

Scale of Government Procurement of Carbon-Intensive Materials in the U.S.



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Executive Summary

Public procurement accounts for an average of 12 percent of gross domestic product (GDP) in Organization for Economic Cooperation and Development (OECD) countries, and up to 30 percent of GDP in many developing countries. When public entities leverage their large-scale purchasing power by buying goods and services with a lower carbon footprint, they help drive markets in the direction of sustainability, reduce the negative impacts of their use of goods, and produce positive environmental and social benefits (UNEP, 2017).

This report aims to analyze the scale of government procurement of carbon-intensive materials (in particular, concrete, cement, steel, aluminum, and glass), both at the federal and state-levels, for the development of infrastructure in the U.S. It analyzes the scale of federal funds provided to state and local governments for the development of physical capital, the amount of federal spending on imported and domestic materials for infrastructure projects, and specific states where federal funds are used to purchase significant amounts of materials for infrastructure projects.

Some of the key findings of this report are as follows:

- Federal findings:
 - In 2018, around 68% (\$75.2 billion) of the federal government's non-defense expenditure on physical capital was through grants to state and local governments.
 - In 2018, federal non-defense expenditure on physical capital was dominated by transportation projects, accounting for around 58% (\$63.9 billion) of total. Additionally, 92% (\$58.8 billion) of total federal expenditure on transportation was through federal grants to state and local governments.
 - As per 2012 U.S. Bureau of Economic Analysis (BEA) data, transportation, education, and other non-residential structures represent the highest proportion of total government spending on construction projects (around \$237 billion). The federal government spent around \$75.4 billion, either directly or through federal funds to state and local governments, on construction.
 - Procurement spending was estimated to account for 43% of total spending on construction in 2012. As a result, federal government spending on the procurement of goods and services was determined to be around \$32.4 billion (43% of \$75.4 billion).
 - Using 2012 U.S. BEA data, the total breakdown of government spending on construction was estimated to be: direct federal spending (8%), spending of federal funds by state and local governments (18%) and state and local government own-sourced spending (74%).
- State and Local findings:
 - In FY2017, federal grants accounted for roughly 31% of state budgets and 23% of combined state and local budgets.

- In FY2019, around 26% of state capital expenditures were supported by federal funds.
- As per 2012 U.S. BEA data, state and local governments spent around \$214 billion on construction through their own-sourced funds, with around \$92 billion (43% of \$214 billion) going towards the procurement of goods and services.
- Commodity level findings:
 - In 2012, the federal government spent \$804 million directly and \$1.8 billion indirectly through grants to state and local governments, for the procurement of the five commodities of interest (concrete, cement, steel, aluminum, and glass) for construction.
 - Based on estimations, the federal government procured imported commodities of interest worth around \$156 million for construction in 2012.
 - In 2012, state and local governments spent \$7.5 billion on the procurement of the five commodities of interest through their own-sourced funds.
 - Federal spending on the procurement of concrete and steel for construction projects was in the range of \$2.3 billion and \$190 million respectively, as per 2012 U.S. BEA data.
 - In 2012, government spending (including federal, state, and local) accounted for 42% of total U.S. procurement spending on concrete for construction, with the federal government accounting for 25% of total government procurement spending on concrete.
 - The estimation analysis projected a rise in concrete procurement spending by the federal government, increasing from \$2.3 billion in 2012 to \$5.2 billion in 2018.

In the U.S., there are few federal, state and local regulatory policies to address the “embodied carbon” emissions associated with the production of materials used in publicly funded infrastructure projects. But several voluntary national programs (e.g., Leadership in Energy and Environmental Design (LEED) and Living Building Challenge) have evolved to strengthen focus on embodied carbon. Some cities and states view procurement-based policies as a key opportunity to reduce carbon emissions. Implementation of the Buy Clean California procurement policy may act as a model for other jurisdictions considering embodied carbon policies. Ideally, a U.S. Federal Buy Clean program should be instated, enabling the federal government to leverage its purchasing power to drive decarbonization in energy-and carbon-intensive industrial sectors.

Figures 1 and 2 below provide a quick overview of the analysis carried out in this report. They help explain the distribution and scale of federal spending and procurement. Figure 1 provides a breakdown of total federal outlays on investment based on 2018 data (Campbell & Tawil, 2019). Figure 2 provides an estimate of the scale of federal spending on construction and procurement of certain construction materials, based on BEA’s 2012 Use table data (U.S. BEA, 2020a). The two figures are linked as federal spending on construction is a subset of federal investment in physical capital.

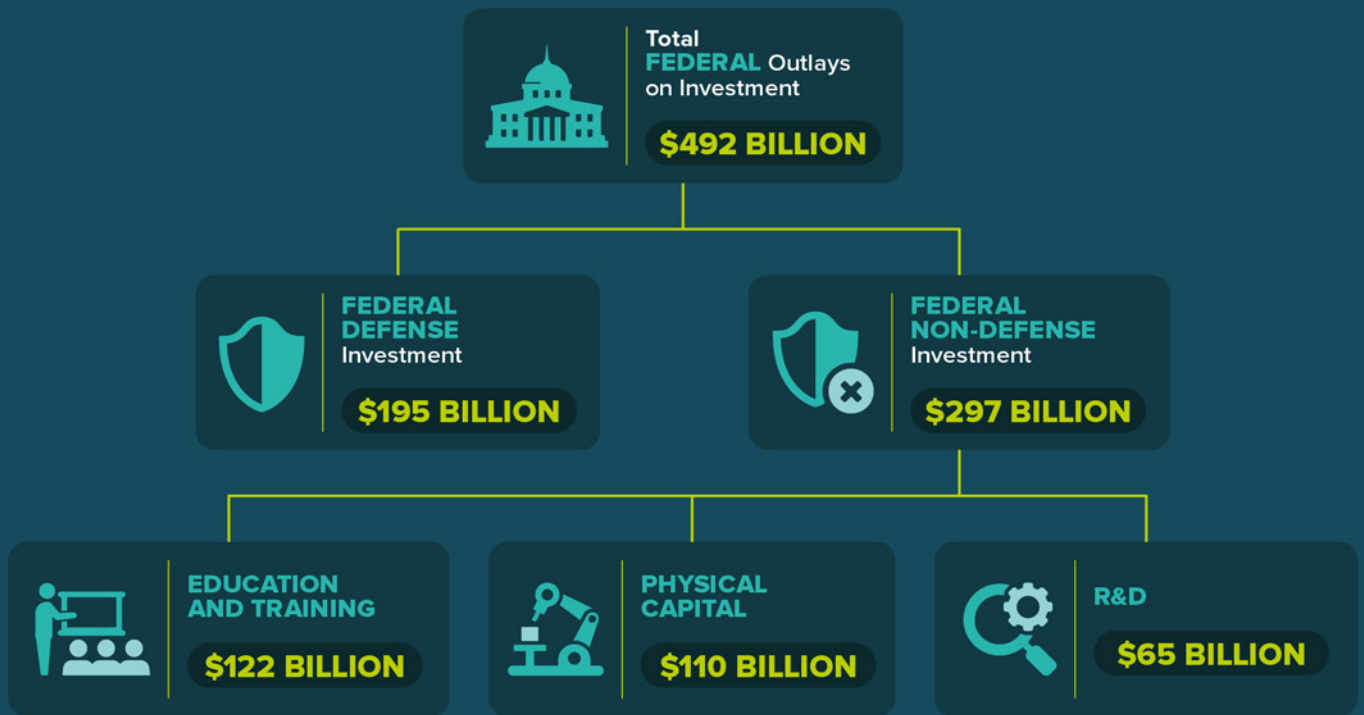


Figure 1: Distribution of Federal Outlays on Investment in 2018 (Campbell & Tawil, 2019)

