U.S. GREEN BUILDING COUNCIL

Green Building Economic Impact Study

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About

U.S. Green Building Council

The U.S. Green Building Council (USGBC) is committed to a prosperous, healthy and sustainable future through cost-efficient and energy-saving green buildings. USGBC works toward its mission of market transformation through its LEED green building certification program, robust educational offerings, a nationwide community and volunteer network of thousands of individuals, the annual Greenbuild International Conference & Expo, the Center for Green Schools and advocacy in support of public policy that encourages and enables green buildings and communities.

Industry-led and consensus-driven, USGBC is as diverse as the marketplace it serves. Membership includes nearly 13,000 building owners and end-users, real estate developers, facility managers, architects, designers, engineers, general contractors, subcontractors, product and building system manufacturers, government agencies, and nonprofits. Leaders from within each of these sectors participate in the development of the LEED certification system and the direction of the organization through volunteer service on USGBC's open committees.

Leadership in Energy and Environmental Design (LEED) USGBC's LEED green building program is the foremost program for the design, construction, maintenance and operations of green buildings, homes and communities. By using less energy, LEED-certified spaces save money for families, businesses and taxpayers; reduce carbon emissions; and contribute to a healthier environment for residents, workers and the larger community.

LEED is a globally recognized benchmark for green building. The rating systems are supported by numerous USGBC staff and volunteers who serve on committees and advisory groups that are constantly reevaluating LEED to ensure it remains technically rigorous, market relevant and leadership-oriented. Whether through clarification of language to a specific credit, an adaptation to an existing rating system or a comprehensive update to the entire suite of rating systems, our experts are dedicated to keeping LEED on the leading edge of the sustainable design and building movement.

Booz Allen Hamilton

Booz Allen Hamilton has been at the forefront of strategy and technology consulting for 100 years. Today, Booz Allen is a leading provider of management consulting, technology, and engineering services to the US government in defense, intelligence, and civil markets, and to major corporations, institutions, and not-for-profit organizations. Booz Allen Hamilton partners with clients to solve their most important and complex problems, making their mission our mission, and delivering results that endure. With a culture that thrives on collaboration, reinforced by our intimate client connections and key external alliances, Booz Allen tackles today's market trends with a focus on the future.

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Executive Summary

The U.S. Green Building Council (USGBC) presents the Green Building Economic Impact Study, prepared by Booz Allen Hamilton (Booz Allen). The study explores the multifaceted economic contribution of green construction to the U.S. market. Building from the 2009 Green Jobs Study[1] that Booz Allen compiled for USGBC, we have refined the methodology and data to account for the evolving market environment. In this study we have quantified the economic value creation from green construction and Leadership in Energy and Environmental Design (LEED) building construction in gross domestic product (GDP), jobs, labor earnings, individual states' tax contributions, and environmental indicators at the national and state levels. The increase in green construction spending is notable, however the direct, indirect, and induced economic impact of this growth is yet to be reported in detail. This study elucidates these direct, indirect, and induced economic impacts.

The future for the green industry is projected to see positive growth for years to come, with its influence reaching across the U.S. economy with significant environmental and social benefits being generated to protect the people and the planet. Our findings show that green building construction growth currently outpaces general construction and will continue to do so through 2018. Annual green construction spending is expected to grow 15.1% year over year (YoY) for 2015-2018, with annual spending projected to increase from $150.6 billion in 2015 to $224.4 billion in 2018. LEED construction spending is forecast to have a year-over-year growth rate of 12.3%, increasing from a $61.8 billion spending in 2015, to $78.6 billion spending in 2018. LEED residential is forecasted at a high YoY growth rate of 31.1% during the period of 2015 to 2018, reflecting its potential given the historically small market penetration. The LEED commercial forecast demonstrates a steady YoY growth rate of 8.5% for 2015-2018. Estimates of the economic impact of green building construction for 2015-18 show a significant increase in impact on GDP, jobs, and labor earnings as compared to 2011-14.

National Green Construction Cumulative Direct Economic Impact

From 2011-2014, the green construction market has:

- Generated $167.4 billion in GDP
- Supported over 2.1 million jobs
- Provided $147.7 billion in labor earnings

From 2015-2018, this study predicts that green construction will:

- Generate an additional $303.4 billion in GDP
- Support 3.9 million jobs
- Provide $268.4 billion in labor earnings

[1] Booz Allen Hamilton (2009). *USGBC Green Jobs Study*.

National LEED Construction Cumulative Direct Economic Impact

From 2011-2014, LEED-related construction spending has:

- Generated $80.6 billion in GDP
- Supported 1 million jobs
- Provided $70.9 billion in labor earnings

From 2015-2018, this study forecasts that LEED-related construction spending will:

- Generate an additional $108.8 billion in GDP
- Support 1.4 million jobs
- Provide $95.7 billion in labor earnings

1 Introduction

The construction industry, as a whole, has proven to be durable and able to withstand external influences after the initially lagging recovery following the economic downturn of 2009.[2] Both residential and nonresidential building sectors have experienced growth since 2011, creating essential jobs and noticeably contributing to GDP. Although the growth of the construction industry has mirrored that of the overall economy since 2009, there has been a steady increase in investments and bank lending, allowing for the possibility of more sustained economic development positively affecting construction going forward.

Green construction represents a portion of building activity as a whole and its growth rate has outpaced general construction over the past few years.[3] The green construction market is expected to continue its growth in the coming years due to sustained investment in green technologies, manageable inflation rates, increased government infrastructure spending, declines in long-term interest rates, and a steady market signal for green construction and resale value.[4] Local and national policy has continued to support green construction and renovation due to multiple drivers such as changes in code, and regional, state and national emphasis on energy efficiency, greenhouse gas reduction, and creating more jobs domestically.[5] LEED construction is a market leader of green construction and continues to be a key influencer of widespread green construction adoption over the next four years. Economic and social benefits to owners and occupants, incentive utility program benefits, decreased lifecycle costs, and increased asset value are among the reasons that companies and individuals will continue to choose to build LEED-certified buildings. These benefits, as well as quantifiable environmental benefits including reduction in carbon footprint will be amongst the reasons for government bodies to continue to choose to build LEED-certified buildings.

This study aims to provide a methodical analysis of the economic value of both green and LEED-certified building construction at the national and state levels. We began by forecasting construction spending for green construction and LEED-certified construction. Next, we examined the economic impacts of green and LEED construction, including total jobs supported. Finally, we analyzed state revenue contributions from LEED construction. This report follows in broad strokes the topics of the 2009 USGBC Green Jobs Study, leveraging newly published data pertaining to green and LEED-certified building construction to expand the detail of our forecasts and analyses.

In the following nine sections, we project annual green and LEED construction spending for the years 2015-2018 and provide an analysis of both green construction's and LEED construction's contributions to key economic indicators including GDP, jobs, and labor earnings. Each section details the assumptions, analysis, and key takeaways of the economic impact of both green and LEED-certified building construction, with accompanying figures and tables throughout. In addition to quantifying the economic impact of green and LEED construction, we have estimated the savings

[2] Booz Allen Hamilton (unpublished). Analysis of *U.S. Census Bureau construction spending data* retrieved from http://www.census.gov/econ/currentdata/

[3] Dodge Data & Analytics (2012). *2013 Dodge Construction Green Outlook Report*.

[4] JLL (2013). *U.S. Construction Outlook Report*.

[5] The American Institutes of Architects (2009). *Local Leaders in Sustainability- Green Building Policy in a Changing Economic Environment.*

of these sectors. The report concludes with an analysis of LEED construction's impact on state tax revenues and forecasts the four-year impact (2015-2018).

Specifically:

- Section 2 identifies the central data sources used and the accompanying methodology, including use of literature and models.
- Section 3 estimates the national economic impact resulting from the total green construction market, including the total value of green construction.
- Section 4 estimates the national economic impact resulting from LEED-related expenditures for all LEED-certified buildings.
- Sections 5 and 6 provide the results of an analysis of green and LEED construction economic impacts, respectively, at the state level.
- Section 7 estimates the energy savings and selected environmental benefits for the total green construction market and for LEED-certified buildings.
- Section 8 evaluates tax contributions of LEED construction by state.
- Section 9 summarizes the study's conclusions.

2 Data and Methodology

Data Sources
Our analysis used a robust set of data on the U.S. construction industry and green construction industry, which is tracked annually and projected out for three years (until 2017). For the LEED construction industry, the USGBC project database captures data for over 80,000 projects including project size, location, building asset type and certification level. To construct a robust methodology, we have utilized best available data and combined it with sound modeling techniques.

A key data source is the 2015 Dodge Construction Outlook report, which provides the forecast of U.S. construction starts, including detailed analysis of the industry's economic environment and market trends. It discusses recent developments in economic affairs and how they shape the construction outlook. According to the report, construction starts are expected to increase 9% in 2015 and will reach $612 billion.[6] The 2015 Dodge Construction Outlook analyzes which sectors of the U.S. construction market will see improvement over the year and which sectors will continue to struggle toward a long-awaited recovery. It covers the major sectors of the U.S. construction market with breakouts for detailed categories within the residential, nonresidential and engineering sectors.

Dodge Data & Analytics' Green Building Market Sizing is based on its construction market forecast, project data, and substantiated by additional research, analysis and surveys conducted by Dodge Data & Analytics between 2005 and 2013. Building codes, legislation, and policies are also used in determining market estimates.

Dodge Data & Analytics defines the Green Construction Market as follows:

> "We define green building as one built to LEED standards, an equivalent green building certification program, or one that incorporates numerous green building elements across five category areas: energy efficiency, water efficiency, resource efficiency, responsible site management and improved indoor air quality. Projects that only feature a few green building products (e.g., HVAC systems, waterless urinals) or that only address one aspect of a green building, such as energy efficiency, are not included in this calculation." [7]

Based on this definition, Dodge Data & Analytics evaluates a project in its sample pool to determine whether it should be categorized as part of the green construction market. If a project is determined to meet the criteria above, the entire project value is deemed to be part of the green construction market, not just the share of the project that can be traced to green building elements. The value of each project is logged in the database according to the construction start date. Therefore, if a $100 million building is scheduled to break ground in 2016, the entire $100 million project value will be assigned to 2016, regardless of the planned construction schedule or how long the project actually takes to complete. The database primarily captures new construction data; however, major renovations are also included.

[6] Dodge Data & Analytics (2014). *2015 Construction Outlook Report*.
[7] Dodge Data & Analytics (2012). *2013 Dodge Construction Green Outlook Report*.

This definition is clarified as follows: "Equally important, the definition does not include administrative or non-construction professionals working for design or construction firms, including accounting, marketing and green cleaning staff. It also does not include the manufacturing of green products."

The Dodge Data & Analytics report provides the greatest volume of data for our analysis. However, additional, smaller data sets were required for individual analyses. These specific data sets are described in the relevant methodology sections below.

Modeling Techniques

The economic impact from annual green construction spending and savings was calculated for the entire U.S. using the IMPLAN model. The national economic impacts in terms of direct, indirect, and induced effects were then disaggregated by states based on each state's ratio of green spending and savings relative to the nation. Within this analysis:

- Direct effects are the initial economic changes to the impacted industry (e.g., a general contractor who constructs a green building).
- Indirect effects represent the increased economic activity generated for downstream businesses that provide supplies and raw materials for the industries directly affected (e.g., the general contractor purchases supplies from steel and lumber companies).
- Induced effects capture the economic impact from the increased income of households that are directly and indirectly affected by green building expenditures (e.g., employees of the general contractor, the steel supplier, and the lumber supplier use their additional income from green construction spending to purchase products and services from food and gas to healthcare and education).

The annual green construction spending and savings estimates, which were pulled from reputable sources, were grouped into 14 economic sectors within the IMPLAN model. For each impacted economic sector, IMPLAN calculates the direct, indirect, and induced effects on GDP, jobs, and labor earnings (wages). Construction spending will generate positive economic impact, whereas savings will reduce economic activity within an industry sector.

Calculated LEED spending and savings were assigned to 11 economic sectors based on an analysis of the types of buildings that are LEED certified. Similarly, green spending and savings were assigned to 11 economic sectors listed below.

These 11 sectors were selected based on the type of LEED-certified buildings since economic impact would depend on total spending on LEED projects. For example, a new build high-rise office building will have a different economic impact than retrofitting an existing high-rise office building since its construction spending for the new high-rise office building would be considerably higher resulting in greater impact. Similarly, construction spending on a hospital will have a different economic impact than construction on single-family homes. Based on this approach, construction spending will have a positive impact on the following 11 economic sectors:

- Construction of new health care structures
- Construction of new manufacturing structures
- Construction of new educational and vocational structures
- Construction of new highways and streets
- Construction of new commercial structures, including farm structures
- Construction of other new nonresidential structures
- Construction of new single-family residential structures

- Construction of new multifamily residential structures
- Maintenance and repair construction of nonresidential structures
- Maintenance and repair construction of residential structures
- Maintenance and repair construction of highways, streets, bridges, and tunnels

The five categories that will experience economic contraction as a result of the non-residential and residential structure maintenance savings are as follows:

- Maintenance and repair construction of nonresidential structures
- Maintenance and repair construction of residential structures
- Waste management and remediation services
- Water, sewage, and other water treatment systems
- Electric power generation, transmission, and distribution

The model produces economic impact on national GDP, jobs and labor earnings by these specific economic sectors.

Analytical Methodology

Below we provide an overview of the data sources, approach, and methodology for the analyses of:

- Green Construction
- LEED Construction
- Tax Contributions by State

The results of our approach section, acted as inputs for our IMPLAN model and were segmented into the different economic sectors we considered for our analysis. We went about calculating construction spending and savings associated with green and LEED construction from 2005 to 2018. Our state-level segmentation approach for spending and savings for both, green and LEED construction has also been detailed below. Finally, we have elaborated on our approach to forecast State Tax contributions by LEED construction for all 50 states between 2015 and 2018.

National Green Construction Approach

Dodge Data & Analytics' 2013 Green Construction Outlook[8] provides estimates for years 2009 to 2016. Where a range of values was provided, we used the midpoint of the values. We then used these numbers to generate an estimate of the green construction market for all other years between 2005 and 2018. For this purpose we used exponential smoothing techniques in Tableau in considering various demand factors to forecast green construction spending based on historical data from the 2013 Green Construction Outlook Report. After conducting a thorough literature review of current green-related studies, we tested potential drivers and identified the major drivers of green construction growth, that is, the two with highest correlation, which include urbanization and GDP. Regressing historical data considering these demand drivers, we forecasted projections for Green Construction Spending until 2018. The result of these estimates can be seen in Appendix C. We further used this report to understand spending segmented by building asset type to assign this data toward IMPLAN codes for our Economic Impact Analysis model.

We conducted a Green Savings analysis, to size the potential costs avoided due to green construction compared to conventional construction for the following savings categories: energy,

[8] Dodge Data & Analytics (2012). *2013 Dodge Construction Green Outlook Report*.

maintenance, trash, and water. For the purposes of calculating the economic impact of green construction, the value of savings reduces income for those impacted economic sectors we consider in our IMPLAN model. Dodge Data & Analytics does not report the number of square feet associated with the green construction market. This information is necessary to calculate the green construction market savings. To do this, we obtained data on the average green construction cost per square foot ($/ sq. ft.) for a new building by building asset type. After segmenting green construction spending by building asset type, we calculated total annual square foot of each building asset type for 2015-18 by using total spending data by building asset type and per square foot cost data for that building asset type in 2015-2018. We used the 2015 RSMeans Square Foot Cost Book to get this data. Further, by using historical indices for construction, we calculated cost per square foot for all years between 2005-2015 and used this to size total annual square foot of green construction by building asset type from 2005-2015. This data is displayed in Appendix C. Using the aggregate annual square foot of green construction, we estimated the aggregate associated savings along energy, maintenance, trash and water, by multiplying it with per square foot green savings projections as explained in Section 7. We segmented this savings data to assign towards relevant IMPLAN codes for our Economic Impact Analysis model.

