management and Budget (OMB) has used those or similar categories in its collection of R&D data since 1949. Please note that R&D crosscuts in specific topical areas as mandated by law will be reported separately in forthcoming Supplements to the President's 2022 Budget.

Background on Federal R&D Funding

More than 20 Federal agencies fund R&D in the United States. The character of the R&D that these agencies fund depends on the mission of each agency and on the role of R&D in accomplishing it. Table 14–1 shows agency-by-agency spending on basic research, applied research, experimental development, and R&D equipment and facilities.

Basic research is systematic study directed toward a fuller knowledge or understanding of the fundamental aspects of phenomena and of observable facts without specific applications toward processes or products in mind. Basic research, however, may include activities with broad applications in mind.

Applied research is systematic study to gain knowledge or understanding necessary to determine the means by which a recognized and specific need may be met.

Experimental development is 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.

Research and development equipment includes acquisition or design and production of movable equipment, such as spectrometers, research satellites, detectors, and other instruments. At a minimum, this category includes programs devoted to the purchase or construction of R&D equipment.

Research and development facilities include the acquisition, design, and construction of, or major repairs or alterations to, all physical facilities for use in R&D activities. Facilities include land, buildings, and fixed capital equipment, regardless of whether the facilities are to be used by the Government or by a private organization, and regardless of where title to the property may rest. This category includes such fixed facilities as reactors, wind tunnels, and particle accelerators.

Table 14–1. FEDERAL RESEARCH AND DEVELOPMENT SPENDING

(Mandatory and discretionary budget authority[1], dollar amounts in millions)

	2020 Actual	2021 Estimate[2]	2022 Proposed[3]	Dollar Change: 2021 to 2022	Percent Change: 2021 to 2022
By Agency					
Defense[4]	62,438	63,350	62,800	–550	–1%
Health and Human Services	44,455	43,494	51,232	7,738	18%
Energy	19,476	19,312	21,452	2,140	11%
NASA	14,801	13,226	14,565	1,339	10%
National Science Foundation	6,800	7,408	8,173	765	10%
Agriculture	2,989	2,965	3,609	644	22%
Commerce	1,953	2,122	2,743	621	29%
Veterans Affairs	1,366	1,420	1,498	78	5%
Interior	1,043	1,024	1,339	315	31%
Transportation	1,094	1,033	1,221	188	18%
Homeland Security	532	590	627	37	6%
Environmental Protection Agency	516	524	585	61	12%
Education	237	445	473	28	6%
Smithsonian Institution	344	322	346	24	7%
Other	582	563	597	34	6%
TOTAL	**158,626**	**157,798**	**171,260**	**13,462**	**9%**
Basic Research					
Defense	2,546	2,651	2,362	–289	–11%
Health and Human Services	21,826	21,872	24,022	2,150	10%
Energy	5,494	5,519	5,892	373	7%
NASA	6,655	4,515	5,620	1,105	24%
National Science Foundation	5,437	5,966	6,532	566	9%
Agriculture	1,061	1,124	1,416	292	26%
Commerce	241	250	320	70	28%
Veterans Affairs	523	555	584	29	5%
Interior	82	84	171	87	104%
Transportation	16	16	16	0	0%
Homeland Security	47	53	70	17	32%
Environmental Protection Agency	.....	.....	.....	.....	.....
Education	58	78	58	–20	.....
Smithsonian Institution	290	288	310	22	8%
Other	14	14	14	0	0%
SUBTOTAL	**44,290**	**42,985**	**47,387**	**4,402**	**10%**
Applied Research					
Defense	6,274	6,654	5,559	–1,095	–16%
Health and Human Services	22,081	21,297	26,835	5,538	26%
Energy[5]	8,444	7,395	7,669	274	4%
NASA	2,668	2,669	2,982	313	12%
National Science Foundation	834	848	1,047	199	23%
Agriculture	1,285	1,344	1,634	290	22%
Commerce	1,074	1,150	1,353	203	18%
Veterans Affairs	813	835	882	47	6%
Interior	778	768	961	193	25%
Transportation	702	716	879	163	23%
Homeland Security	165	178	203	25	14%
Environmental Protection Agency	400	406	460	54	13%
Education	129	242	311	69	29%
Smithsonian Institution	.....	.....	.....	.....	.....
Other	345	341	351	10	3%
SUBTOTAL	**45,992**	**44,843**	**51,126**	**6,283**	**14%**

Table 14–1. FEDERAL RESEARCH AND DEVELOPMENT SPENDING—Continued

(Mandatory and discretionary budget authority[1], dollar amounts in millions)

	2020 Actual	2021 Estimate[2]	2022 Proposed[3]	Dollar Change: 2021 to 2022	Percent Change: 2021 to 2022
Experimental Development					
Defense[4]	51,764	54,045	54,859	814	2%
Health and Human Services	53	53	53	0	0%
Energy[6]	3,060	3,715	5,206	1,491	40%
NASA	5,430	5,990	5,915	–75	–1%
National Science Foundation	.....	.....	.....	.....	.....
Agriculture	295	306	359	53	17%
Commerce	272	370	413	43	12%
Veterans Affairs	30	30	32	2	7%
Interior	181	170	205	35	21%
Transportation	338	269	288	19	7%
Homeland Security	320	340	345	5	1%
Environmental Protection Agency	116	118	125	7	6%
Education	50	125	104	–21	–17%
Smithsonian Institution	.....	.....	.....	.....	.....
Other	215	208	232	24	12%
SUBTOTAL	**62,124**	**65,739**	**68,136**	**2,397**	**4%**
Facilities and Equipment					
Defense	1,854	0	20	20	.....
Health and Human Services	495	272	322	50	18%
Energy	2,478	2,683	2,685	2	0%
NASA	48	52	48	–4	–8%
National Science Foundation	529	594	594	0	0%
Agriculture	348	191	200	9	5%
Commerce	366	352	657	305	87%
Veterans Affairs	.....	.....	.....	.....	.....
Interior	2	2	2	0	0%
Transportation	38	32	38	6	19%
Homeland Security	0	19	9	–10	.....
Environmental Protection Agency	.....	.....	.....	.....	.....
Education	.....	.....	.....	.....	.....
Smithsonian Institution	54	34	36	2	0%
Other	8	0	0	0	0%
SUBTOTAL	**6,220**	**4,231**	**4,611**	**380**	**9%**

[1] This table shows funding levels for Departments or Independent agencies with more than $200 million in R&D activities in 2022.

[2] The FY 2021 Estimate column applies the main FY 2022 President's Budget volume approach of using FY 2021 enacted appropriations.

[3] Amounts shown in FY 2022 do not include R&D funding from the American Jobs Plan.

[4] The totals for Experimental Development spending do not include the DOD Budget Activity 06 (Research, Development, Test, and Evaluation Management Support). OMB and DOD are currently evaluating whether Activity 06 may in the future be categorized as Experimental Development.

[5] Of the percent change for Energy's applied research, -5% is defense and 17% is non-defense.

[6] Of the percent change for Energy's experimental development, -3% is defense and 114% is non-defense.