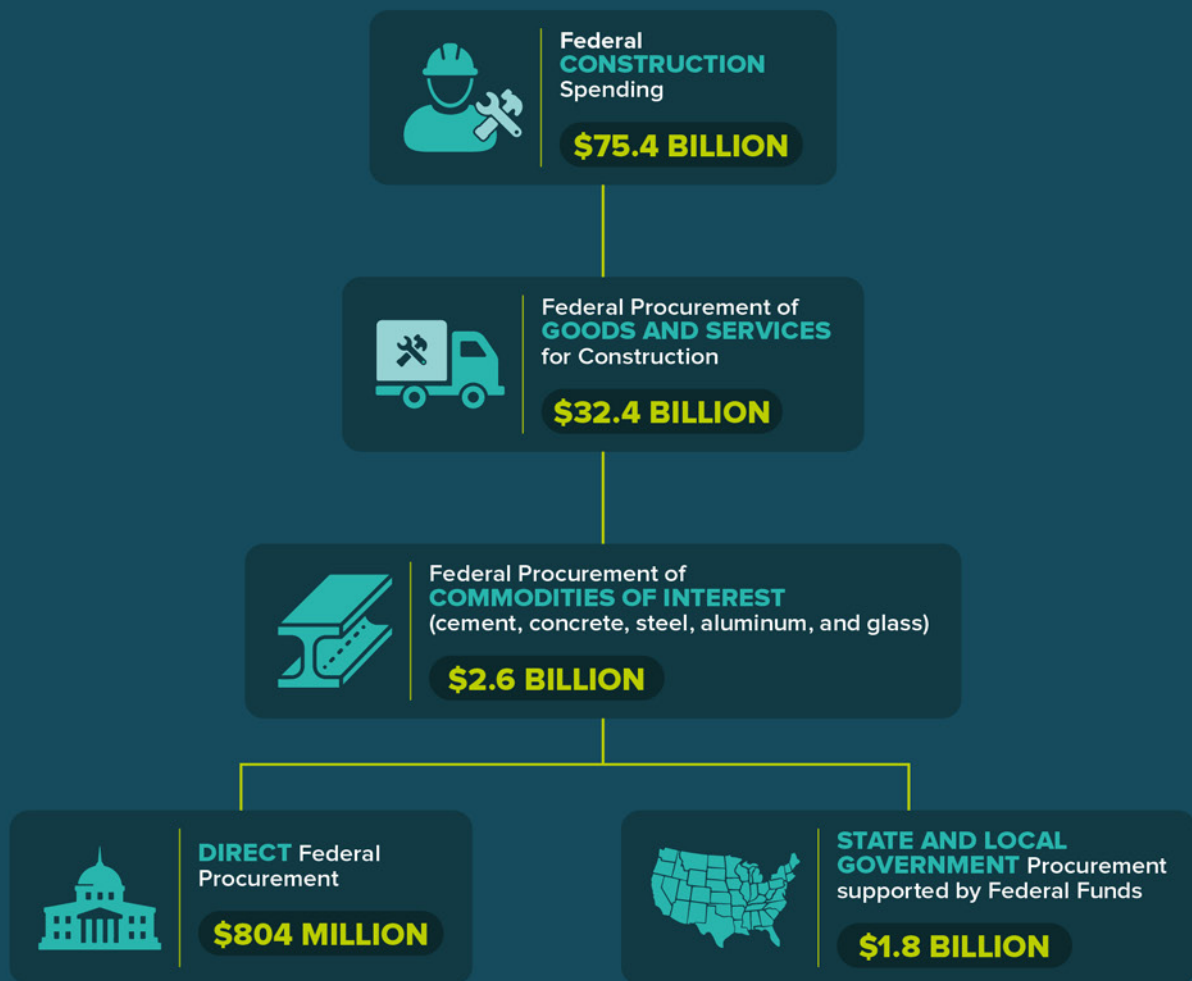


Figure 2: Scale of Federal Construction Spending and Procurement of Commodities in 2012 (U.S. BEA, 2020a) (Note: the latest input-output data available from BEA and used in this analysis was for 2012)

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Public procurement accounts for an average of 12 percent of gross domestic product (GDP) in Organization for Economic Cooperation and Development (OECD) countries, and up to 30 percent of GDP in many developing countries. When public entities leverage their large-scale purchasing power by buying goods and services with a lower carbon footprint, they help drive markets in the direction of sustainability, reduce the negative impacts of their use of goods, and produce positive environmental and social benefits. (UNEP, 2017)

Many governments around the world have already recognized the value of green public procurement (GPP) as a policy instrument and are trying to leverage the money they invest in large contracts to achieve green goals. Hasanbeigi et al. (2019) studied 30 such programs, 22 of which are in countries in Asia, Europe, North and South America, Africa, and Oceania, five case-studies at the city and regional level, as well as GPP programs of three multi-lateral banks and the UN to promote sustainable production and consumption (Hasanbeigi, Becque, & Springer, 2019).

In the United States, 55% of GHG emissions attributed to public institutions are a result of government-purchased goods and products. There is little federal, state, or local regulatory framework to address these emissions, but several voluntary national programs (e.g., Leadership in Energy and Environmental Design (LEED) and Living Building Challenge) have evolved to strengthen focus on embodied carbon. Some cities and states view procurement-based policies as a key opportunity to reduce carbon emissions. Implementation of the Buy Clean California procurement policy may act as a model for other jurisdictions considering embodied carbon policies (Simonen, Huang, & Huang, 2018).

1.1. Definitions of key terminologies

Capital Expenditure (NASBO, 2020): Expenditures on new construction, infrastructure, major repairs and improvements, land purchases and the acquisition of major equipment and existing structures.

Carbon-Intensive Materials: Materials that are associated with a high level of total greenhouse gas (GHG) emissions caused directly or indirectly over their lifetime (high embodied carbon).

Government Gross Expenditure (U.S. BEA, 2018a): Expenditures consisting of government purchases of structures, equipment, and own-account production of structures and software. It includes expenditures by both general government agencies and government enterprises, such as the Federal Financing Bank and the Tennessee Valley Authority.

Own-account production (U.S. BEA, 2018b): Production performed by a business or government for its own use.

Physical Capital (Campbell & Tawil, 2019): Tangible objects that result from investment and can be categorized as 1) structures, such as government buildings, transportation

infrastructure, and water and power projects; 2) major equipment, including computers, machinery, and vehicles; or 3) software.

(Note: In order to qualify as investment, spending on physical capital must have a minimum useful life of two years.)

Procurement (Young, 2020): The act of obtaining goods and services, typically for business purposes.

Structures (U.S. BEA, 2018c): Products that are usually constructed at the location where they will be used and that typically have long economic lives.

Total value of construction put in place (U.S. Census Bureau, 2020a): The “value of construction put in place” is a measure of the value of construction installed or erected at the site during a given period. For an individual project, this includes:

1. Cost of materials installed or erected.
2. Cost of labor (both by contractors and force account) and a proportionate share of the cost of construction equipment rental.
3. Contractor’s profit.
4. Cost of architectural and engineering work.
5. Miscellaneous overhead and office costs chargeable to the project on the owner’s books.
6. Interest and taxes paid during construction (except for state and locally owned projects).

The total value-in-place for a given period is the sum of the value of work done on all projects underway during this period, regardless of when work on each individual project was started or when payment was made to the contractors.