State-level Green Construction Approach

The approach utilized to analyze economic impact at the state level mirrors that of the national level approach modified for the change in scope. For the state analysis, we first used the 2013 Dodge Data & Analytics Green Outlook report to gain data regarding building asset type green construction spending and segmented overall green spending by building asset type. We then looked at CBRE's National Green Building Adoption Index report to capture green construction adoption rates based on location, in order to provide further insight into the projections for future green construction. Since individual state residential and non-residential green construction has different penetration levels, we ran independent exponential smoothing forecasts on each and calculated total green construction by state. For residential green construction, we used location cost factors and square foot cost of construction for residential projects, and used state-level split of spending provided in the 2013 Dodge Data & Analytics Green Outlook report[9]. For non-residential green construction, we used constructions put in place data from U.S. Census to understand total penetration for non-residential construction by state. [10] Using both green adoption levels and non-residential construction penetration by state, we forecasted segmentation of non-residential green construction spending by state up to 2018. We proceeded to use location cost factors from the 2015 RSMeans Square Foot Cost Book[11] to calculate spending by state. We then added residential and non-residential green construction spending by state to calculate total state-level green construction spending. We used these spending ratios to model savings by state as well. Finally, we assigned both spending and savings by state to relevant IMPLAN codes for our Economic Impact Analysis model.

National LEED Construction Approach

The approach to determine the economic impact of LEED construction was based on the total cost of construction of LEED buildings plus certification fees. In contrast, the 2009 Green Jobs study was

[9] Dodge Data & Analytics (2012). *2013 Dodge Construction Green Outlook Report*.

[10] U.S. Census Bureau (2015, July). *Value of Construction Put in Place at a Glance*. Retrieved from: https://www.census.gov/construction/c30/c30index.html.

[11] Phelan, Marilyn. AIA (2015). *RSMeans Square Foot Costs, 36th annual edition.*

based on the marginal cost of LEED based on studies available at the time. Following analysis of the USGBC database of LEED certifications along with a thorough review of current LEED-related literature, we used exponential smoothing to forecast LEED construction assets by square foot based on historical LEED-certified project data. Our project database comprised of detailed information about location, certification level, construction square foot, certification type, registration date, and building asset type. We identified 12 major drivers of LEED construction growth and used Excel, R, and Tableau to run covariance analyses to determine most correlative factors such as Urbanization and GDP for each asset type. We then chose the two most correlated factors based on their p-values. We set our threshold value at 5% or 0.05. Both Urbanization and GDP had p-values lesser than 1% (p-values < 0.01) indicating we do not reject the null hypotheses of a significant test if the observed results have a 99% level of confidence. We forecasted projections for LEED Construction square foot growth for three different scenarios: baseline, pessimistic, and optimistic by using exponential smoothing technique on multivariate regression around these leading demand drivers. The optimistic forecast was chosen based on the assumption that economic conditions will continue in their positive trajectories and provide an incubator for the growth of the LEED construction market. Subsequently, we ran Monte Carlo simulations on these projections to gain a more realistic, tempered growth rate. In addition, we invalidated any potential spikes in LEED growth due to new version releases by plotting LEED version maturity curves and demonstrating that the version changes had little effect on the overall LEED demand curve.

Using USGBC's historical database we segmented this square foot data by building asset type from 2005-2018, as follows. Based on the per square foot cost by building asset type for green construction, we calculated the construction component of LEED spending for 2015. Specifically, we used the 2015 RSMeans Square Foot Cost Book[12] for data on construction cost per square foot ($/sq. ft.) for new buildings by building asset type. Further, we calculated and added the LEED certification fees by certification level for each building type for years 2015, the collective sum of which gave us LEED spending for 2015. Then, by using historical indices for construction, we calculated cost per square foot for all years between 2005-2015 and used this to size annual spending of LEED construction by building asset type from 2005-2015. We proceeded to forecast LEED construction spending from 2016 to 2018.

We conducted a LEED savings analysis to size the potential building owner expenditures avoided due to LEED construction over traditional construction for the following savings categories: energy, maintenance, waste, and water. After segmenting LEED construction spending by building asset type, we conducted a certification level analysis on USGBC's historical LEED project database. We segmented the historical LEED project database to get aggregate square foot data of LEED construction by certification level per year from 2005-2015 and also for forecasted projections until 2018. We proceeded to conduct a meta-analysis to calculate per square foot LEED savings projections for different LEED certification levels as described in section 7. Using the aggregate annual square foot of LEED construction by certification level, we estimated aggregate associated savings along energy, maintenance, trash and water, by multiplying it with the per square foot LEED savings projections. We segmented this savings data to assign toward relevant IMPLAN codes for our Economic Impact Analysis model.

[12] Phelan, Marilyn. AIA (2015). *RSMeans Square Foot Costs, 36th annual edition.*

State-level LEED Construction Approach

The approach utilized to analyze economic impact at the state level is essentially the same as was used at the national level with a few exceptions. USGBC's historical LEED project database comprised of detailed information on which we conducted a location-based analysis to segment this database by state by year from 2005 to 2015. This analysis also helped us understand building asset type LEED construction segments by state, which helped estimate costs by state as per square foot costs by building asset type vary. We also looked at CBRE's National Green Building Adoption Index[13] report to understand adoption rates based on location, in order to gain a better understanding of projections. Since state-wise LEED construction for residential and non-residential LEED construction has different penetration levels, we ran independent analysis on each and calculated total LEED construction by state. For residential LEED construction, we used the historical LEED project database, and looked at location cost factors and square foot costs of construction for residential projects and added LEED certification fees. For non-residential LEED construction, we ran a similar analysis, however using square foot construction data for different non-residential building asset types. We used the 2015 RSMeans Square Foot Cost Book[14] for all square foot data. Thus, location-specific data was used to derive LEED construction for each state. We then added residential and non-residential LEED construction spending by state to get total state-level LEED construction spending. We used these spending ratios to get savings by state as well. Finally, we assigned both spending and savings by state to relevant IMPLAN codes for our Economic Impact Analysis model.

Tax Contributions by State Approach

To quantify the impact of LEED construction at the state level and to forecast the four-year impact (2015-2018), this study utilized income and property tax as measures of contribution. We then took data from the USGBC internal database and used a bottom-up approach that calculates tax revenues by building asset type (property type), income generated by individuals involved, rental income and other indirect and induced income tax generated by LEED construction. We collected individual historical state tax data and segmented tax income based on categories relevant to LEED construction. We did not include taxes around certifications and credentials, if any, from our calculations because they would have little impact to overall tax generated. We used tax information and segmented total jobs and construction jobs with state level results of our economic impact analysis. Further, we used average construction jobs data by state to calculate total income and tax associated. By using labor earnings by state for LEED construction, we calculated the individual income tax associated with each state. Similarly, we calculated corporate income tax by companies involved in construction by applying the national average proportion of corporate tax that represents rentals and construction (1.5%) to each state's total corporate tax revenues, and then segmented it by LEED penetration by state.[15] By using project data, by asset type, by state, we ran an analysis to calculate property tax.

In this analysis, there were three major buckets of tax utilized: individual income tax, corporate income tax, and property tax. Individual income tax refers to the income tax collected from individuals with a LEED-related job. This state-imposed individual income tax was further split into

[13] CBRE, Maastricht University, and real GREEN (2014). *National Green Building Adoption Index*.
[14] Phelan, Marilyn. AIA (2015). *RSMeans Square Foot Costs, 36th annual edition.*
[15] CBRE, Maastricht University, and real GREEN (2014). *National Green Building Adoption Index*.

direct, indirect, and induced LEED-related employment income tax categories. Corporate income tax refers to state taxes collected from LEED-related corporations and similarly, state property tax refers to taxes collected on LEED-related properties.

Appendix A provides a glossary. Appendix B and C provide additional details concerning modeling and assumptions.

3 National Green Construction Economic Impact

Green construction continues its growth as building owners look to sustainable building for economic, environmental, and social motivations. While the increase in green construction spending is notable, the direct, indirect, and induced economic impact of this growth is not yet well studied. This report aims to shed light on exactly these direct, indirect, and induced economic impacts, beginning with a national scope of analysis.

Green building, also called sustainable or high performance building, emerged in response to concerns of the long-term environmental and economic impacts of traditional construction. In pursuit of sustainability, green buildings have used energy, land, water, and materials more efficiently, and have the added benefit of saving money for both businesses and taxpayers. For example, it has been shown that an initial upfront "green investment" of just 2% of construction costs is shown to yield lifecycle savings of more than 10 times the amount of the initial investment.[16] The standards for green building include processes that aim to reduce environmental impact throughout a building's lifecycle, resulting in the reduction of environmental impact, emissions costs, waste disposal, water bills, energy usage, and operations and maintenance costs.[17] In addition to the economic and environmental benefits, there is substantial evidence to support a correlation between green standards and worker health and productivity.[18] While this study does not explore the productivity or

KEY TAKEAWAYS

From 2015-2018, green construction spending forecasted to grow 15.1% YoY to $224.4 billion

National green construction will directly impact GDP by $303.4 billion from 2015-2018

Also, it will directly support over 3.9 million jobs generating $268.4 billion in labor earnings from 2015-2018

[16] Kats, Greg (2003, October) *The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force*. Retrieved from: http://www.calrecycle.ca.gov/greenbuilding/design/costbenefit/report.pdf

[17] JLL (2013). *U.S. Construction Outlook Report*.

[18] Kats, Greg (2003, October) *The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force*. Retrieved from: http://www.calrecycle.ca.gov/greenbuilding/design/costbenefit/report.pdf

health of workers, it is worth noting the far reach of green constructions' benefits and areas of potential future study.

This section summarizes the findings of the green building construction economic analysis performed in this study. The results forecast annual green building construction spending for the years 2015-2018, as well as quantify the contribution of green construction to key annual economic indicators. The economic impacts cited here are the result of an analysis of the total value of green buildings, rather than segmented spending separating out green-specific technologies or professions, as green construction creates employment opportunities for both green and non-green professions. This section of the study includes both LEED-certified buildings and non-LEED-certified high-performance green buildings and further estimates the savings associated with green building construction, as there can be a contraction of economic activity in some industry sectors due to efficient operation and resulting decreased expenditures (e.g., electrical savings). [19]

Assumptions

We made several assumptions based on the available data:

- Dodge Data & Analytics' definition of the green construction market includes the total value of the building, not just the incremental value attributable to environmentally friendly equipment. Therefore, the economic and employment impact of these investments will capture both "green jobs" and traditional construction jobs employed in these green buildings.
- Dodge Analytics issues periodic forecasts for the total value of the green construction market, but it does not estimate the number of square feet of building space associated with those estimates. Therefore, we calculated the approximate number of square feet for each year by asset type by dividing the building's total construction cost by the average cost per square foot for each asset type to construct a building and used historical indices and inflation to calculate square foot per from 2005-2018.
- Inflation rates from 2005 to 2018 were included to adjust the average energy, trash, water, and maintenance costs.
- The 2015 RS Means Square Foot Cost[20] book was used to calculate asset type and used historical factors to calculate the cost per year.
- GDP deflators from OMB President's Budget table were leveraged to understand historical dollar value economic impact based on the current dollar value.
- IMPLAN input-output accounts are based on industry survey data collected periodically by the U.S. Bureau of Economic Analysis and follow a balanced account format recommended by the United Nations.
- The national economic impacts in terms of direct, indirect, and induced effects were disaggregated by state, as presented in Section 5.

Analysis

The growth in green construction spending is currently outpacing non-green construction spending. Annual green construction spending is expected to grow 15.1% YoY for 2015-2018, with

[19] When this report refers to "negative" impacts, such as those induced by electrical savings, it is to say that certain industry sectors, e.g. electric utilities, will see a decrease in their revenue due to the increased efficiency and thus decreased electricity use in green buildings.

[20] Phelan, Marilyn. AIA (2015). *RSMeans Square Foot Costs, 36th annual edition.*

annual spending projected to increase from $150.6 billion in 2015 to $224.4 billion in 2018. Residential green construction spending is expected to grow from $55 billion in 2015 to $100.4 billion in 2018, representing a YoY growth of 24.5%, while commercial green construction spending is estimated to grow from $95.6 billion in 2015 to $123.96 billion in 2018, reflecting a YoY growth of 9.76%. By 2018, green residential construction is projected to represent approximately 44.75% of all green construction.

Green construction contributed significantly to the national GDP with a net direct economic impact of $60.7 billion and an indirect impact of $68.9 billion in 2015. It is expected to grow to $85.4 billion and $98.3 billion respectively by 2018. This means that the green construction market's impact on GDP is projected to increase by 41% from 2015 to 2018. It is estimated that in 2015, green construction will directly contribute 796,000 jobs to the U.S. economy, while $53.6 billion of all wages will be directly accounted for by the green construction industry. By 2018, these numbers will increase to 1.1 million and $75.6 billion respectively. According to predictions, by 2018, the green construction industry will be in some way responsible for 38% of all construction jobs. [21] Indirect GDP contributions from green construction between the years 2011 and 2014 total $188.8 billion and are projected to rise to a four-year indirect contribution total of $345.7 billion for 2015-2018. Current induced GDP contribution projections for 2015 total $70.8 billion and will increase to approximately $100.3 billion by 2018.

FIGURE 3.1: NATIONAL GREEN CONSTRUCTION SPENDING ($)

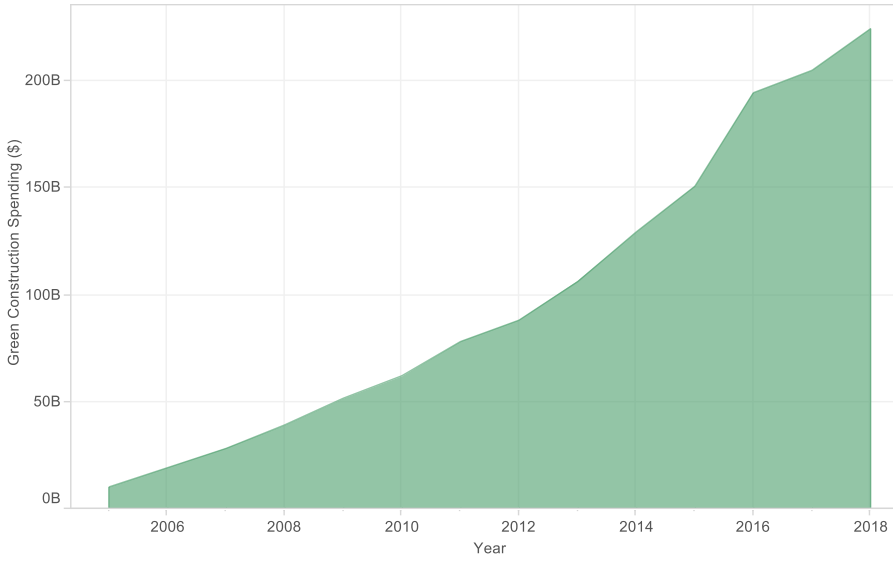

TABLE 3.1: NATIONAL GREEN CONSTRUCTION SPENDING

Year	National Green Construction Spending ($Millions)
2005	10,000
2006	19,000

[21] Lacey, T., Wright, B. (2009). *Occupational employment projections to 2018*.

2007	28,000
2008	39,000
2009	51,500
2010	62,000
2011	78,000
2012	88,000
2013	106,000
2014	129,000
2015	*151,000*
2016	*194,000*
2017	*205,000*
2018	*224,000*

Note: Italics indicate that data is a projection

TABLE 3.2: SUMMARY OF NET IMPACT OF NATIONAL GREEN CONSTRUCTION EXPENDITURES

	Cumulative Net Impact	
Type of Economic Impact Supported by Green Construction Spending	**2011-2014**	***2015-2018***
GDP (millions)	$551,000	*$1,004,000*
Employment (jobs)	6,429,000	*11,796,000*
Labor Earnings (millions)	$369,000	*$673,000*

Note: Italics indicate that data is a projection

FIGURE 3.2: TOTAL DIRECT, INDIRECT, AND INDUCED IMPACT OF NATIONAL GREEN CONSTRUCTION ON GDP ($)

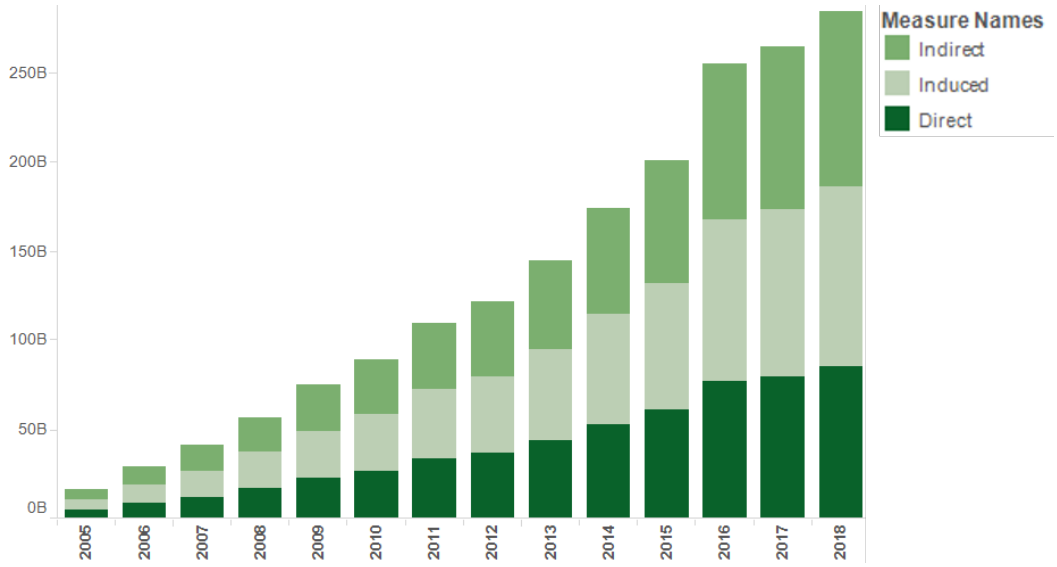

TABLE 3.3: TOTAL IMPACT OF NATIONAL GREEN CONSTRUCTION ON GDP ($, BILLIONS)

Total Impact of National Green Construction on GDP ($, billions)				
Year	**Direct**	**Indirect**	**Induced**	**Total**
2005	4.71	5.71	5.66	16.08
2006	8.66	10.25	10.29	29.19
2007	12.40	14.67	14.73	41.79
2008	17.16	19.70	20.14	57.00
2009	22.64	25.59	26.38	74.61
2010	27.11	30.50	31.48	89.09
2011	33.56	37.55	38.87	109.98
2012	36.89	41.98	43.06	121.94
2013	43.78	49.92	51.19	144.88
2014	53.17	59.40	61.59	174.15
2015	*60.73*	*68.92*	*70.82*	*200.47*
2016	*77.52*	*87.30*	*90.09*	*254.90*
2017	*79.79*	*91.16*	*93.36*	*264.31*
2018	*85.44*	*98.40*	*100.35*	*284.19*

Note: Italics indicate that data is a projection

FIGURE 3.3: TOTAL DIRECT, INDIRECT, AND INDUCED IMPACT OF NATIONAL GREEN CONSTRUCTION ON EMPLOYMENT (JOBS)

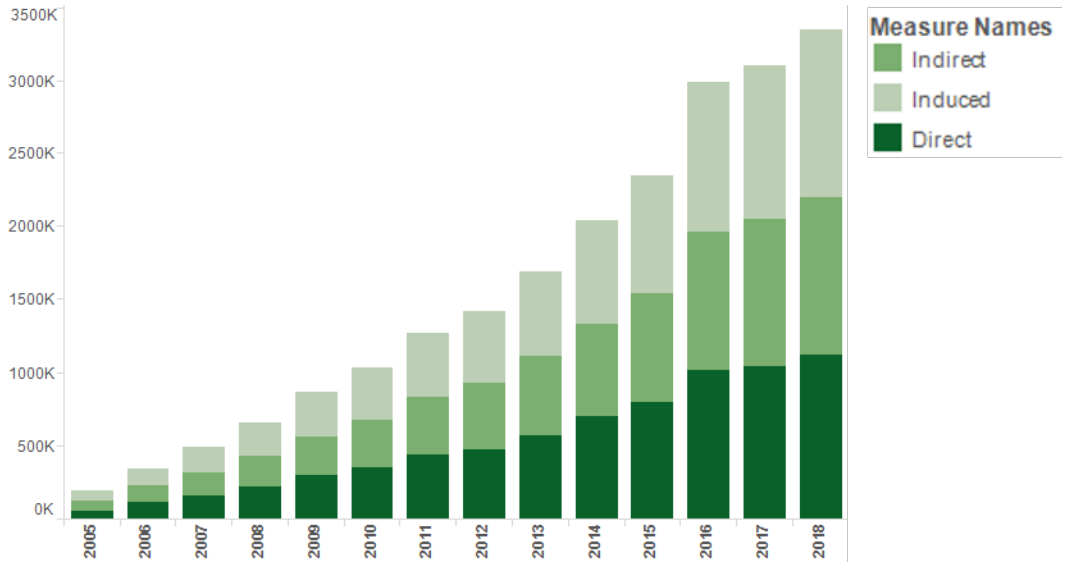

TABLE 3.4: TOTAL IMPACT OF NATIONAL GREEN CONSTRUCTION ON EMPLOYMENT (JOBS)

Total Impact of National Green Construction on Employment (Jobs)				
Year	**Direct**	**Indirect**	**Induced**	**Total**
2005	62,000	66,000	65,000	192,000
2006	113,000	112,000	117,000	343,000
2007	162,000	157,000	168,000	487,000
2008	225,000	210,000	229,000	664,000
2009	296,000	272,000	300,000	868,000
2010	354,000	322,000	358,000	1,034,000
2011	438,000	397,000	442,000	1,277,000
2012	482,000	447,000	490,000	1,419,000
2013	575,000	539,000	583,000	1,696,000
2014	699,000	637,000	701,000	2,037,000
2015	*797,000*	*746,000*	*806,000*	*2,349,000*
2016	*1,018,000*	*945,000*	*1,025,000*	*2,989,000*
2017	*1,049,000*	*997,000*	*1,063,000*	*3,109,000*
2018	*1,124,000*	*1,082,000*	*1,143,000*	*3,349,000*

Note: Italics indicate that data is a projection

FIGURE 3.4: TOTAL DIRECT, INDIRECT, AND INDUCED IMPACT OF NATIONAL GREEN CONSTRUCTION ON LABOR EARNINGS ($)

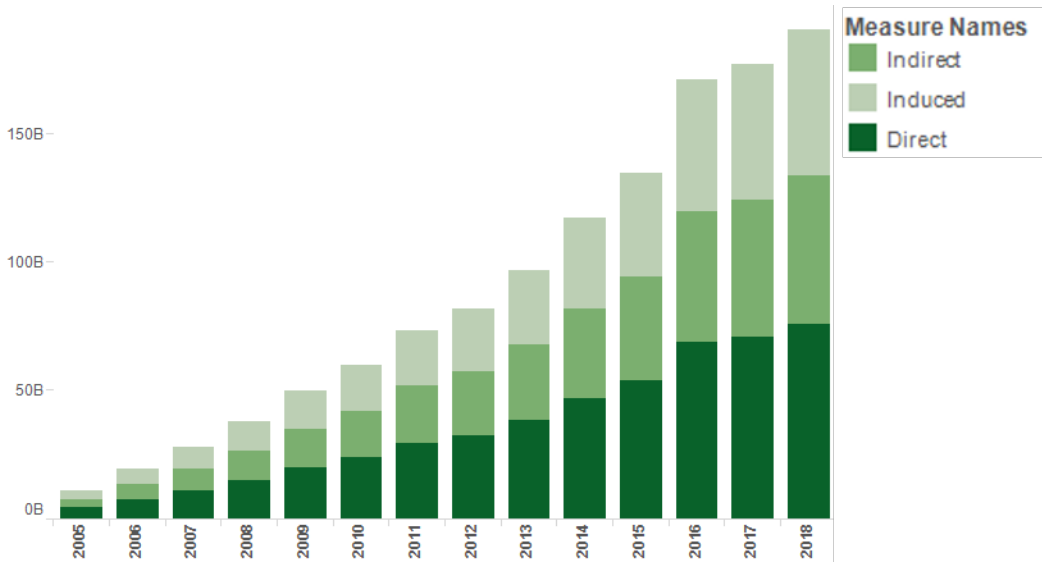

TABLE 3.5: TOTAL IMPACT OF NATIONAL GREEN CONSTRUCTION ON LABOR EARNINGS ($, BILLIONS)

Total Impact of National Green Construction on Labor Earnings ($, billions)				
Year	**Direct**	**Indirect**	**Induced**	**Total**
2005	4.15	3.36	3.22	10.73
2006	7.62	6.05	5.85	19.52
2007	10.91	8.65	8.37	27.93
2008	15.11	11.64	11.45	38.20
2009	19.99	15.04	14.99	50.03
2010	23.93	17.88	17.89	59.70
2011	29.62	22.01	22.10	73.72
2012	32.54	24.66	24.48	81.68
2013	38.69	29.31	29.10	97.10
2014	46.94	34.90	35.01	116.84
2015	*53.66*	*40.42*	*40.26*	*134.33*
2016	*68.50*	*51.19*	*51.21*	*170.90*
2017	*70.61*	*53.42*	*53.07*	*177.10*
2018	*75.67*	*57.64*	*57.05*	*190.36*

Note: Italics indicate that data is a projection

4 National LEED Construction Economic Impact

LEED provides a voluntary third-party verification of green building design and construction, and is widely embraced as the premier green building design standard. Over the past 15 years since its inception, LEED has gone from a single standard for new construction to a comprehensive system of standards which aims to comprehensively address the development and construction process. The benefits of LEED-certified buildings go beyond energy and operating cost savings to include increases in asset value, ROI, and occupancy. Additional benefits such as increased worker productivity and positive public reputation resulting from LEED certification can also contribute to LEED's attraction as a market differentiator. [22]

LEED is largely responsible for the growth of the green construction sector, as it composed nearly 37.5% of green construction jobs in 2014. Additionally, LEED was responsible for $20.7 billion in direct GDP contribution to the U.S. economy in that same year. This section of the study aims to estimate the national economic impact of LEED-certified construction.

Assumptions

We made several assumptions given the available data:

- LEED construction numbers represent the total value of the building, and not solely the incremental value. As stated above, the economic and employment impact of these investments captures both "green jobs" and traditional construction used in the building of the LEED certified buildings.

KEY TAKEAWAYS

From 2015-2018, LEED construction spending forecasted to grow 12.3% YoY to $78.6 Billion in 2018

National LEED construction will directly impact GDP by $108.8 Billion from 2015-2018

It will also support over 1.4 million jobs generating $95.7 billion in labor earnings from 2015-2018

[22] McGraw-Hill Construction (2013). *Smart Market Report: World Green Building Trends, Business Benefits Driving New and Retrofit Market Opportunities in Over 60 Countries.*

- In addition to the total construction cost, we added estimated LEED certification fees. The costs do not expressly account for any consulting fees or added costs (if any) given that the study focuses on overall aggregate contribution from the construction of LEED buildings.
- Considered inflation rates from 2005 to 2018 to adjust the average energy, trash, water, and operation and maintenance costs.
- For the LEED spending analysis, from 2009 onwards we removed all square foot data associated with LEED rating system LEED Existing Buildings: Operations & Maintenance (EBOM), since subject matter expert (SME) input suggested low spending associated with such projects. LEED certification fees were projected from 2009 onwards given the availability of data.
- We used GDP deflators from Office of Management and Budget President's Budget table to understand historical dollar value economic impact based on the current dollar value.
- The IMPLAN input-output accounts are based on industry survey data collected periodically by the U.S. Bureau of Economic Analysis and follow a balanced account format recommended by the United Nations.
- For the IMPLAN economic analysis, spending and savings were assigned to 11 economic sectors based on an analysis of the types of buildings that are LEED certified.
- The national economic impacts in terms of direct, indirect, and induced effects were disaggregated by states based on each state's ratio of green and LEED spending and savings relative to the nation, as presented in Section 6.

Note: USGBC's LEED economic impact is a subset of the impact of the overall green construction market because the definition of the "green construction market" is broader and includes buildings that do not qualify for LEED certification as well those that have not applied for LEED certification. See definition of green construction in Appendix A.

Analysis

A Monte Carlo simulation of the optimistic LEED construction forecast resulted in a YoY spending growth rate of 12.3%, growing from a $61.8 billion industry in 2015, to $78.6 billion in 2018. LEED Residential is forecasted at a high YoY growth rate of 31.1% by square foot, reflecting its potential given the historically small market penetration. The LEED Commercial forecast demonstrates a steady YoY growth rate of 8.5% by square foot, for 2015-2018.

Construction of LEED certified buildings contributed $20.7 billion to the national GDP and 272,000 jobs to the U.S. economy in 2014. By 2018, these contributions are expected to increase to $29.8 billion and 385,000 respectively. In addition, LEED is forecasted to account for $26.2 billion in wages in 2018, increasing from $18.3 billion in 2014.