1.2. Objective and structure of the report

The challenge of reducing embodied carbon associated with federally-supported construction projects cannot be effectively addressed without understanding the scale and scope of government procurement of carbon-intensive materials (such as concrete, cement, steel, aluminum, and glass), both at the federal and state-levels, for the development of infrastructure in the U.S. This report analyzes:

- The scale of federal funds provided to state and local governments for the development of physical capital
- The amount of federal procurement spending on imported and domestic materials for infrastructure projects
- Specific states where federal funds are used to purchase significant amounts of materials for infrastructure projects

Chapter 2 begins with a detailed discussion of federal expenditure on physical capital, through direct spending and through grants allocated to state and local governments. A further breakdown of federal expenditure on physical capital is provided to help understand which infrastructure categories dominate federal capital spending. Next, federal grants to state and

local governments are examined in greater detail and classified into two major types: categorical and block grants. Finally, state level expenditure data are analyzed to assess the contribution of federal funds to states' overall budgets.

Chapters 3 and 4 highlight government and private sector spending on construction, and their procurement spending on commodities utilized during construction, by means of input output (IO) modeling. The different commodities of interest analyzed in the report include: concrete, cement, steel, aluminum, and glass. The analysis carried out in these chapters helps understand the scale of federal procurement of various materials for infrastructure projects.

Chapter 5 provides the results of an estimation analysis for identifying the scale of procurement spending on concrete by the government, in select U.S. states. Due to limitations associated with data availability, the analysis was only carried out for a single commodity.

Throughout the report, state level data have been provided, wherever possible, for the 15 states of interest, namely: Arizona, California, Colorado, Florida, Georgia, Illinois, Michigan, New York, North Carolina, Ohio, Oregon, Pennsylvania, Texas, Washington, and Wisconsin. Most of these states are among the top 20 states in terms of annual value of state and local construction expenditure.

This report aims to better inform policymakers about the scale of federal spending on infrastructure, by providing a well-structured analysis of data from multiple credible sources. It is intended to help understand and promote the immense potential of a green public procurement program at the federal level.

1.3. Limitations and information/data gaps

This report utilizes a combination of latest and slightly dated publicly available data sources to come up with meaningful estimations and conclusions. It focuses on the procurement of specific commodities by the government related to infrastructure development.

Due to unavailability of latest year procurement data, the report relies heavily on input-output (IO) analysis carried out by using the detailed-level Use table reported by BEA for the year 2012. In addition, obtaining state level material procurement data was a huge challenge while developing this report, resulting in data being reported for a single commodity, concrete.



Federal Spending Distribution on Infrastructure Projects by Funding Type

- In 2018, federal non-defense investments in physical capital totaled \$110 billion.
- Around 68% (\$75.2 billion) of the federal government's non-defense expenditure on physical capital was through grants to state and local governments.
- Transportation projects accounted for around 60% (\$63.9 billion) of total federal non-defense expenditure on physical capital.
- Around 92% (\$58.8 billion) of total federal expenditure on transportation was through federal grants to state and local governments.
- In FY2017, federal grants accounted for roughly 31% of state budgets and 23% of combined state and local budgets.
- In FY2019, around 26% of state capital expenditures were supported by federal funds.

The federal government supports investments (in infrastructure and in general) through the following main mechanisms (Mallett, 2018):

- ◆ Direct spending
- ◆ Grants to non-federal entities
- ◆ Loans to non-federal entities
- ◆ Tax preferences that reduce tax liabilities for non-federal entities

This chapter mainly focuses on federal spending through direct payments and grants provided to state and local governments.

2.1. Total federal outlays to state and local governments for investment

In 2018, the federal government spent \$492 billion on investment, with almost all of it being discretionary spending. Investments are mainly categorized as: physical capital, research and development (R&D), and education and training. These represent goods and services that would contribute towards a nation's overall growth. Sixty percent of total federal spending on investments, \$297 billion, falls under the non-defense umbrella. (Campbell & Tawil, 2019) Table 1 provides a breakdown of federal non-defense investments by the three expenditure categories.

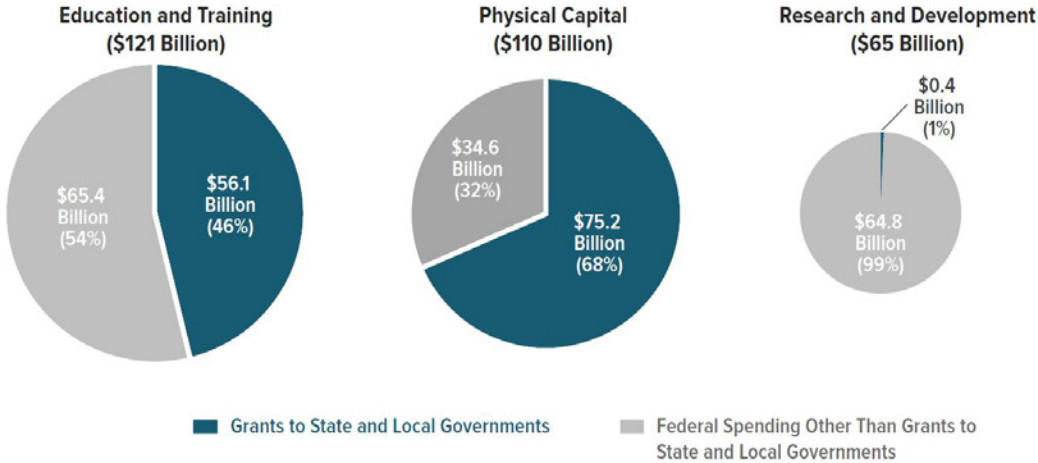
Table 1. Breakdown of federal non-defense investments (billion US\$) (Campbell & Tawil, 2019)

Expenditure Category	Funding
Education and training	122
Physical capital	110
R&D	65
Total	297

The remaining 40% of federal expenditure (\$195 billion) is associated with defense activities, mainly focused on physical capital (\$146 billion) and R&D (\$49 billion). The investments in physical capital under the defense category are mainly linked with the procurement of major equipment like ships and aircrafts. (Campbell & Tawil, 2019)

For the purposes of this report, we focus on the \$110 billion in federal non-defense investments in physical capital that among other things, result in the development of infrastructure like highways, bridges, etc. that support the overall long-term growth of the U.S. economy. The Congressional Budget Office (CBO) provides the breakdown of federal non-defense investments for each expenditure category divided into funding by direct spending and funding through grants provided to state and local governments (see Figure 3).

Share of Federal Nondefense Investment Provided as Grants to State and Local Governments, 2018



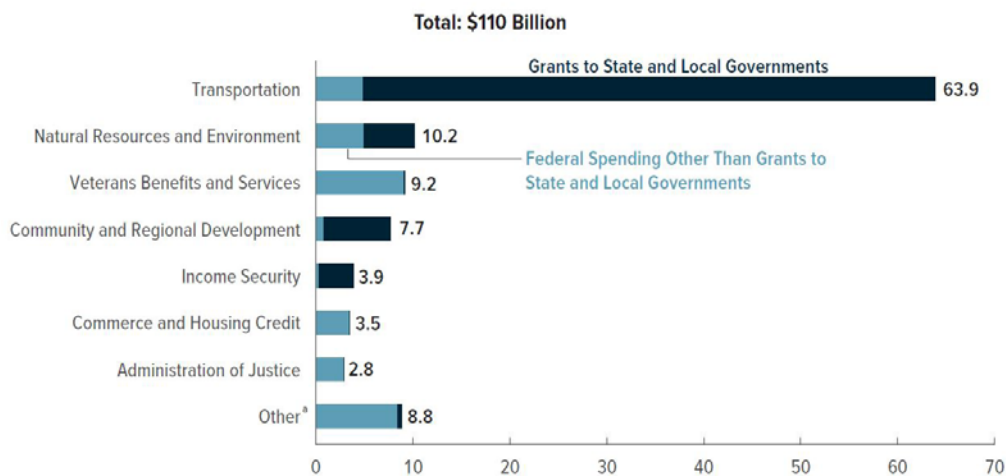
Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

Figure 3. Breakdown of Federal Non-defense Expenditure in the three major expenditure categories (Campbell & Tawil, 2019)

Figure 3 depicts that around 68% (\$75.2 billion) of the federal government’s non-defense investment in physical capital is through federal grants to state and local governments. Figure 4 shows that funding for transportation clearly dominates the overall spending, accounting for around 58% (\$63.9 billion) of the total. Of the \$63.9 billion in transportation funding, almost 92% (\$58.8 billion) was issued through grants to state and local governments, whereas, the remaining 8% represented direct spending by the federal government. These grants to state and local governments concentrate on the development of highways, mass transportation, and airports. (Campbell & Tawil, 2019)

Physical Capital: Federal Nondefense Investment by Budget Function, 2018

Billions of Dollars



Source: Congressional Budget Office, using data from the Office of Management and Budget and the American Public Transportation Association.

a. Includes the following budget functions: energy; general government; general science, space, and technology; international affairs; health; education, training, and employment services; agriculture; and Social Security.