FIGURE 4.1: NATIONAL LEED CONSTRUCTION SPENDING ($)

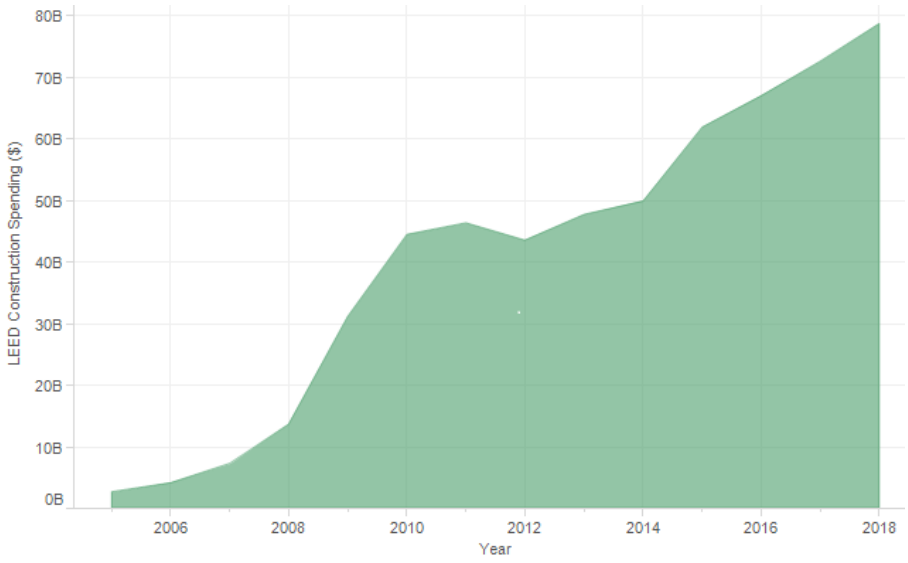

TABLE 4.1: NATIONAL LEED CONSTRUCTION SPENDING ($, BY YEAR)

Year	National LEED Construction Spending ($)
2005	2,640,000,000
2006	4,100,000,000
2007	7,230,000,000
2008	13,600,000,000
2009	31,140,000,000
2010	44,390,000,000
2011	46,280,000,000
2012	43,460,000,000
2013	47,640,000,000
2014	49,790,000,000
2015	*61,800,000,000*
2016	*66,870,000,000*
2017	*72,520,000,000*
2018	*78,630,000,000*

Note: Italics indicate that data is a projection

TABLE 4.2: SUMMARY OF NET IMPACT OF NATIONAL LEED-CERTIFIED CONSTRUCTION EXPENDITURES

	Cumulative Net Impact	
Type of Economic Impact Supported by LEED Construction Spending	**2011-2014**	***2015-2018***
GDP (millions)	$256,000	*$357,000*
Employment (jobs)	2,900,000	*4,100,000*
Labor Earnings (millions)	$172,000	*$239,000*

Note: Italics indicate that data is a projection

FIGURE 4.2: TOTAL DIRECT, INDIRECT, AND INDUCED IMPACT OF NATIONAL LEED-CERTIFIED CONSTRUCTION ON GDP ($)

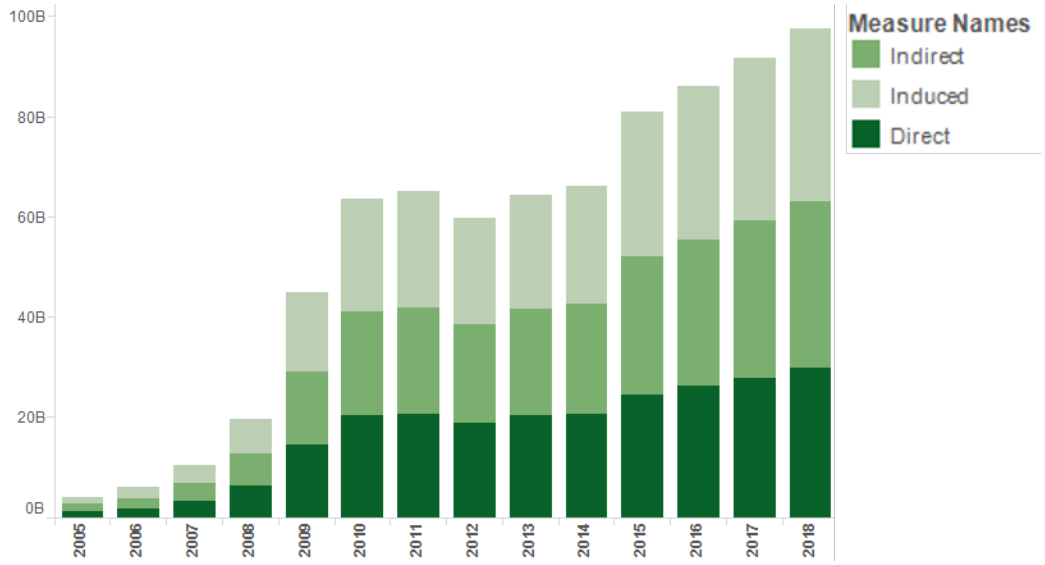

TABLE 4.3: TOTAL IMPACT OF NATIONAL LEED CONSTRUCTION ON GDP ($, BILLIONS)

Total Impact of National LEED Construction on GDP ($, billions)				
Year	**Direct**	**Indirect**	**Induced**	**Total**
2005	1.36	1.30	1.48	4.14
2006	2.02	1.98	2.22	6.23
2007	3.41	3.50	3.81	10.72
2008	6.45	6.27	7.06	19.78
2009	14.60	14.32	16.02	44.94
2010	20.36	20.64	22.61	63.60
2011	20.69	21.22	23.08	65.00
2012	18.87	19.71	21.23	59.81
2013	20.30	21.28	22.87	64.44
2014	20.76	22.04	23.55	66.36
2015	*24.70*	*27.60*	*28.60*	*80.90*
2016	*26.30*	*29.40*	*30.46*	*86.17*
2017	*28.03*	*31.33*	*32.46*	*91.81*
2018	*29.81*	*33.32*	*34.52*	*97.66*

Note: Italics indicate that data is a projection

FIGURE 4.3: TOTAL DIRECT, INDIRECT, INDUCED IMPACT OF NATIONAL LEED CONSTRUCTION ON EMPLOYMENT (JOBS)

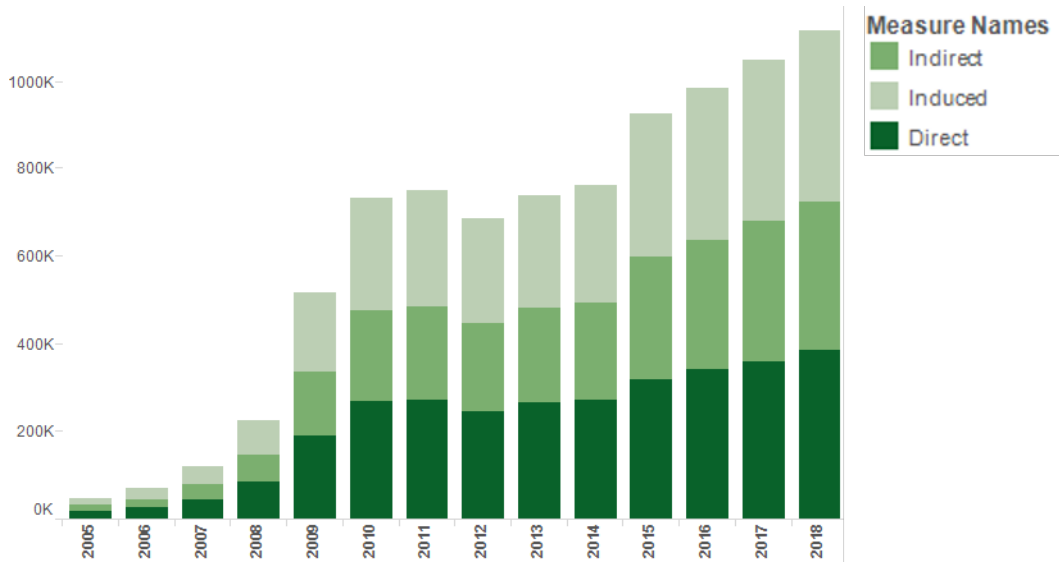

TABLE 4.4: TOTAL IMPACT OF NATIONAL LEED CONSTRUCTION ON EMPLOYMENT (JOBS)

Total Impact of National LEED Construction on Employment (Jobs)				
Year	**Direct**	**Indirect**	**Induced**	**Total**
2005	18,000	13,000	17,000	48,000
2006	27,000	19,000	25,000	71,000
2007	45,000	35,000	43,000	123,000
2008	85,000	62,000	80,000	227,000
2009	193,000	144,000	182,000	519,000
2010	267,000	209,000	257,000	734,000
2011	271,000	216,000	262,000	749,000
2012	247,000	199,000	241,000	688,000
2013	266,000	216,000	260,000	741,000
2014	272,000	224,000	268,000	764,000
2015	*319,000*	*281,000*	*325,000*	*925,000*
2016	*340,000*	*299,000*	*346,000*	*985,000*
2017	*362,000*	*318,000*	*369,000*	*1,049,000*
2018	*386,000*	*339,000*	*392,000*	*1,116,000*

Note: Italics indicate that data is a projection

FIGURE 4.4: TOTAL DIRECT, INDIRECT, AND INDUCED IMPACT OF NATIONAL LEED-CERTIFIED CONSTRUCTION ON LABOR EARNINGS ($)

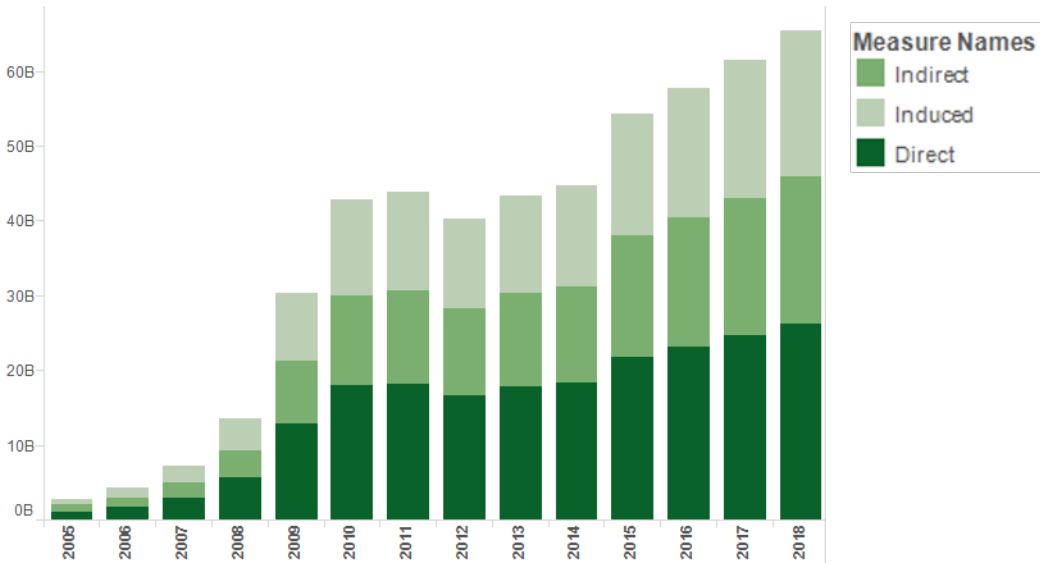

TABLE 4.5: TOTAL IMPACT OF NATIONAL LEED CONSTRUCTION ON LABOR EARNINGS ($, BILLIONS)

Total Impact of National LEED Construction on Labor Earnings ($, billions)				
Year	**Direct**	**Indirect**	**Induced**	**Total**
2005	1.19	0.78	0.84	2.81
2006	1.78	1.18	1.26	4.22
2007	3.00	2.08	2.17	7.24
2008	5.67	3.73	4.01	13.42
2009	12.85	8.45	9.11	30.41
2010	17.93	12.12	12.85	42.91
2011	18.22	12.47	13.12	43.80
2012	16.60	11.62	12.07	40.28
2013	17.85	12.55	13.00	43.39
2014	18.30	12.99	13.39	44.68
2015	*21.72*	*16.25*	*16.26*	*54.23*
2016	*23.13*	*17.31*	*17.32*	*57.76*
2017	*24.64*	*18.45*	*18.45*	*61.54*
2018	*26.21*	*19.62*	*19.63*	*65.46*

Note: Italics indicate that data is a projection

5 State Green Construction Economic Impact

To quantify the contribution of green construction to state economies, we analyzed green construction spending, savings as well as direct, indirect, and induced contributions to GDP, employment, and labor earnings. This analysis was conducted using green construction spending data from the 2013 Green Construction Outlook[23] and location factors from the 2015 RSMeans Square Foot Costs report[24] in order to identify past green construction impact on GDP, employment, and labor earnings as well as to project the 2015-2018 LEED construction contribution in these same areas.

Analysis

Just as some states have more general construction activity than others, a few states emerging as leaders in their total green spend and resulting economic impact. States in the top 10% of economic contributors for green construction (aggregate 2005-2014 historical and 2015-2018 forecasted data) include California, Florida, New York, North Carolina, and Texas. Green construction's contribution to state GDP ranged from 0.2% to 0.6% from 2011 to 2014 and is expected to grow between 53% and 204% for the forecasted period 2015 to 2018. Data for the individual economic impact categories was separated into impact subcategories for the 2011-2014 and 2015-2018 time periods. Illinois, Nebraska, Nevada, Rhode Island and West Virginia were the five states with the highest projected increase in green construction's direct contribution to GDP while comparing economic impact during 2011-2014 and 2015-2018.

KEY TAKEAWAYS

CA, FL, NY, NC & TX will be largest contributors to green construction economic impact from 2015-2018

Median direct green construction contribution to GDP by state is forecasted at $934 million in 2015

Median direct green construction contribution to GDP by state is forecasted at $1.3 billion in 2018

[23] Dodge Data & Analytics (2012). *2013 Dodge Construction Green Outlook Report*.
[24] Phelan, Marilyn. AIA (2015). *RSMeans Square Foot Costs, 36th annual edition.*

TABLE 5.1: STATE GREEN CONSTRUCTION ECONOMIC IMPACT ON GDP (2011-2014, $, BILLIONS)

State Green Construction Economic Impact on GDP (2011-2014, $, billions)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	2.46	2.77	2.86	8.09
Alaska	0.33	0.37	0.38	1.07
Arizona	4.71	5.31	5.47	15.49
Arkansas	1.17	1.31	1.36	3.84
California	14.28	16.11	16.61	47.00
Colorado	4.33	4.89	5.04	14.25
Connecticut	1.46	1.65	1.70	4.80
Delaware	0.52	0.59	0.61	1.71
Florida	12.02	13.55	13.98	39.55
Georgia	4.97	5.61	5.78	16.35
Hawaii	0.76	0.86	0.89	2.51
Idaho	1.10	1.24	1.28	3.61
Illinois	5.36	6.05	6.24	17.64
Indiana	3.59	4.04	4.17	11.80
Iowa	2.50	2.83	2.92	8.25
Kansas	1.77	1.99	2.06	5.82
Kentucky	1.67	1.88	1.94	5.50
Louisiana	3.43	3.87	3.99	11.30
Maine	0.55	0.62	0.64	1.81
Maryland	2.64	2.98	3.07	8.69
Massachusetts	4.02	4.54	4.68	13.23
Michigan	3.44	3.88	4.00	11.33
Minnesota	2.85	3.21	3.31	9.38
Mississippi	1.43	1.61	1.66	4.70
Missouri	2.67	3.01	3.11	8.79
Montana	0.51	0.57	0.59	1.68
Nebraska	1.08	1.22	1.26	3.56
Nevada	1.68	1.90	1.96	5.54
New Hampshire	0.70	0.79	0.82	2.31
New Jersey	3.33	3.75	3.87	10.95
New Mexico	1.41	1.59	1.64	4.64
New York	9.60	10.84	11.17	31.62
North Carolina	6.32	7.13	7.35	20.79
North Dakota	1.10	1.24	1.28	3.62
Ohio	5.13	5.78	5.96	16.87
Oklahoma	2.06	2.32	2.39	6.77
Oregon	3.04	3.44	3.54	10.02
Pennsylvania	4.71	5.31	5.47	15.49
Rhode Island	0.29	0.32	0.33	0.94
South Carolina	3.58	4.04	4.16	11.77
South Dakota	0.61	0.68	0.70	1.99
Tennessee	3.83	4.32	4.46	12.61

Texas	18.76	21.16	21.82	61.73
Utah	2.56	2.89	2.98	8.43
Vermont	0.31	0.35	0.36	1.01
Virginia	4.08	4.60	4.74	13.42
Washington	4.93	5.57	5.74	16.24
West Virginia	0.58	0.65	0.67	1.91
Wisconsin	2.70	3.04	3.14	8.87
Wyoming	0.51	0.57	0.59	1.66

TABLE 5.2: STATE GREEN CONSTRUCTION ECONOMIC IMPACT ON GDP (2015-2018, $, BILLIONS)

State Green Construction Economic Impact on GDP (2015-2018, $, billions)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	*4.94*	*5.63*	*5.77*	*16.34*
Alaska	*0.57*	*0.65*	*0.67*	*1.90*
Arizona	*9.05*	*10.31*	*10.57*	*29.93*
Arkansas	*2.13*	*2.43*	*2.49*	*7.06*
California	*27.33*	*31.94*	*31.94*	*91.22*
Colorado	*7.23*	*8.24*	*8.45*	*23.92*
Connecticut	*2.80*	*3.19*	*3.27*	*9.25*
Delaware	*0.81*	*0.92*	*0.94*	*2.67*
Florida	*23.04*	*26.26*	*26.93*	*76.23*
Georgia	*10.09*	*11.49*	*11.79*	*33.37*
Hawaii	*1.55*	*1.77*	*1.81*	*5.13*
Idaho	*2.10*	*2.39*	*2.45*	*6.94*
Illinois	*11.33*	*13.24*	*13.24*	*37.80*
Indiana	*7.07*	*8.06*	*8.27*	*23.40*
Iowa	*3.92*	*4.46*	*4.58*	*12.96*
Kansas	*2.80*	*3.19*	*3.27*	*9.25*
Kentucky	*3.08*	*3.50*	*3.59*	*10.17*
Louisiana	*5.41*	*6.16*	*6.32*	*17.89*
Maine	*1.11*	*1.27*	*1.30*	*3.69*
Maryland	*5.15*	*5.87*	*6.02*	*17.04*
Massachusetts	*6.62*	*7.55*	*7.74*	*21.91*
Michigan	*6.24*	*7.11*	*7.29*	*20.63*
Minnesota	*4.67*	*5.32*	*5.45*	*15.44*
Mississippi	*2.46*	*2.80*	*2.87*	*8.13*
Missouri	*5.06*	*5.76*	*5.91*	*16.73*
Montana	*0.78*	*0.89*	*0.92*	*2.59*
Nebraska	*2.22*	*2.53*	*2.59*	*7.34*
Nevada	*5.11*	*5.83*	*5.97*	*16.91*
New Hampshire	*1.31*	*1.50*	*1.54*	*4.35*
New Jersey	*6.20*	*7.06*	*7.24*	*20.51*
New Mexico	*2.34*	*2.67*	*2.74*	*7.76*

New York	*14.80*	*16.87*	*17.30*	*48.97*
North Carolina	*11.87*	*13.52*	*13.87*	*39.26*
North Dakota	*1.26*	*1.43*	*1.47*	*4.16*
Ohio	*8.69*	*9.90*	*10.16*	*28.76*
Oklahoma	*3.48*	*3.97*	*4.07*	*11.52*
Oregon	*4.53*	*5.16*	*5.29*	*14.98*
Pennsylvania	*8.79*	*10.02*	*10.28*	*29.09*
Rhode Island	*0.65*	*0.74*	*0.75*	*2.14*
South Carolina	*6.20*	*7.06*	*7.24*	*20.51*
South Dakota	*1.04*	*1.19*	*1.22*	*3.44*
Tennessee	*6.52*	*7.43*	*7.62*	*21.58*
Texas	*32.39*	*36.90*	*37.85*	*107.13*
Utah	*4.26*	*4.85*	*4.97*	*14.08*
Vermont	*0.55*	*0.63*	*0.65*	*1.83*
Virginia	*8.03*	*9.15*	*9.38*	*26.56*
Washington	*8.70*	*9.91*	*10.16*	*28.77*
West Virginia	*1.35*	*1.54*	*1.58*	*4.46*
Wisconsin	*5.03*	*5.73*	*5.87*	*16.63*
Wyoming	*0.81*	*0.95*	*0.95*	*2.70*

Note: Italics indicate that data is a projection

TABLE 5.3: STATE GREEN CONSTRUCTION ECONOMIC IMPACT ON EMPLOYMENT (2011-2014, JOBS)

State Green Construction Economic Impact on Employment (2011-2014, Jobs)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	32,000	30,000	33,000	94,000
Alaska	4,000	4,000	4,000	13,000
Arizona	62,000	57,000	62,000	181,000
Arkansas	15,000	14,000	15,000	45,000
California	187,000	172,000	189,000	549,000
Colorado	57,000	52,000	57,000	166,000
Connecticut	19,000	18,000	19,000	56,000
Delaware	7,000	6,000	7,000	20,000
Florida	158,000	145,000	159,000	462,000
Georgia	65,000	60,000	66,000	191,000
Hawaii	10,000	9,000	10,000	29,000
Idaho	14,000	13,000	15,000	42,000
Illinois	70,000	65,000	71,000	206,000
Indiana	47,000	43,000	47,000	138,000
Iowa	33,000	30,000	33,000	96,000
Kansas	23,000	21,000	23,000	68,000
Kentucky	22,000	20,000	22,000	64,000
Louisiana	45,000	41,000	45,000	132,000
Maine	7,000	7,000	7,000	21,000
Maryland	35,000	32,000	35,000	101,000

Massachusetts	53,000	49,000	53,000	154,000
Michigan	45,000	41,000	46,000	132,000
Minnesota	37,000	34,000	38,000	109,000
Mississippi	19,000	17,000	19,000	55,000
Missouri	35,000	32,000	35,000	103,000
Montana	7,000	6,000	7,000	20,000
Nebraska	14,000	13,000	14,000	42,000
Nevada	22,000	20,000	22,000	65,000
New Hampshire	9,000	8,000	9,000	27,000
New Jersey	44,000	40,000	44,000	128,000
New Mexico	18,000	17,000	19,000	54,000
New York	126,000	116,000	127,000	369,000
North Carolina	83,000	76,000	84,000	243,000
North Dakota	14,000	13,000	15,000	42,000
Ohio	67,000	62,000	68,000	197,000
Oklahoma	27,000	25,000	27,000	79,000
Oregon	40,000	37,000	40,000	117,000
Pennsylvania	62,000	57,000	62,000	181,000
Rhode Island	4,000	3,000	4,000	11,000
South Carolina	47,000	43,000	47,000	137,000
South Dakota	8,000	7,000	8,000	23,000
Tennessee	50,000	46,000	51,000	147,000
Texas	246,000	226,000	248,000	720,000
Utah	34,000	31,000	34,000	98,000
Vermont	4,000	4,000	4,000	12,000
Virginia	53,000	49,000	54,000	157,000
Washington	65,000	59,000	65,000	189,000
West Virginia	8,000	7,000	8,000	22,000
Wisconsin	35,000	33,000	36,000	104,000
Wyoming	7,000	6,000	7,000	19,000

TABLE 5.4: STATE GREEN CONSTRUCTION ECONOMIC IMPACT ON EMPLOYMENT (2015-2018, JOBS)

State Green Construction Economic Impact on Employment (2015-2018, Jobs)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	*65,000*	*61,000*	*66,000*	*192,000*
Alaska	*8,000*	*7,000*	*8,000*	*22,000*
Arizona	*119,000*	*112,000*	*120,000*	*352,000*
Arkansas	*28,000*	*27,000*	*28,000*	*83,000*
California	*359,000*	*340,000*	*364,000*	*1,062,000*
Colorado	*95,000*	*90,000*	*96,000*	*281,000*
Connecticut	*37,000*	*35,000*	*37,000*	*109,000*
Delaware	*11,000*	*10,000*	*11,000*	*31,000*
Florida	*303,000*	*286,000*	*307,000*	*896,000*
Georgia	*133,000*	*125,000*	*134,000*	*392,000*

Hawaii	*20,000*	*19,000*	*21,000*	*60,000*
Idaho	*28,000*	*26,000*	*28,000*	*82,000*
Illinois	*149,000*	*141,000*	*151,000*	*440,000*
Indiana	*93,000*	*88,000*	*94,000*	*275,000*
Iowa	*51,000*	*49,000*	*52,000*	*152,000*
Kansas	*37,000*	*35,000*	*37,000*	*109,000*
Kentucky	*40,000*	*38,000*	*41,000*	*120,000*
Louisiana	*71,000*	*67,000*	*72,000*	*210,000*
Maine	*15,000*	*14,000*	*15,000*	*43,000*
Maryland	*68,000*	*64,000*	*69,000*	*200,000*
Massachusetts	*87,000*	*82,000*	*88,000*	*257,000*
Michigan	*82,000*	*77,000*	*83,000*	*242,000*
Minnesota	*61,000*	*58,000*	*62,000*	*181,000*
Mississippi	*32,000*	*31,000*	*33,000*	*95,000*
Missouri	*66,000*	*63,000*	*67,000*	*197,000*
Montana	*10,000*	*10,000*	*10,000*	*30,000*
Nebraska	*29,000*	*28,000*	*30,000*	*86,000*
Nevada	*67,000*	*64,000*	*68,000*	*199,000*
New Hampshire	*17,000*	*16,000*	*17,000*	*51,000*
New Jersey	*81,000*	*77,000*	*82,000*	*241,000*
New Mexico	*31,000*	*29,000*	*31,000*	*91,000*
New York	*195,000*	*184,000*	*197,000*	*575,000*
North Carolina	*156,000*	*147,000*	*158,000*	*461,000*
North Dakota	*17,000*	*16,000*	*17,000*	*49,000*
Ohio	*114,000*	*108,000*	*116,000*	*338,000*
Oklahoma	*46,000*	*43,000*	*46,000*	*135,000*
Oregon	*60,000*	*56,000*	*60,000*	*176,000*
Pennsylvania	*116,000*	*109,000*	*117,000*	*342,000*
Rhode Island	*8,000*	*8,000*	*9,000*	*25,000*
South Carolina	*81,000*	*77,000*	*82,000*	*241,000*
South Dakota	*14,000*	*13,000*	*14,000*	*40,000*
Tennessee	*86,000*	*81,000*	*87,000*	*254,000*
Texas	*426,000*	*402,000*	*431,000*	*1,259,000*
Utah	*56,000*	*53,000*	*57,000*	*165,000*
Vermont	*7,000*	*7,000*	*7,000*	*22,000*
Virginia	*106,000*	*100,000*	*107,000*	*312,000*
Washington	*114,000*	*108,000*	*116,000*	*338,000*
West Virginia	*18,000*	*17,000*	*18,000*	*52,000*
Wisconsin	*66,000*	*62,000*	*67,000*	*195,000*
Wyoming	*11,000*	*10,000*	*11,000*	*31,000*

Note: Italics indicate that data is a projection

TABLE 5.5: STATE GREEN CONSTRUCTION ECONOMIC IMPACT ON LABOR EARNINGS (2011-2014, $, BILLIONS)

State Green Construction Economic Impact on Labor Earnings (2011-2014, $, billions)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	2.17	1.63	1.63	5.43
Alaska	0.29	0.22	0.22	0.72
Arizona	4.15	3.12	3.11	10.38
Arkansas	1.03	0.77	0.77	2.57
California	12.61	9.46	9.44	31.51
Colorado	3.82	2.87	2.86	9.55
Connecticut	1.29	0.97	0.96	3.22
Delaware	0.46	0.34	0.34	1.15
Florida	10.61	7.96	7.95	26.51
Georgia	4.39	3.29	3.29	10.96
Hawaii	0.67	0.50	0.50	1.68
Idaho	0.97	0.73	0.73	2.42
Illinois	4.73	3.55	3.54	11.83
Indiana	3.17	2.37	2.37	7.91
Iowa	2.21	1.66	1.66	5.53
Kansas	1.56	1.17	1.17	3.90
Kentucky	1.47	1.11	1.10	3.68
Louisiana	3.03	2.27	2.27	7.57
Maine	0.49	0.36	0.36	1.21
Maryland	2.33	1.75	1.75	5.83
Massachusetts	3.55	2.66	2.66	8.87
Michigan	3.04	2.28	2.28	7.59
Minnesota	2.51	1.89	1.88	6.29
Mississippi	1.26	0.95	0.94	3.15
Missouri	2.36	1.77	1.77	5.89
Montana	0.45	0.34	0.34	1.12
Nebraska	0.95	0.72	0.71	2.39
Nevada	1.49	1.11	1.11	3.71
New Hampshire	0.62	0.47	0.46	1.55
New Jersey	2.94	2.20	2.20	7.34
New Mexico	1.25	0.93	0.93	3.11
New York	8.48	6.36	6.35	21.19
North Carolina	5.58	4.18	4.18	13.94
North Dakota	0.97	0.73	0.73	2.42
Ohio	4.53	3.40	3.39	11.31
Oklahoma	1.82	1.36	1.36	4.54
Oregon	2.69	2.02	2.01	6.72
Pennsylvania	4.15	3.12	3.11	10.38
Rhode Island	0.25	0.19	0.19	0.63
South Carolina	3.16	2.37	2.36	7.89
South Dakota	0.53	0.40	0.40	1.34
Tennessee	3.38	2.54	2.53	8.45

Texas	16.56	12.42	12.40	41.39
Utah	2.26	1.70	1.69	5.65
Vermont	0.27	0.20	0.20	0.68
Virginia	3.60	2.70	2.70	8.99
Washington	4.36	3.27	3.26	10.89
West Virginia	0.51	0.38	0.38	1.28
Wisconsin	2.38	1.79	1.78	5.95
Wyoming	0.45	0.33	0.33	1.12

TABLE 5.6: STATE GREEN CONSTRUCTION ECONOMIC IMPACT ON LABOR EARNINGS (2015-2018, $, BILLIONS)

State Green Construction Economic Impact on Labor Earnings (2015-2018, $, billions)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	*4.37*	*3.30*	*3.28*	*10.95*
Alaska	*0.51*	*0.38*	*0.38*	*1.27*
Arizona	*8.00*	*6.04*	*6.01*	*20.06*
Arkansas	*1.89*	*1.42*	*1.42*	*4.73*
California	*24.18*	*18.26*	*18.16*	*60.59*
Colorado	*6.40*	*4.83*	*4.80*	*16.03*
Connecticut	*2.47*	*1.87*	*1.86*	*6.20*
Delaware	*0.71*	*0.54*	*0.54*	*1.79*
Florida	*20.38*	*15.39*	*15.31*	*51.08*
Georgia	*8.92*	*6.74*	*6.70*	*22.36*
Hawaii	*1.37*	*1.04*	*1.03*	*3.44*
Idaho	*1.85*	*1.40*	*1.39*	*4.65*
Illinois	*10.02*	*7.57*	*7.52*	*25.11*
Indiana	*6.26*	*4.72*	*4.70*	*15.68*
Iowa	*3.46*	*2.62*	*2.60*	*8.68*
Kansas	*2.47*	*1.87*	*1.86*	*6.20*
Kentucky	*2.72*	*2.05*	*2.04*	*6.82*
Louisiana	*4.79*	*3.61*	*3.59*	*11.99*
Maine	*0.99*	*0.74*	*0.74*	*2.47*
Maryland	*4.56*	*3.44*	*3.42*	*11.42*
Massachusetts	*5.86*	*4.42*	*4.40*	*14.68*
Michigan	*5.52*	*4.16*	*4.14*	*13.82*
Minnesota	*4.13*	*3.12*	*3.10*	*10.35*
Mississippi	*2.17*	*1.64*	*1.63*	*5.45*
Missouri	*4.47*	*3.38*	*3.36*	*11.21*
Montana	*0.69*	*0.52*	*0.52*	*1.74*
Nebraska	*1.96*	*1.48*	*1.47*	*4.92*
Nevada	*4.52*	*3.41*	*3.40*	*11.33*
New Hampshire	*1.16*	*0.88*	*0.87*	*2.91*
New Jersey	*5.48*	*4.14*	*4.12*	*13.74*
New Mexico	*2.07*	*1.57*	*1.56*	*5.20*
New York	*13.09*	*9.89*	*9.83*	*32.81*