Figure 4. Breakdown of Federal Non-defense Expenditure in Physical Capital (Campbell & Tawil, 2019)

2.2. Federal grants to state and local government by grant types

Federal grants to state and local governments are mainly characterized as: categorical grants and block grants. These grants differ based on the level of discretion available to the recipients for spending these funds, the methodology followed for allocating these funds to the various recipients, and the range of conditions that come attached to the grant (Dilgar, Jaroscak, & Lawhorn, 2020). Table 2 provides a quick overview of different types of grants based on their key characteristics.

Funding for most categorical grants is allocated to the recipients based on “a formula set out in legislation or by federal administrators” (Campbell, Kile, & Shirley, 2013). These formulas could account for a wide range of factors – demographics, income levels, housing conditions, etc. – based on issues that the grant is trying to address. These grants typically set out rules and control the type of projects that are funded by the recipients, however, the specific projects to be funded are selected by the recipients. Project categorical grants serve as an exception, as these grants are awarded on a competitive basis where the federal government selects specific projects based on applications submitted by the recipients. As a result, the federal government has a significant level of discretion over which projects are funded through project categorical grants. On the other hand, block grants usually provide recipients greater flexibility and there are fewer performance conditions imposed by the federal government regarding projects that receive funding. (Campbell, Kile, & Shirley, 2013)

Table 2. Classification of grant types by their defining traits (Dilgar, Jaroscak, & Lawhorn, 2020)

	Level of Discretion		
	Low	Medium	High
Federal Administrator’s Funding Discretion	Formula Categorical Grant; Open-ended Reimbursement Categorical Grant	Block Grant; Formula-Project Categorical Grant	Project Categorical Grant
Recipient’s Discretion in Use of Funds	Formula Categorical Grant; Open-ended Reimbursement Categorical Grant; Formula-Project Categorical Grant; Project Categorical Grant	Block Grant	-
Extent of Performance Conditions	-	Block Grant	Formula Categorical Grant; Open-ended Reimbursement Categorical Grant; Formula-Project Categorical Grant; Project Categorical Grant

The analysis of funding for transportation specifically depicts total outlays of federal grants to state and local governments for FY2020 to be around \$68.3 billion (nominal dollars) (Office of Management and Budget (OMB), 2020). The Congressional Research Service (CRS) report on block grants provides the total value of funding from block grants administered by the Department of Transportation to be around \$13.2 billion (nominal dollars) (Dilgar, Jaroscak, & Lawhorn, 2020). This shows that block grants account for almost 20% of total federal outlays of grants to state and local governments for transportation. The estimate falls in line with data from an Urban Institute report released in 2004 which reports a similar 20% proportion of block grants towards total federal outlays to state and local governments for transportation (Finegold, Wherry, & Schardin, 2004).

2.3. State expenditures by funding category and program area

In this section, the expenditures by specific states of interest and the role played by federal funds in driving growth across different functions in these states is discussed. Table 3 provides state expenditures differentiated by various fund categories for a few selected states. Federal grants to state and local governments account for around 31% of state budgets and 23% of the combined state and local budgets (Center on Budget and Policy Priorities (CBPP), 2018).

Figure 5 provides the breakdown of state spending with federal funds by major functional categories. Medicaid, Elementary & Secondary Education, and Higher Education comprise around 70% of total state expenditures supported by federal funds. The “All Other” category includes spending on a wide range of programs, such as, the Children’s Health Insurance Program (CHIP), public health programs, state police, parks and recreation, housing, environmental programs, etc. (NASBO, 2020)

Table 3. Total State Expenditures by Fund Category for FY2019 (million dollars) (NASBO, 2020)

State	General Fund	Federal Funds	Other State Funds	Bonds	Total	Federal Funds as % of Total
Arizona	10,725	15,727	11,487	752	38,691	41%
California	140,387	97,202	57,152	5,704	300,445	32%
Colorado	13,209	10,260	19,324	0	42,793	24%
Florida	32,958	28,598	19,369	1,650	82,575	35%
Georgia	23,517	14,446	12,265	1,166	51,394	28%
Illinois	36,361	15,983	18,920	576	71,840	22%
Michigan	10,345	21,786	27,204	289	59,624	37%
New York	72,783	60,146	31,138	6,538	170,875	35%
North Carolina	23,666	14,350	10,753	393	49,162	29%
Ohio	32,678	15,417	20,106	2,803	71,004	22%
Oregon	9,613	10,835	21,869	324	42,641	25%
Pennsylvania	33,401	30,489	24,445	596	88,931	34%
Texas	52,897	42,570	24,618	951	121,036	35%
Washington	22,936	12,857	12,204	2,515	50,512	25%
Wisconsin	17,152	11,787	21,304	0	50,243	23%
Total (50 States)	858,078	641,928	558,460	40,511	2,098,977	31%

Note: General funds and other state funds basically represent total state funds, federal funds represent funds provided to states by the federal government, and bonds represent funds obtained through the issuance of bonds by the state (mainly used to support capital projects).

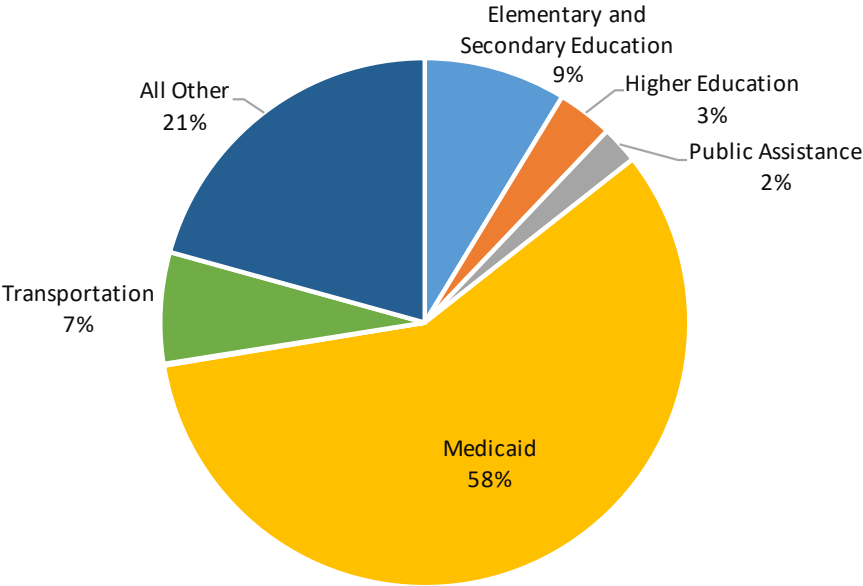


Figure 5. Breakdown of State Spending with Federal Funds for FY2019 (NASBO, 2020)

In addition, federal funds account for 26% of total state capital expenditures. The transportation category accounts for almost 66% of total capital spending by states with around 93% of federal funds for capital purposes supporting transportation projects (NASBO, 2020). Figure 6 depicts capital expenditures by states for different program areas.