North Carolina	*10.50*	*7.93*	*7.88*	*26.31*
North Dakota	*1.11*	*0.84*	*0.83*	*2.78*
Ohio	*7.69*	*5.81*	*5.77*	*19.27*
Oklahoma	*3.08*	*2.33*	*2.31*	*7.72*
Oregon	*4.01*	*3.02*	*3.01*	*10.04*
Pennsylvania	*7.78*	*5.87*	*5.84*	*19.49*
Rhode Island	*0.57*	*0.43*	*0.43*	*1.43*
South Carolina	*5.48*	*4.14*	*4.12*	*13.74*
South Dakota	*0.92*	*0.69*	*0.69*	*2.31*
Tennessee	*5.77*	*4.36*	*4.33*	*14.46*
Texas	*28.65*	*21.63*	*21.51*	*71.79*
Utah	*3.77*	*2.84*	*2.83*	*9.44*
Vermont	*0.49*	*0.37*	*0.37*	*1.23*
Virginia	*7.10*	*5.36*	*5.33*	*17.80*
Washington	*7.69*	*5.81*	*5.78*	*19.28*
West Virginia	*1.19*	*0.90*	*0.90*	*2.99*
Wisconsin	*4.45*	*3.36*	*3.34*	*11.14*
Wyoming	*0.72*	*0.54*	*0.54*	*1.80*

Note: Italics indicate that data is a projection

6 State LEED Construction Economic Impact

To quantify the contribution of LEED construction to state economies, we analyzed LEED construction spending as well as direct, indirect, and induced contributions to GDP, employment, and labor earnings. This analysis was conducted using USGBC data and location factors from the 2015 RSMeans Square Foot Costs report[25] in order to identify past LEED construction impact on GDP, employment, and labor earnings as well as to project the 2015-2018 LEED construction contribution in these same areas.

Analysis

States in the top 10% of economic contributors for LEED (aggregate 2005-2014 historical and 2015-2018 forecasted data) include California, Illinois, Nevada, New York, and Texas. Data for the individual economic impact categories separated into impact subcategories for the 2011-2014 and 2015-2018 time periods can be found in the charts on the next page. LEED construction's contribution to state GDP ranged from 0.02% to 0.23% from 2011 to 2014 and is expected to grow up to 153% for the forecasted period of 2015 to 2018. Idaho, Michigan, Nevada, Oregon and Vermont were the five states with the highest projected increase in green construction's direct contribution to GDP while comparing economic impact during 2011-2014 and 2015-2018.

TABLE 6.1: STATE LEED CONSTRUCTION ECONOMIC IMPACT ON GDP (2011-2014,

KEY TAKEAWAYS

CA, IL, NV, NY & TX will be largest contributors to LEED construction economic impact from 2015-2018

Median direct LEED construction contribution to GDP by state is forecasted at $103 million in 2015

Median direct LEED construction contribution to GDP by state is forecasted at $214 million in 2018

[25] Phelan, Marilyn. AIA (2015). *RSMeans Square Foot Costs, 36th annual edition.*

$, BILLIONS)

State LEED Construction Economic Impact on GDP (2011-2014, $, billions)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	0.31	0.32	0.34	1.04
Alaska	0.11	0.11	0.12	0.35
Arizona	1.30	1.36	1.46	4.98
Arkansas	0.17	0.17	0.19	0.58
California	14.28	14.93	16.07	49.13
Colorado	2.15	2.25	2.42	7.48
Connecticut	0.62	0.65	0.70	2.19
District of Columbia	3.55	3.71	4.00	10.21
Delaware	0.08	0.08	0.09	0.21
Florida	2.65	2.76	2.98	7.91
Georgia	2.33	2.43	2.62	7.71
Hawaii	0.43	0.45	0.48	1.22
Idaho	0.11	0.12	0.12	0.50
Illinois	6.57	6.87	7.40	25.77
Indiana	0.90	0.94	1.02	2.57
Iowa	0.42	0.44	0.47	1.26
Kansas	0.25	0.26	0.28	1.02
Kentucky	0.37	0.39	0.42	1.04
Louisiana	0.27	0.28	0.30	0.73
Maine	0.16	0.16	0.18	0.54
Maryland	2.19	2.29	2.47	7.78
Massachusetts	2.92	3.05	3.28	10.61
Michigan	1.00	1.05	1.13	4.89
Minnesota	1.47	1.54	1.65	4.63
Mississippi	0.24	0.25	0.27	0.88
Missouri	0.88	0.92	0.99	2.96
Montana	0.06	0.06	0.06	0.22
Nebraska	0.19	0.20	0.21	0.58
Nevada	0.96	1.01	1.09	14.92
New Hampshire	0.15	0.15	0.17	0.53
New Jersey	1.61	1.69	1.82	6.04
New Mexico	0.39	0.40	0.43	1.16
New York	7.64	7.98	8.60	23.85
North Carolina	1.83	1.91	2.06	5.89
North Dakota	0.05	0.05	0.06	0.14
Ohio	2.58	2.70	2.91	8.42
Oklahoma	0.22	0.23	0.25	0.70
Oregon	1.13	1.18	1.27	5.08
Pennsylvania	2.50	2.61	2.82	9.23
Rhode Island	0.16	0.17	0.18	0.52
South Carolina	0.44	0.46	0.49	1.64
South Dakota	0.08	0.08	0.09	0.20
Tennessee	1.02	1.07	1.15	3.31

Texas	6.68	6.97	7.51	20.94
Utah	0.49	0.51	0.55	1.68
Vermont	0.08	0.08	0.09	0.40
Virginia	3.48	3.64	3.92	10.32
Washington	2.18	2.27	2.45	8.84
West Virginia	0.07	0.07	0.07	0.21
Wisconsin	0.87	0.91	0.98	3.31
Wyoming	0.06	0.07	0.07	0.22

TABLE 6.2: STATE LEED CONSTRUCTION ECONOMIC IMPACT ON GDP (2015-2018, $, BILLIONS)

State LEED Construction Economic Impact on GDP (2015-2018, $, billions)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	*0.37*	*0.42*	*0.43*	*1.23*
Alaska	*0.12*	*0.13*	*0.14*	*0.38*
Arizona	*2.08*	*2.32*	*2.40*	*6.80*
Arkansas	*0.22*	*0.24*	*0.25*	*0.71*
California	*17.83*	*19.93*	*20.64*	*58.40*
Colorado	*2.76*	*3.09*	*3.20*	*9.05*
Connecticut	*0.83*	*0.92*	*0.96*	*2.70*
District of Columbia	*2.63*	*2.94*	*3.05*	*8.63*
Delaware	*0.04*	*0.05*	*0.05*	*0.14*
Florida	*2.24*	*2.50*	*2.59*	*7.33*
Georgia	*2.63*	*2.94*	*3.05*	*8.63*
Hawaii	*0.31*	*0.34*	*0.36*	*1.01*
Idaho	*0.24*	*0.27*	*0.28*	*0.79*
Illinois	*11.03*	*12.33*	*12.77*	*36.13*
Indiana	*0.65*	*0.73*	*0.75*	*2.13*
Iowa	*0.36*	*0.40*	*0.41*	*1.17*
Kansas	*0.46*	*0.51*	*0.53*	*1.49*
Kentucky	*0.25*	*0.28*	*0.29*	*0.83*
Louisiana	*0.16*	*0.18*	*0.19*	*0.54*
Maine	*0.20*	*0.22*	*0.23*	*0.65*
Maryland	*2.94*	*3.29*	*3.41*	*9.64*
Massachusetts	*4.15*	*4.64*	*4.81*	*13.60*
Michigan	*2.53*	*2.83*	*2.93*	*8.30*
Minnesota	*1.45*	*1.62*	*1.68*	*4.75*
Mississippi	*0.35*	*0.40*	*0.41*	*1.16*
Missouri	*1.03*	*1.15*	*1.19*	*3.37*
Montana	*0.09*	*0.10*	*0.10*	*0.30*
Nebraska	*0.17*	*0.19*	*0.20*	*0.56*
Nevada	*2.61*	*2.92*	*3.02*	*8.55*
New Hampshire	*0.20*	*0.23*	*0.23*	*0.66*
New Jersey	*2.45*	*2.74*	*2.84*	*8.03*
New Mexico	*0.33*	*0.37*	*0.39*	*1.10*

New York	*7.36*	*8.23*	*8.52*	*24.11*
North Carolina	*1.93*	*2.15*	*2.23*	*6.32*
North Dakota	*0.04*	*0.04*	*0.04*	*0.12*
Ohio	*2.80*	*3.13*	*3.24*	*9.17*
Oklahoma	*0.22*	*0.24*	*0.25*	*0.71*
Oregon	*2.48*	*2.77*	*2.87*	*8.13*
Pennsylvania	*3.68*	*4.11*	*4.26*	*12.04*
Rhode Island	*0.18*	*0.20*	*0.20*	*0.57*
South Carolina	*0.67*	*0.74*	*0.77*	*2.18*
South Dakota	*0.04*	*0.04*	*0.05*	*0.13*
Tennessee	*1.09*	*1.22*	*1.26*	*3.57*
Texas	*6.53*	*7.30*	*7.56*	*21.39*
Utah	*0.60*	*0.67*	*0.70*	*1.97*
Vermont	*0.21*	*0.24*	*0.24*	*0.69*
Virginia	*2.87*	*3.20*	*3.32*	*9.39*
Washington	*3.93*	*4.39*	*4.55*	*12.87*
West Virginia	*0.06*	*0.07*	*0.07*	*0.21*
Wisconsin	*1.38*	*1.54*	*1.60*	*4.51*
Wyoming	*0.08*	*0.09*	*0.09*	*0.26*

Note: Italics indicate that data is a projection

TABLE 6.3: STATE LEED CONSTRUCTION ECONOMIC IMPACT ON EMPLOYMENT (2011-2014, JOBS)

State LEED Construction Economic Impact on Employment (2011-2014, Jobs)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	4,000	3,000	4,000	11,000
Alaska	1,000	1,000	1,000	4,000
Arizona	17,000	14,000	17,000	47,000
Arkansas	2,000	2,000	2,000	6,000
California	187,000	152,000	183,000	521,000
Colorado	28,000	23,000	27,000	78,000
Connecticut	8,000	7,000	8,000	23,000
District of Columbia	47,000	38,000	45,000	130,000
Delaware	1,000	1,000	1,000	3,000
Florida	35,000	28,000	34,000	97,000
Georgia	30,000	25,000	30,000	85,000
Hawaii	6,000	5,000	5,000	16,000
Idaho	1,000	1,000	1,000	4,000
Illinois	86,000	70,000	84,000	240,000
Indiana	12,000	10,000	12,000	33,000
Iowa	6,000	4,000	5,000	15,000
Kansas	3,000	3,000	3,000	9,000
Kentucky	5,000	4,000	5,000	14,000
Louisiana	4,000	3,000	3,000	10,000
Maine	2,000	2,000	2,000	6,000

Maryland	29,000	23,000	28,000	80,000
Massachusetts	38,000	31,000	37,000	106,000
Michigan	13,000	11,000	13,000	37,000
Minnesota	19,000	16,000	19,000	54,000
Mississippi	3,000	3,000	3,000	9,000
Missouri	12,000	9,000	11,000	32,000
Montana	1,000	1,000	1,000	2,000
Nebraska	2,000	2,000	2,000	7,000
Nevada	13,000	10,000	12,000	35,000
New Hampshire	2,000	2,000	2,000	5,000
New Jersey	21,000	17,000	21,000	59,000
New Mexico	5,000	4,000	5,000	14,000
New York	100,000	81,000	98,000	279,000
North Carolina	24,000	19,000	23,000	67,000
North Dakota	1,000	1,000	1,000	2,000
Ohio	34,000	27,000	33,000	94,000
Oklahoma	3,000	2,000	3,000	8,000
Oregon	15,000	12,000	14,000	41,000
Pennsylvania	33,000	27,000	32,000	91,000
Rhode Island	2,000	2,000	2,000	6,000
South Carolina	6,000	5,000	6,000	16,000
South Dakota	1,000	1,000	1,000	3,000
Tennessee	13,000	11,000	13,000	37,000
Texas	87,000	71,000	85,000	243,000
Utah	6,000	5,000	6,000	18,000
Vermont	1,000	1,000	1,000	3,000
Virginia	46,000	37,000	45,000	127,000
Washington	29,000	23,000	28,000	79,000
West Virginia	1,000	1,000	1,000	2,000
Wisconsin	11,000	9,000	11,000	32,000
Wyoming	1,000	1,000	1,000	2,000

TABLE 6.4: STATE LEED CONSTRUCTION ECONOMIC IMPACT ON EMPLOYMENT (2015-2018, JOBS)

State LEED Construction Economic Impact on Employment (2015-2018, Jobs)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	*5,000*	*4,000*	*5,000*	*14,000*
Alaska	*2,000*	*1,000*	*2,000*	*4,000*
Arizona	*27,000*	*24,000*	*27,000*	*78,000*
Arkansas	*3,000*	*2,000*	*3,000*	*8,000*
California	*231,000*	*203,000*	*234,000*	*668,000*
Colorado	*36,000*	*31,000*	*36,000*	*103,000*
Connecticut	*11,000*	*9,000*	*11,000*	*31,000*
District of Columbia	*34,000*	*30,000*	*35,000*	*99,000*
Delaware	*1,000*	*0*	*1,000*	*2,000*