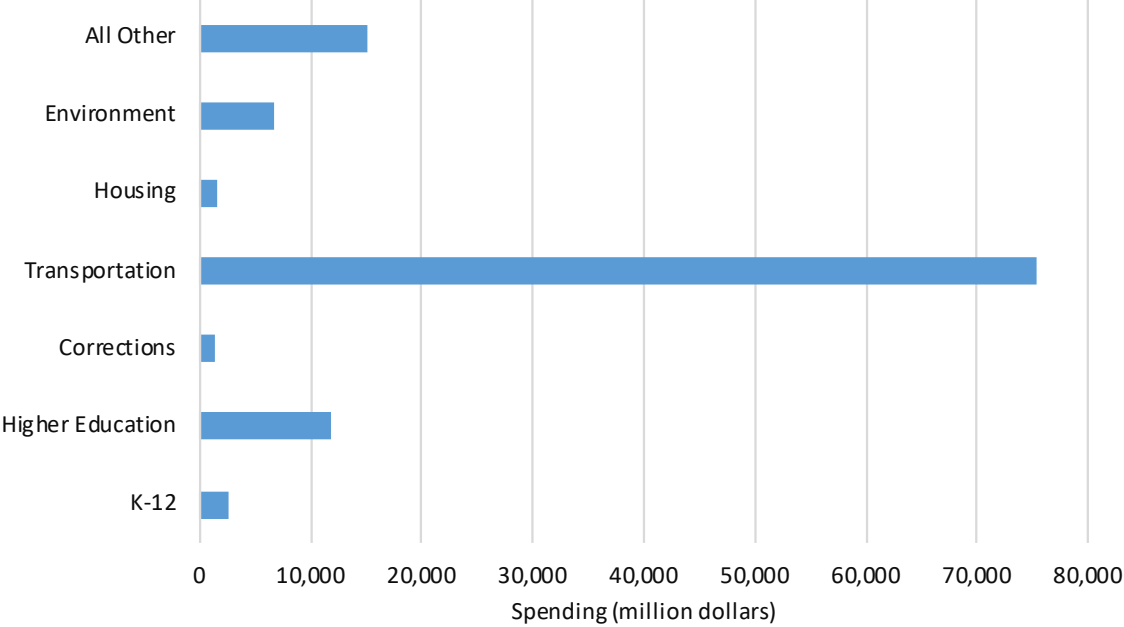


Figure 6. Capital expenditures by program area for states, 2019 (estimated using data from the 2020 State Expenditure Report) (NASBO, 2020)



Private and Government Procurement of Infrastructure Materials

- As per 2012 U.S. BEA data, the federal government spent around \$75.4 billion, either directly or through federal funds to state and local governments, on construction.
- Transportation, education, and other non-residential structures represent the highest proportion of total government spending on construction projects (around \$237 billion).
- In 2012, procurement spending was estimated to account for 43% of total spending on construction, with the federal government spending around \$32.4 billion on the procurement of goods and services.
- The total breakdown of government spending on construction was estimated to be: direct federal spending (8%), spending of federal funds by state and local governments (18%) and state and local government own-sourced spending (74%).
- In 2012, the federal government spent \$804 million directly and \$1.8 billion indirectly through grants to state and local governments, for the procurement of the five commodities of interest (concrete, cement, steel, aluminum, and glass) for construction.

Infrastructure projects are grouped under the construction sector category. The BEA's 2012 Use table provides data for 10 construction sectors, as listed in Table 4. This chapter studies these ten sectors associated with infrastructure development in greater detail.

Table 4: Construction sectors reported by 2012 BEA's Use Table (U.S. BEA, 2020a)

Sector Description
Health care structures
Educational and vocational structures
Office and commercial structures
Multifamily residential structures
Other residential structures
Manufacturing structures
Other non-residential structures
Power and communication structures
Single-family residential structures
Transportation structures and highways and streets

Additionally, the commodities of interest, namely, concrete, cement, steel, aluminum, and glass are represented in the BEA's Use table by the sectors reported in Table 5, and are discussed in-depth throughout the chapter¹.

¹ See Table A1 in Appendix A for a crosswalk between the commodities of interest and the various sectors representing the commodities of interest

Table 5: Sectors representing commodities of interest – 2012 BEA’s Use Table (U.S. BEA, 2020a)

Sector Description
Glass and glass product manufacturing
Cement manufacturing
Ready-mix concrete manufacturing
Concrete pipe, brick, and block manufacturing
Other concrete product manufacturing
Iron and steel mills and ferroalloy manufacturing
Steel product manufacturing from purchased steel
Aluminum product manufacturing from purchased aluminum

Table 6 provides private and government spending and procurement data for each of the 10 construction sectors reported in Table 4. It highlights differing spending levels of the private sector and government on the various construction sectors. While private entities spend more on residential structures, and power and communication structures, the government spends more on the construction of transportation structures and highways and streets, educational and vocational structures, and other non-residential structures.

As per the U.S. government budget for FY2021, federal capital grants accounted for 19.4% of total state and local gross investments in 2019, whereas state and local own-source financing accounted for the remaining 80.6% of investments (Office of Management and Budget (OMB), 2020). As a result, total government spending on construction is categorized as follows: direct federal spending (8%), state and local government spending via federal funds (18%), and state and local government own-sourced spending (74%).

As observed from Table 6, the federal government spent \$75.4 billion on construction in 2012 (with \$23.8 billion spend directly and \$51.6 billion spent indirectly through grants to state and local governments). Table 6 also indicates that procurement of goods and services accounted for 43% of total spending on construction, which leads us to the conclusion that federal procurement spending on construction was around \$32.4 billion (43% of \$75.4 billion) in 2012.

Table 6: Private Sector and Government Construction Spending and Procurement (data estimated using BEA's 2012 Use Table) (million US\$) (U.S. BEA, 2020a)

Sector Description	Private Sector Spending	Direct Federal Government Spending	State and Local Government Spending from Federal Funds	State and Local Government Spending from Own-Funds	Total Spending	Ratio of Procurement of Goods and Services to Total Spending**
Other residential structures	159,222	957	1,707	7,090	168,976	0.53
Single-family residential structures	132,015	215	148	617	132,995	0.39
Transportation structures and highways and streets	11,172	2,431	21,036	87,398	122,037	0.45
Power and communication structures	102,355	1,055	1,971	8,190	113,571	0.31
Other nonresidential structures	32,965	6,344	10,553	43,845	93,707	0.56
Educational and vocational structures	16,160	1,927	12,315	51,163	81,565	0.36
Office and commercial structures	68,109	5,033	1,503	6,244	80,889	0.41
Manufacturing structures	46,774	1,183	167	693	48,817	0.36
Health care structures	35,375	3,474	1,417	5,887	46,153	0.38
Multifamily residential structures	22,510	1,148	792	3,290	27,740	0.21
Total	626,657	23,767	51,609	214,417	916,450	0.43

Note: *This table is arranged in the descending order of total spending column.

**Total spending includes compensation of employees, taxes on production and imports less subsidies, and gross operating surplus in addition to procurement of goods and services.

Table 7 provides a breakdown of government and private sector procurement spending on the different commodities of interest. The federal government spent \$804 million directly and \$1.8 billion indirectly through grants to state and local governments, for the procurement of the five commodities of interest (concrete, cement, steel, aluminum, and glass) in 2012. Whereas, the state and local governments spent around \$7.5 billion on the procurement of these commodities. Specifically, federal procurement spending on concrete and steel for construction projects was around \$2.3 billion and \$190 million respectively, as per 2012 U.S. BEA data.