Florida	*29,000*	*25,000*	*29,000*	*84,000*
Georgia	*34,000*	*30,000*	*35,000*	*99,000*
Hawaii	*4,000*	*4,000*	*4,000*	*12,000*
Idaho	*3,000*	*3,000*	*3,000*	*9,000*
Illinois	*143,000*	*125,000*	*145,000*	*413,000*
Indiana	*8,000*	*7,000*	*9,000*	*24,000*
Iowa	*5,000*	*4,000*	*5,000*	*13,000*
Kansas	*6,000*	*5,000*	*6,000*	*17,000*
Kentucky	*3,000*	*3,000*	*3,000*	*9,000*
Louisiana	*2,000*	*2,000*	*2,000*	*6,000*
Maine	*3,000*	*2,000*	*3,000*	*7,000*
Maryland	*38,000*	*33,000*	*39,000*	*110,000*
Massachusetts	*54,000*	*47,000*	*55,000*	*155,000*
Michigan	*33,000*	*29,000*	*33,000*	*95,000*
Minnesota	*19,000*	*16,000*	*19,000*	*54,000*
Mississippi	*5,000*	*4,000*	*5,000*	*13,000*
Missouri	*13,000*	*12,000*	*14,000*	*39,000*
Montana	*1,000*	*1,000*	*1,000*	*3,000*
Nebraska	*2,000*	*2,000*	*2,000*	*6,000*
Nevada	*33,000*	*29,000*	*34,000*	*96,000*
New Hampshire	*3,000*	*2,000*	*3,000*	*8,000*
New Jersey	*32,000*	*28,000*	*32,000*	*92,000*
New Mexico	*4,000*	*4,000*	*4,000*	*13,000*
New York	*95,000*	*84,000*	*97,000*	*276,000*
North Carolina	*25,000*	*22,000*	*25,000*	*72,000*
North Dakota	*0*	*0*	*0*	*1,000*
Ohio	*36,000*	*32,000*	*37,000*	*105,000*
Oklahoma	*3,000*	*2,000*	*3,000*	*8,000*
Oregon	*32,000*	*28,000*	*33,000*	*93,000*
Pennsylvania	*48,000*	*42,000*	*48,000*	*138,000*
Rhode Island	*2,000*	*2,000*	*2,000*	*7,000*
South Carolina	*9,000*	*8,000*	*9,000*	*25,000*
South Dakota	*1,000*	*0*	*1,000*	*1,000*
Tennessee	*14,000*	*12,000*	*14,000*	*41,000*
Texas	*84,000*	*74,000*	*86,000*	*244,000*
Utah	*8,000*	*7,000*	*8,000*	*23,000*
Vermont	*3,000*	*2,000*	*3,000*	*8,000*
Virginia	*37,000*	*33,000*	*38,000*	*107,000*
Washington	*51,000*	*45,000*	*52,000*	*147,000*
West Virginia	*1,000*	*1,000*	*1,000*	*2,000*
Wisconsin	*18,000*	*16,000*	*18,000*	*52,000*
Wyoming	*1,000*	*1,000*	*1,000*	*3,000*

Note: Italics indicate that data is a projection

TABLE 6.5: STATE LEED CONSTRUCTION ECONOMIC IMPACT ON LABOR EARNINGS (2011-2014, $, BILLIONS)

State LEED Construction Economic Impact on Labor Earnings (2011-2014, $, billions)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	0.27	0.19	0.20	0.70
Alaska	0.10	0.07	0.07	0.24
Arizona	1.14	0.80	0.83	3.31
Arkansas	0.15	0.10	0.11	0.39
California	12.57	8.79	9.13	33.09
Colorado	1.89	1.32	1.38	5.03
Connecticut	0.55	0.38	0.40	1.47
District of Columbia	3.13	2.19	2.27	7.05
Delaware	0.07	0.05	0.05	0.14
Florida	2.33	1.63	1.69	5.43
Georgia	2.05	1.43	1.49	5.22
Hawaii	0.38	0.26	0.27	0.84
Idaho	0.10	0.07	0.07	0.32
Illinois	5.78	4.05	4.20	17.09
Indiana	0.79	0.56	0.58	1.78
Iowa	0.37	0.26	0.27	0.86
Kansas	0.22	0.15	0.16	0.67
Kentucky	0.33	0.23	0.24	0.72
Louisiana	0.24	0.17	0.17	0.51
Maine	0.14	0.10	0.10	0.37
Maryland	1.93	1.35	1.40	5.22
Massachusetts	2.57	1.80	1.87	7.09
Michigan	0.88	0.62	0.64	3.17
Minnesota	1.29	0.90	0.94	3.15
Mississippi	0.21	0.15	0.15	0.59
Missouri	0.78	0.54	0.57	2.00
Montana	0.05	0.03	0.04	0.14
Nebraska	0.17	0.12	0.12	0.39
Nevada	0.85	0.60	0.62	9.07
New Hampshire	0.13	0.09	0.09	0.35
New Jersey	1.42	0.99	1.03	4.03
New Mexico	0.34	0.24	0.25	0.80
New York	6.73	4.70	4.89	16.27
North Carolina	1.61	1.12	1.17	4.00
North Dakota	0.04	0.03	0.03	0.10
Ohio	2.27	1.59	1.65	5.71
Oklahoma	0.20	0.14	0.14	0.47
Oregon	0.99	0.69	0.72	3.32
Pennsylvania	2.20	1.54	1.60	6.16
Rhode Island	0.14	0.10	0.10	0.36
South Carolina	0.39	0.27	0.28	1.09
South Dakota	0.07	0.05	0.05	0.14

Tennessee	0.90	0.63	0.65	2.25
Texas	5.88	4.10	4.27	14.28
Utah	0.43	0.30	0.31	1.13
Vermont	0.07	0.05	0.05	0.26
Virginia	3.06	2.14	2.23	7.09
Washington	1.92	1.34	1.39	5.84
West Virginia	0.06	0.04	0.04	0.14
Wisconsin	0.76	0.53	0.55	2.20
Wyoming	0.06	0.04	0.04	0.15

TABLE 6.6: STATE LEED CONSTRUCTION ECONOMIC IMPACT ON LABOR EARNINGS (2015-2018, $, BILLIONS)

State LEED Construction Economic Impact on Labor Earnings (2015-2018, $, billions)				
State	**Direct**	**Indirect**	**Induced**	**Total**
Alabama	*0.33*	*0.25*	*0.25*	*0.82*
Alaska	*0.10*	*0.08*	*0.08*	*0.26*
Arizona	*1.83*	*1.37*	*1.37*	*4.56*
Arkansas	*0.19*	*0.14*	*0.14*	*0.48*
California	*15.68*	*11.73*	*11.74*	*39.15*
Colorado	*2.43*	*1.82*	*1.82*	*6.06*
Connecticut	*0.73*	*0.54*	*0.54*	*1.81*
District of Columbia	*2.32*	*1.73*	*1.73*	*5.78*
Delaware	*0.04*	*0.03*	*0.03*	*0.09*
Florida	*1.97*	*1.47*	*1.47*	*4.92*
Georgia	*2.32*	*1.73*	*1.73*	*5.79*
Hawaii	*0.27*	*0.20*	*0.20*	*0.68*
Idaho	*0.21*	*0.16*	*0.16*	*0.53*
Illinois	*9.70*	*7.26*	*7.26*	*24.22*
Indiana	*0.57*	*0.43*	*0.43*	*1.43*
Iowa	*0.31*	*0.24*	*0.24*	*0.79*
Kansas	*0.40*	*0.30*	*0.30*	*1.00*
Kentucky	*0.22*	*0.17*	*0.17*	*0.55*
Louisiana	*0.14*	*0.11*	*0.11*	*0.36*
Maine	*0.18*	*0.13*	*0.13*	*0.44*
Maryland	*2.59*	*1.94*	*1.94*	*6.46*
Massachusetts	*3.65*	*2.73*	*2.73*	*9.12*
Michigan	*2.23*	*1.67*	*1.67*	*5.56*
Minnesota	*1.28*	*0.96*	*0.96*	*3.19*
Mississippi	*0.31*	*0.23*	*0.23*	*0.78*
Missouri	*0.91*	*0.68*	*0.68*	*2.26*
Montana	*0.08*	*0.06*	*0.06*	*0.20*
Nebraska	*0.15*	*0.11*	*0.11*	*0.38*
Nevada	*2.29*	*1.72*	*1.72*	*5.73*
New Hampshire	*0.18*	*0.13*	*0.13*	*0.44*

New Jersey	*2.16*	*1.61*	*1.61*	*5.38*
New Mexico	*0.29*	*0.22*	*0.22*	*0.73*
New York	*6.47*	*4.85*	*4.85*	*16.16*
North Carolina	*1.70*	*1.27*	*1.27*	*4.23*
North Dakota	*0.03*	*0.02*	*0.02*	*0.08*
Ohio	*2.46*	*1.84*	*1.84*	*6.15*
Oklahoma	*0.19*	*0.14*	*0.14*	*0.48*
Oregon	*2.18*	*1.63*	*1.63*	*5.45*
Pennsylvania	*3.23*	*2.42*	*2.42*	*8.07*
Rhode Island	*0.15*	*0.12*	*0.12*	*0.39*
South Carolina	*0.59*	*0.44*	*0.44*	*1.46*
South Dakota	*0.03*	*0.03*	*0.03*	*0.09*
Tennessee	*0.96*	*0.72*	*0.72*	*2.39*
Texas	*5.74*	*4.30*	*4.30*	*14.34*
Utah	*0.53*	*0.40*	*0.40*	*1.32*
Vermont	*0.19*	*0.14*	*0.14*	*0.46*
Virginia	*2.52*	*1.89*	*1.89*	*6.29*
Washington	*3.45*	*2.59*	*2.59*	*8.63*
West Virginia	*0.06*	*0.04*	*0.04*	*0.14*
Wisconsin	*1.21*	*0.91*	*0.91*	*3.03*
Wyoming	*0.07*	*0.05*	*0.05*	*0.18*

Note: Italics indicate that data is a projection

7 Selected Savings

Green buildings result in real, quantifiable savings such as energy savings and maintenance labor as well as other benefits such as better quality of air and worker satisfaction. For example, the U.S. General Services Administration's Green Building Performance report stated that their green buildings studied outperformed U.S. commercial buildings by using less energy and water, emitting less CO_2, costing less to maintain and had occupants who are more satisfied than those working in typical buildings.[26] In fact, these buildings scored 76% higher by occupants in terms of satisfaction than the average for U.S. commercial buildings. This analysis focuses on quantifying projected operational savings only, for those savings categories with accountable data.

Booz Allen performed a high-level evaluation of the aggregate energy and environmental benefits reported from green and LEED building construction. Green buildings generate savings for building owners by reducing demand in various operational cost categories. These savings have been quantitatively reported most often across four savings categories:

- Energy
- Water
- Trash
- Maintenance labor

Green construction can also save money in construction, including, but not limited to:[27]

- Reducing disposal cost of construction waste
- Integrated design process

KEY TAKEAWAYS

Green construction to save 23.5 billion Kilowatt Hours of energy from 2015-2018

LEED construction to save 12.38 billion Kilowatt Hours of energy from 2015-2018

LEED construction to reduce annual greenhouse gas emissions from 1.8 million cars from 2015-2018

[26] GSA Public Buildings Service (2011, August). *Green Building Performance: A Post Occupancy Evaluation of 22 GSA Buildings*.

[27] Charles Lockwood (2006, June) "Building the Green Way," Harvard Business Review. Retrieved from: https://hbr.org/2006/06/building-the-green-way.

- Correctly sizing equipment

We did not attempt to quantify additional benefits such as employee productivity, for this study.

To calculate green building monetary savings, we analyzed only operational savings categories throughout the expected life of green buildings on an annual basis. Demand is reduced and thus savings are realized in energy, water, trash, and maintenance. In pursuit of a holistic approach to the impact of savings and spending on green and LEED construction, the Booz Allen team identified the need to subtract these savings associated with increased spending on green buildings, from the economic sectors in our IMPLAN model explained in the methodology section. To quantify LEED energy savings, Booz Allen used a meta-analysis based approach to estimate the average savings per square foot associated with LEED for each LEED achievement level of LEED v2009. We conducted an analysis of several sources including the Department of Energy's Buildings Performance Database and GSA's Green Building Performance Study to calculate savings.[28] [29] These sources looked at the performance of over 750,000 projects, which categorized as either general, green, or LEED construction. All reports or databases considered assessed the performance of these projects against at least one of the four savings categories mentioned above. Through this analysis, we then calculated the average savings per square foot by savings category: energy, water, trash, and maintenance displayed below. To estimate historical and forecasted data, we adjusted the data using both historical and projected inflation rates. Our findings from our meta-analysis of the literature considered is summarized into the following (Tables 7.5, 7.6, 7.7, 7.8):

- Annual per square foot energy savings
- Annual per square foot water savings
- Annual per square foot trash savings
- Annual per square foot maintenance savings

These were further categorized into different certification levels for LEED or green so as to get a better estimate of total savings. They are as follows:

- LEED Certified
- LEED Silver
- LEED Gold
- LEED Platinum
- Green

We segmented our LEED square foot database by level of certification as listed above. To calculate the savings generated each year by green construction, we multiplied the cumulative square footage of green buildings for each year by the savings (per square foot) by savings category for that year. To calculate the savings generated each year for LEED, we followed a similar process for each of the different certification levels. Finally we added all four certification levels to get total LEED savings.

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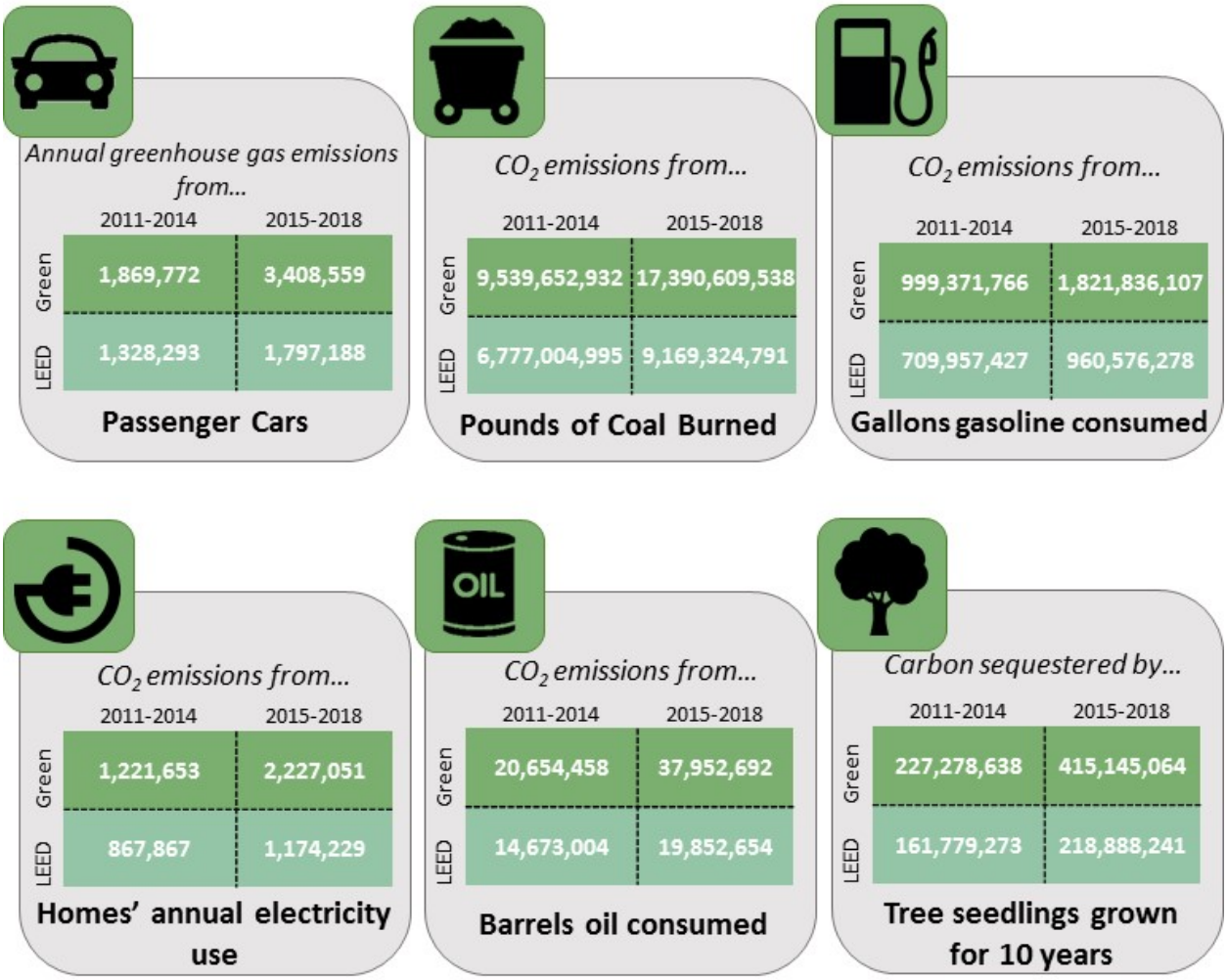
[28] GSA Public Buildings Service (2011, August). *Green Building Performance: A Post Occupancy Evaluation of 22 GSA Buildings*.