Table 7: Total Procurement of Commodities of Interest by the Private Sector and Government for Construction (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Sector Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	672	49	51	210	982
Cement manufacturing	380	16	37	152	584
Ready-mix concrete manufacturing	7,877	302	934	3,881	12,995
Concrete pipe, brick, and block manufacturing	1,685	118	231	959	2,992
Other concrete product manufacturing	2,852	249	439	1,823	5,364
Iron and steel mills and ferroalloy manufacturing	558	43	74	308	983
Steel product manufacturing from purchased steel	515	25	47	195	783
Aluminum product manufacturing from purchased aluminum	30	1	2	7	40
Total	14,570	804	1,814	7,535	24,723



Private and Government Procurement of Imported Infrastructure Materials

- Based on estimations using 2012 U.S. Bureau of Economic Analysis (BEA) data, the total government procurement spending on imported commodities of interest (concrete, cement, steel, aluminum and glass) was around \$558 million.
- The federal government procured imported commodities of interest worth around \$156 million for construction.
- Among the different commodities of interest, construction spending was dominated by procurement of concrete and steel.

This chapter discusses the spending by the government and private sector on imported commodities used by the construction sectors. Specifically, the five commodities of interest – concrete, cement, steel, aluminum and glass – are discussed using BEA's 2012 detailed-level Use Table data.

The BEA's Use Table data were used to estimate the proportion of goods imported by each of the 8 commodity sectors (representing the 5 commodities of interest). The estimated import proportions are depicted in Table 8.

Table 8: Import proportions for sectors representing commodities of interest (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Sector Description	Import Proportion
Glass and glass product manufacturing	22%
Cement manufacturing	9%
Ready-mix concrete manufacturing	0%
Concrete pipe, brick, and block manufacturing	1%
Other concrete product manufacturing	11%
Iron and steel mills and ferroalloy manufacturing	23%
Steel product manufacturing from purchased steel	31%
Aluminum product manufacturing from purchased aluminum	15%

Based on data provided in Tables 7 and 8, the IO analysis depicted that the federal government procured imported commodities of interest worth around \$156 million (see Table 9). Among the different commodities of interest, construction spending was dominated by procurement of concrete and steel, and these two commodities were associated with the highest value of imports as shown in Table 9.

Table 9: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	148	11	11	46	216
Cement manufacturing	34	1	3	14	53
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	17	1	2	10	30
Other concrete product manufacturing	314	27	48	201	590
Iron and steel mills and ferroalloy manufacturing	128	10	17	71	226
Steel product manufacturing from purchased steel	160	8	15	61	243
Aluminum product manufacturing from purchased aluminum	5	0	0	1	6
Total	805	59	97	402	1,363



State-level Spending on Infrastructure Projects and Procurement of Materials

- In 2019, greater than 98% of public construction value put in place was for non-residential structures, with highways and streets, educational, and transportation structures accounting for 66% of total value of public construction.
- As per data from U.S. Geological Survey, the value of U.S. cement consumption went up from \$6.55 billion in 2010 to \$11.9 billion in 2018.
- In 2012, government spending (including federal, state, and local) accounted for 42% of total U.S. procurement spending on concrete for construction, with the federal government accounting for 25% of total government procurement spending on concrete.
- The estimation analysis projected a rise in concrete procurement spending by the federal government, increasing from \$2.3 billion in 2012 to \$5.2 billion in 2018.

This chapter briefly discusses the U.S. total and state level annual value of construction put in place, which is followed by a section that examines government procurement spending on one of the commodities of interest (concrete) associated with the construction sector.

The total value of publicly and privately-owned construction put in place in the U.S. is shown in Table 10. The construction put in place by these two entities is further broken down into two categories: residential and non-residential.

Table 10: Annual value of construction put in place in the United States by type of construction (million US\$) (U.S. Census Bureau, 2020b)

Year	Total Public Construction	Total Private Construction	Total Construction
2018	310,167	1,023,016	1,333,183
2019	334,433	1,030,704	1,365,137

The value of private construction put in place is almost equally split between residential (52%) and non-residential (48%) for 2019, and the majority of non-residential private construction (70%) goes to the development of power structures, manufacturing facilities, commercial facilities, and office structures. On the other hand, greater than 98% of public construction value put in place is for non-residential structures, with highways and streets, educational, and transportation structures accounting for 66% of total value of public construction in 2019. (U.S. Census Bureau, 2020b) The total value of state and local construction put in place by each of the 15 states of interest is reported in Table 11 below. In 2019, California, Texas and New York combined accounted for 32% of the total state and local construction value in the U.S.

Table 11: Annual value of state and local construction by state, 2019 (million dollars) (U.S. Census Bureau, 2020c)

State	Construction Value
California	39,565
Texas	36,535
New York	24,048
Florida	14,900
Washington	12,011
Ohio	9,705
Pennsylvania	9,596
North Carolina	9,369
Illinois	9,062
Georgia	8,572
Wisconsin	5,728
Colorado	5,377
Michigan	5,092
Oregon	4,643
Arizona	4,390
U.S. (50 States and the District of Columbia)	309,171

The following section discusses procurement spending on concrete in greater detail, at the national and state levels.

Government concrete procurement

Concrete is a fundamental input for the construction sector, accounting for around 87% (\$2.3 billion) of total federal government procurement spending on the five commodities of interest (concrete, cement, steel, aluminum, and glass) for construction, based on 2012 U.S. BEA data. In a 2011 report, the Transportation Development Foundation (TDF) provided concrete usage data for the different departments of transportation (DOT) of each state in the U.S. The 15 states of interest represented around 56% of the total value of concrete products used by all state departments of transportation in 2010. (ARTBA-TDF, 2011)

The total value of concrete products for 2018 was estimated based on the growth in U.S. cement consumption from 2010 to 2018, which was assumed to mirror growth in concrete usage. The value of U.S. cement consumption went up from \$6.55 billion in 2010 to \$11.9 billion in 2018, as per data from U.S. Geological Survey (USGS, 2012 and 2020). This represents a nominal growth rate of 82%.

Based on data from BEA’s 2012 detailed-level Use Table, the proportion of government’s (including federal, state, and local) procurement spending in the total procurement spending on concrete for construction in the U.S. was estimated to be 42%, and the federal government accounted for 25% of total government procurement spending on concrete. In addition, spending on procurement of concrete products for transportation projects (used as a proxy for DOT expenditure) accounted for 20% of total procurement spending on concrete by all construction sectors (U.S. BEA, 2020a). Table 12 represents the estimated total value of concrete products procured by different states and their DOT, along with the proportion of total concrete products procured by the government in each state.

On the basis of the estimation analysis, the total value of concrete products procured by the federal government in 2018 would be around \$5.2 billion (25% of \$21.1 billion). The rise in cement consumption in the U.S. over the 2010 to 2018 year period was the main reason for the projected rise in concrete procurement spending (from \$2.3 billion in 2012 to \$5.2 billion in 2018) by the federal government. This is due to the intricate linkage between cement and concrete consumption, as almost 81% of Portland cement shipments in the U.S. in 2012 were for the production of concrete and concrete products, based on the 2016 U.S. Cement Industry Annual Yearbook (PCA, 2016).

Table 12: Breakdown of estimated total value of concrete products used in 2018 (million US\$)

State	Total value of concrete products		
	By State Department of Transportation	For Total Construction in State	By Government Funded Projects
Arizona	109	550	230
California	1,050	5,282	2,210
Colorado	84	420	176
Florida	163	818	342
Georgia	148	743	311
Illinois	465	2,336	978
Michigan	354	1,782	746
New York	197	991	415
North Carolina	110	552	231
Ohio	289	1,452	607
Oregon	59	296	124
Pennsylvania	542	2,726	1,140
Texas	1,203	6,052	2,532
Washington	244	1,225	513
Total (48 States)	10,031	50,448	21,107

Note: 1. Total includes all states, except Alaska and Hawaii; 2. Around 25% of total concrete procured for government funded projects is through federal funds.



The findings of this report can help stakeholders gain an understanding of the distribution and scale of the government's spending on infrastructure and infrastructure materials across different levels of government (federal, state, and local). It combines data from multiple publicly available sources to develop an estimate of government procurement spending on key carbon-intensive materials that would fall under the purview of a buy clean program.

We investigated the federal spending mechanisms used for infrastructure projects. This primarily consists of direct payments, and grants to state and local governments. In 2018, around 68% (\$75.2 billion) of federal spending on physical capital is through federal grants to state and local governments. Federal non-defense expenditure on physical capital encompasses a range of structures (government buildings, transportation infrastructure, water and power projects, etc.), with transportation accounting for almost 60% (\$63.9 billion) of the total investment. Nearly 92% (\$58.8 billion) of the total federal funding for transportation was supported by grants, whereas, the remaining 8% (\$5.1 billion) represented direct spending by the federal government. These grants to state and local governments concentrate on the development of highways, mass transportation, and airports.

Federal funds were recognized as an integral and significant proportion of state and local government expenditures. In FY2017, federal grants accounted for roughly 31% of state budgets and 23% of combined state and local budgets. Also, around 26% of state capital expenditures were supported by federal funds. These statistics help further reinstate the pivotal role played by the federal government in the development of the nation's infrastructure.

As per 2012 U.S. BEA data, transportation, education, and other non-residential structures represented the highest proportion of government spending on construction projects (around \$237 billion). The federal government spent around \$75.4 billion, either directly or through federal funds to state and local governments, on construction. Procurement spending accounted for around 43% of total construction spending in the U.S. As a result, the total procurement spending by the federal government on goods and services was around \$32.4 billion. In addition, the total breakdown of government spending on construction was estimated to be: direct federal spending (8%), spending by state and local governments through federal funds (18%) and state and local government own-sourced spending (74%).

The federal government spent \$804 million directly and \$1.8 billion indirectly through grants to state and local governments, for the procurement of the five commodities of interest (concrete, cement, steel, aluminum, and glass) in 2012. Specifically, federal procurement spending on concrete and steel for construction projects was in the range of \$2.3 billion and \$190 million respectively, as per 2012 U.S. BEA data. Government procurement spending accounted for 42% of total U.S. procurement spending on concrete products, with the federal government accounting for 25% of total government procurement spending on concrete. Based on estimations made in this report, federal procurement spending on concrete was around \$5.2 billion in 2018. The rise in federal spending on construction over the past decade underscores the immense importance of decarbonizing product supply chains of federal government procured materials.

Many governments around the world have already recognized the value of green public procurement as a policy instrument and are trying to leverage the money they invest in large contracts to achieve green goals. Some cities and states in the U.S already view procurement-based policies as a key opportunity to promote sustainability and reduce GHG emissions. Implementation of the Buy Clean California procurement policy may provide a model for other jurisdictions considering embodied carbon policies.



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Appendices

Appendix A. Methodology for Input-Output Analysis

The input-output modelling carried out in Chapters 3 and 4, which analyzes the total U.S. spending on infrastructure projects and procurement spending on infrastructure materials by the private and public sectors, was estimated from publicly available data: the U.S. Bureau of Economic Analysis (BEA)'s 2012 After Redefinitions Use Table (Producers' Prices). Such detailed level benchmark tables which comprise over 400 sectors of the U.S. economy are usually released every 5-10 years. The 2012 Use table is the latest available detailed level benchmark table provided by the U.S. BEA.

The Use table provides spending data for a wide range of sectors such as manufacturing, agriculture, construction, utilities, service, government, etc. The spending data of the different construction sectors on the various commodities of interest were studied to develop key insights. Sectors representing commodities of interest were identified by studying their detailed descriptions and are tabulated below.

Table A1: Sectors representing commodities of interest – 2012 BEA Use Table (U.S. BEA, 2020a)

Sector Description	Commodity of Interest
Glass and glass product manufacturing	Glass
Cement manufacturing	Cement
Ready-mix concrete manufacturing	Concrete
Concrete pipe, brick, and block manufacturing	
Other concrete product manufacturing	
Iron and steel mills and ferroalloy manufacturing	Steel
Steel product manufacturing from purchased steel	
Aluminum product manufacturing from purchased aluminum	Aluminum

This was followed by the analysis of construction spending data of private, federal government, and state and local government entities to in turn determine the proportion of spending by these entities on the various commodities of interest.

Appendix B. Latest Summary level BEA Use Table and Breakdown of Government Construction Spending

While the latest detailed input-output (IO) tables are from 2012, the U.S. Bureau of Economic Analysis (BEA) also releases summary level (less detailed) IO tables comprising 71 industries every year. Table B1 depicts the growth in spending by the construction sector on commodities like non-metallic mineral (e.g. cement and glass) products and primary metals (e.g. steel) which are studied in detail throughout the report.

Table B1: Expenditure by construction sector in sectors representing commodities of interest (million US\$) – estimated using 2019 BEA Summary level Use Table (U.S. BEA, 2020b)

Commodity / Industry		Construction		
Sector Code	Sector Name	2012	2019	Growth (2012 – 2019)
327	Nonmetallic mineral products	42,160	68,097	62%
331	Primary metals	3,860	4,631	20%

Appendix C. Total Spending on Commodities and Related Import Data for each Construction Sector

The sector level procurement spending and related import data for each of the 10 construction sectors discussed in the report are provided below.

Transportation Structures and Highways and Streets:

Table C1: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Transportation Structures and Highways and Streets (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	2	0	3	12	17
Cement manufacturing	7	2	14	58	81
Ready-mix concrete manufacturing	287	62	540	2,243	3,132
Concrete pipe, brick, and block manufacturing	26	6	49	202	282
Other concrete product manufacturing	76	17	143	594	830
Iron and steel mills and ferroalloy manufacturing	3	1	7	27	38
Steel product manufacturing from purchased steel	5	1	9	38	53
Aluminum product manufacturing from purchased aluminum	0	0	0	1	2

Table C2: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Transportation Structures and Highways and Streets (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	0	0	1	3	4
Cement manufacturing	1	0	1	5	7
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	0	0	0	1	2
Other concrete product manufacturing	8	2	15	62	87
Iron and steel mills and ferroalloy manufacturing	1	0	2	6	9
Steel product manufacturing from purchased steel	1	0	3	12	16
Aluminum product manufacturing from purchased aluminum	0	0	0	0	0

Educational and Vocational Structures:

Table C3: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Educational and Vocational Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	33	4	25	105	167
Cement manufacturing	9	1	7	29	46
Ready-mix concrete manufacturing	215	26	164	681	1,086
Concrete pipe, brick, and block manufacturing	61	7	46	192	306
Other concrete product manufacturing	77	9	59	243	388
Iron and steel mills and ferroalloy manufacturing	0	0	0	1	1
Steel product manufacturing from purchased steel	25	3	19	78	125
Aluminum product manufacturing from purchased aluminum	1	0	0	2	3

Table C4: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Educational and Vocational Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	7	1	6	23	37
Cement manufacturing	1	0	1	3	4
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	0	0	0	1	2
Other concrete product manufacturing	8	1	6	26	41
Iron and steel mills and ferroalloy manufacturing	0	0	0	0	0
Steel product manufacturing from purchased steel	8	1	6	24	38
Aluminum product manufacturing from purchased aluminum	0	0	0	0	0

Other Non-residential Structures:

Table C5: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Other Non-residential Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	29	6	9	39	83
Cement manufacturing	34	7	11	46	98
Ready-mix concrete manufacturing	450	87	144	598	1,279
Concrete pipe, brick, and block manufacturing	372	72	119	495	1,057
Other concrete product manufacturing	612	118	196	815	1,741
Iron and steel mills and ferroalloy manufacturing	195	38	63	260	555
Steel product manufacturing from purchased steel	36	7	11	48	102
Aluminum product manufacturing from purchased aluminum	1	0	0	2	4

Table C6: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Other Non-residential Structures (million US\$)
(estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	6	1	2	9	18
Cement manufacturing	3	1	1	4	9
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	2	0	1	3	6
Other concrete product manufacturing	64	12	21	86	183
Iron and steel mills and ferroalloy manufacturing	46	9	15	61	130
Steel product manufacturing from purchased steel	11	2	4	15	31
Aluminum product manufacturing from purchased aluminum	0	0	0	0	1

Healthcare Structures:

Table C7: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Healthcare Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	61	6	2	10	79
Cement manufacturing	20	2	1	3	26
Ready-mix concrete manufacturing	310	30	12	52	404
Concrete pipe, brick, and block manufacturing	144	14	6	24	188
Other concrete product manufacturing	319	31	13	53	416
Iron and steel mills and ferroalloy manufacturing	3	0	0	1	4
Steel product manufacturing from purchased steel	50	5	2	8	65
Aluminum product manufacturing from purchased aluminum	2	0	0	0	2

Table C8: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Healthcare Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	13	1	1	2	17
Cement manufacturing	2	0	0	0	2
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	1	0	0	0	1
Other concrete product manufacturing	33	3	1	6	44
Iron and steel mills and ferroalloy manufacturing	1	0	0	0	1
Steel product manufacturing from purchased steel	15	1	1	3	20
Aluminum product manufacturing from purchased aluminum	0	0	0	0	0

Office and Commercial Structures:

Table C9: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Office and Commercial Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	438	32	10	40	520
Cement manufacturing	35	3	1	3	41
Ready-mix concrete manufacturing	472	35	10	43	561
Concrete pipe, brick, and block manufacturing	192	14	4	18	228
Other concrete product manufacturing	801	59	18	73	951
Iron and steel mills and ferroalloy manufacturing	3	0	0	0	4
Steel product manufacturing from purchased steel	100	7	2	9	119
Aluminum product manufacturing from purchased aluminum	2	0	0	0	2

Table C10: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Office and Commercial Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	96	7	2	9	114
Cement manufacturing	3	0	0	0	4
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	1	0	0	0	1
Other concrete product manufacturing	84	6	2	8	100
Iron and steel mills and ferroalloy manufacturing	1	0	0	0	1
Steel product manufacturing from purchased steel	31	2	1	3	36
Aluminum product manufacturing from purchased aluminum	0	0	0	0	0

Multi-family Residential Structures:

Table C11: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Multi-family Residential Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	8	0	0	1	10
Cement manufacturing	4	0	0	1	5
Ready-mix concrete manufacturing	302	15	11	44	372
Concrete pipe, brick, and block manufacturing	24	1	1	4	30
Other concrete product manufacturing	118	6	4	17	145
Iron and steel mills and ferroalloy manufacturing	33	2	1	5	41
Steel product manufacturing from purchased steel	3	0	0	0	4
Aluminum product manufacturing from purchased aluminum	0	0	0	0	0

Table C12: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Multi-family Residential Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	2	0	0	0	2
Cement manufacturing	0	0	0	0	0
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	0	0	0	0	0
Other concrete product manufacturing	12	1	0	2	15
Iron and steel mills and ferroalloy manufacturing	8	0	0	1	10
Steel product manufacturing from purchased steel	1	0	0	0	1
Aluminum product manufacturing from purchased aluminum	0	0	0	0	0

Manufacturing Structures:

Table C13: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Manufacturing Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	14	0	0	0	15
Cement manufacturing	9	0	0	0	9
Ready-mix concrete manufacturing	734	19	4	15	771
Concrete pipe, brick, and block manufacturing	29	1	0	1	30
Other concrete product manufacturing	244	6	1	5	257
Iron and steel mills and ferroalloy manufacturing	0	0	0	0	0
Steel product manufacturing from purchased steel	8	0	0	0	8
Aluminum product manufacturing from purchased aluminum	0	0	0	0	0

Table C14: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Manufacturing Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	3	0	0	0	3
Cement manufacturing	1	0	0	0	1
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	0	0	0	0	0
Other concrete product manufacturing	26	1	0	1	27
Iron and steel mills and ferroalloy manufacturing	0	0	0	0	0
Steel product manufacturing from purchased steel	2	0	0	0	2
Aluminum product manufacturing from purchased aluminum	0	0	0	0	0

Power and communication structures:

Table C15: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Power and Communication Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	0	0	0	0	0
Cement manufacturing	97	1	2	8	108
Ready-mix concrete manufacturing	746	8	14	60	828
Concrete pipe, brick, and block manufacturing	50	1	1	4	56
Other concrete product manufacturing	134	1	3	11	149
Iron and steel mills and ferroalloy manufacturing	128	1	2	10	142
Steel product manufacturing from purchased steel	82	1	2	7	91
Aluminum product manufacturing from purchased aluminum	14	0	0	1	15

Table C16: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Power and Communication Structures (million US\$) (estimated using data from BEA’s 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	0	0	0	0	0
Cement manufacturing	9	0	0	1	10
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	0	0	0	0	0
Other concrete product manufacturing	14	0	0	1	16
Iron and steel mills and ferroalloy manufacturing	30	0	1	2	33
Steel product manufacturing from purchased steel	25	0	0	2	28
Aluminum product manufacturing from purchased aluminum	2	0	0	0	2

Single-family Residential Structures:

Table C17: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Single-family Residential structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	27	0	0	0	27
Cement manufacturing	79	0	0	0	80
Ready-mix concrete manufacturing	1,237	2	1	6	1,246
Concrete pipe, brick, and block manufacturing	368	1	0	2	371
Other concrete product manufacturing	237	0	0	1	239
Iron and steel mills and ferroalloy manufacturing	104	0	0	0	105
Steel product manufacturing from purchased steel	67	0	0	0	68
Aluminum product manufacturing from purchased aluminum	4	0	0	0	4

Table C18: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Single-family Residential Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	6	0	0	0	6
Cement manufacturing	7	0	0	0	7
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	2	0	0	0	2
Other concrete product manufacturing	25	0	0	0	25
Iron and steel mills and ferroalloy manufacturing	24	0	0	0	25
Steel product manufacturing from purchased steel	21	0	0	0	21
Aluminum product manufacturing from purchased aluminum	1	0	0	0	1

Other Residential Structures:

Table C19: Total Procurement of Commodities of Interest by Private Sector and Government for Construction of Other Residential Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	60	0	1	3	64
Cement manufacturing	85	1	1	4	90
Ready-mix concrete manufacturing	3,125	19	33	139	3,316
Concrete pipe, brick, and block manufacturing	418	3	4	19	444
Other concrete product manufacturing	234	1	3	10	248
Iron and steel mills and ferroalloy manufacturing	88	1	1	4	93
Steel product manufacturing from purchased steel	139	1	1	6	148
Aluminum product manufacturing from purchased aluminum	8	0	0	0	8

Table C20: Total Procurement of Imported Commodities of Interest by Private Sector and Government for Construction of Other Residential Structures (million US\$) (estimated using data from BEA's 2012 Use Table) (U.S. BEA, 2020a)

Commodity Description	Private Sector Procurement	Direct Federal Government Procurement	State and Local Government Procurement from Federal Funds	State and Local Government Procurement from Own-Funds	Total Procurement
Glass and glass product manufacturing	13	0	0	1	14
Cement manufacturing	8	0	0	0	8
Ready-mix concrete manufacturing	0	0	0	0	0
Concrete pipe, brick, and block manufacturing	2	0	0	0	3
Other concrete product manufacturing	25	0	0	1	26
Iron and steel mills and ferroalloy manufacturing	21	0	0	1	22
Steel product manufacturing from purchased steel	43	0	0	2	45
Aluminum product manufacturing from purchased aluminum	1	0	0	0	1



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