[29] Department of Energy (2015, August). *Building Performance Database*. Retrieved from: http://energy.gov/eere/buildings/building-performance-database

Analysis

From 2015– 2018, the green construction market is estimated to generate $4.8 billion in savings from green construction, with LEED-certified buildings accounting for as much as $2.2 billion of total savings. From 2015-2018 the green construction market is expected to generate $2.4 billion in energy savings, $99.2 million in trash savings, $256.5 million in water and $1.5 billion in maintenance savings. During the same time period, LEED-certified buildings account for as much as $1.2 billion in energy savings, $54.2 million in Trash savings, $149.5 million in water and $715.3 million in Maintenance savings.

FIGURE 7.1: ESTIMATED EQUIVALENTS FOR ENERGY BENEFITS[30]



[30] U.S. Environmental Protection Agency (2014, April). Greenhouse Gas Equivalencies Calculator. Retrieved from: http://www.epa.gov/cleanenergy/energy-resources/calculator.html

FIGURE 7.2: SELECTED SAVINGS FOR GREEN CONSTRUCTION ($)

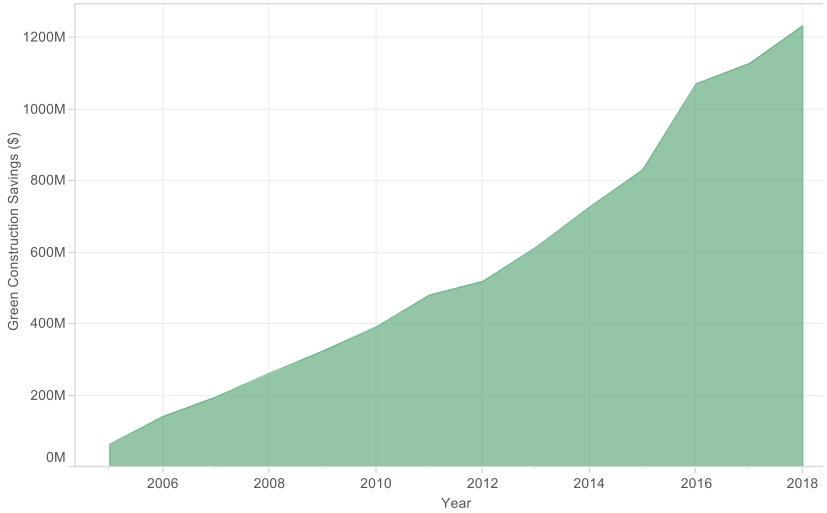


TABLE 7.1: SELECTED SAVINGS FOR GREEN CONSTRUCTION ($, BY YEAR)

Year	Green Construction Savings ($)
2005	62,602,000
2006	139,819,000
2007	194,787,000
2008	261,294,000
2009	323,364,000
2010	390,909,000
2011	480,161,000
2012	517,999,000
2013	614,303,000
2014	726,212,000
2015	*830,784,000*
2016	*1,071,506,000*
2017	*1,128,008,000*
2018	*1,233,671,000*

Note: Italics indicate that data is a projection

FIGURE 7.3: SELECTED SAVINGS FOR LEED CONSTRUCTION ($)

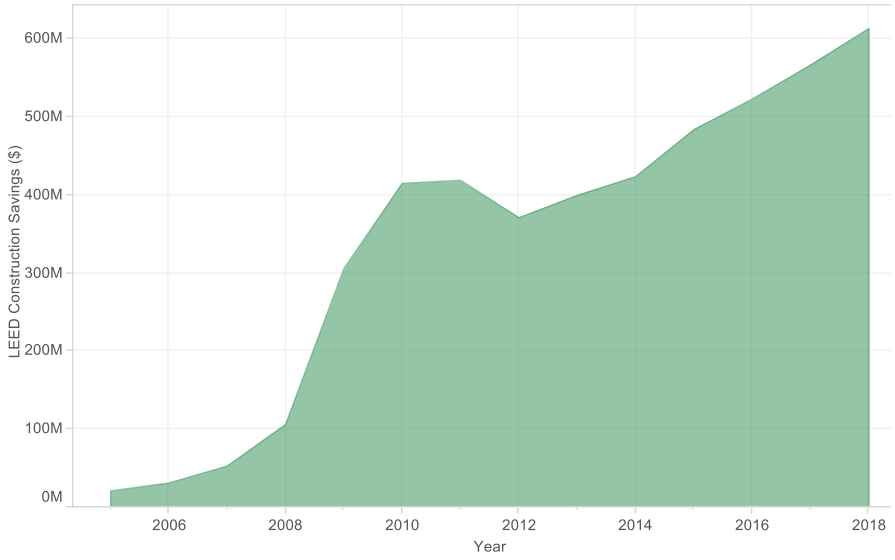


TABLE 7.2: SELECTED SAVINGS FOR LEED CONSTRUCTION ($)

Year	LEED Construction Savings ($)
2005	20,362,000
2006	30,444,000
2007	52,202,000
2008	105,444,000
2009	305,662,000
2010	414,523,000
2011	418,521,000
2012	370,405,000
2013	399,075,000
2014	423,151,000
2015	*483,399,000*
2016	*522,692,000*
2017	*566,179,000*
2018	*613,105,000*

Note: Italics indicate that data is a projection

FIGURE 7.4: SELECTED SAVINGS FOR GREEN CONSTRUCTION BY CATEGORY ($)

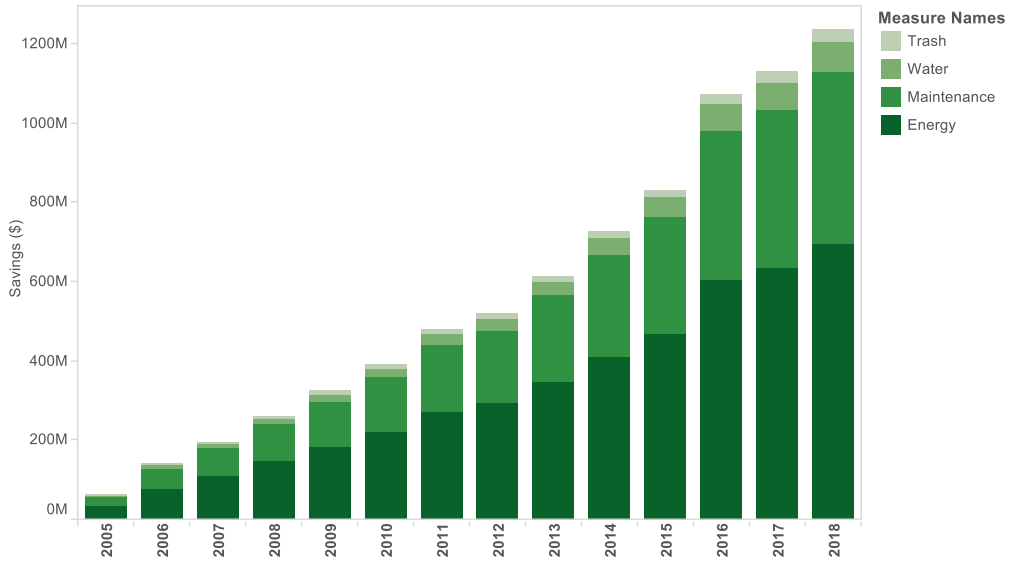


TABLE 7.3: SELECTED SAVINGS FOR GREEN CONSTRUCTION BY CATEGORY ($, MILLIONS)

Total Green Savings by Savings Category ($, millions)				
Year	**Energy**	**Trash**	**Water**	**Maintenance**
2005	35.27	1.46	3.77	22.11
2006	78.77	3.25	8.41	49.39
2007	109.73	4.53	11.72	68.80
2008	147.20	6.08	15.72	92.30
2009	182.17	7.53	19.45	114.22
2010	220.22	9.10	23.52	138.08
2011	270.50	11.18	28.88	169.60
2012	291.81	12.06	31.16	182.97
2013	346.07	14.30	36.95	216.99
2014	409.11	16.90	43.69	256.52
2015	*468.02*	*19.34*	*49.98*	*293.45*
2016	*603.63*	*24.94*	*64.46*	*378.48*
2017	*635.46*	*26.25*	*67.86*	*398.44*
2018	*694.98*	*28.71*	*74.21*	*435.76*

Note: Italics indicate that data is a projection

FIGURE 7.5: SELECTED SAVINGS FOR LEED CONSTRUCTION BY CATEGORY ($)

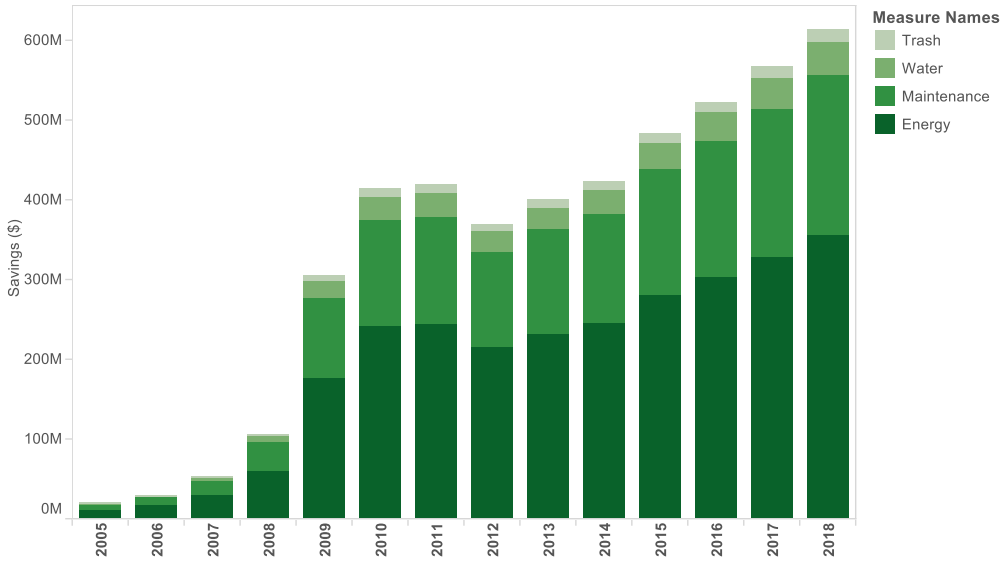


TABLE 7.4: SELECTED SAVINGS FOR LEED CONSTRUCTION BY CATEGORY ($, MILLIONS)

Total LEED Savings by Savings Category ($, millions)				
Year	**Energy**	**Trash**	**Water**	**Maintenance**
2005	1.17	0.45	1.07	7.68
2006	17.36	0.72	1.85	10.51
2007	29.68	1.24	3.28	18.01
2008	59.46	2.52	7.21	36.26
2009	176.55	7.54	20.85	100.71
2010	241.93	10.39	28.49	133.72
2011	243.97	10.49	28.96	135.11
2012	215.61	9.25	25.40	120.15
2013	230.99	9.85	26.80	131.44
2014	245.20	10.55	29.73	137.67
2015	*280.10*	*11.99*	*33.09*	*158.23*
2016	*302.86*	*12.96*	*35.78*	*171.09*
2017	*328.06*	*14.04*	*38.75*	*185.32*
2018	*355.25*	*15.21*	*41.97*	*200.68*

Note: Italics indicate that data is a projection

TABLE 7.5: PER SQUARE FOOT ENERGY SAVINGS BY CERTIFICATION LEVEL ($/ SQ. FT)

Energy Savings ($/sq. ft)					
Year	**LEED Certified**	**LEED Gold**	**LEED Silver**	**LEED Platinum**	**Green**
2005	0.4273	0.4415	0.6631	0.6963	0.5107
2006	0.4266	0.4408	0.6621	0.6952	0.5098
2007	0.4260	0.4402	0.6612	0.6942	0.5091
2008	0.4252	0.4394	0.6599	0.6929	0.5082
2009	0.4253	0.4395	0.6600	0.6930	0.5083
2010	0.4249	0.4391	0.6595	0.6925	0.5079
2011	0.4243	0.4384	0.6585	0.6914	0.5070
2012	0.4238	0.4379	0.6578	0.6906	0.5065
2013	0.4235	0.4376	0.6573	0.6901	0.5061
2014	0.4232	0.4373	0.6567	0.6896	0.5057
2015	0.4231	0.4372	0.6567	0.6895	0.5057
2016	0.4228	0.4369	0.6562	0.6890	0.5053
2017	0.4223	0.4364	0.6554	0.6882	0.5047
2018	0.4218	0.4358	0.6546	0.6873	0.5041

TABLE 7.6: PER SQUARE FOOT TRASH SAVINGS BY CERTIFICATION LEVEL ($/ SQ. FT)

Trash Savings ($/sq. ft)					
Year	**LEED Certified**	**LEED Gold**	**LEED Silver**	**LEED Platinum**	**Green**
2005	0.0144	0.0186	0.0303	0.0318	0.0211
2006	0.0144	0.0186	0.0302	0.0318	0.0211
2007	0.0143	0.0186	0.0302	0.0317	0.0210
2008	0.0143	0.0185	0.0302	0.0317	0.0210
2009	0.0143	0.0185	0.0302	0.0317	0.0210
2010	0.0143	0.0185	0.0301	0.0316	0.0210
2011	0.0143	0.0185	0.0301	0.0316	0.0209
2012	0.0143	0.0185	0.0301	0.0316	0.0209
2013	0.0142	0.0185	0.0300	0.0315	0.0209
2014	0.0142	0.0184	0.0300	0.0315	0.0209
2015	0.0142	0.0184	0.0300	0.0315	0.0209
2016	0.0142	0.0184	0.0300	0.0315	0.0209
2017	0.0142	0.0184	0.0299	0.0314	0.0208
2018	0.0142	0.0184	0.0299	0.0314	0.0208

TABLE 7.7: PER SQUARE FOOT WATER SAVINGS BY CERTIFICATION LEVEL ($/ SQ. FT)

Water Savings ($/sq. ft)					
Year	**LEED Certified**	**LEED Gold**	**LEED Silver**	**LEED Platinum**	**Green**
2005	0.0174	0.0370	0.1092	0.1146	0.0545
2006	0.0174	0.0369	0.1090	0.1144	0.0544
2007	0.0174	0.0369	0.1088	0.1143	0.0544
2008	0.0173	0.0368	0.1086	0.1141	0.0543
2009	0.0173	0.0368	0.1087	0.1141	0.0543
2010	0.0173	0.0368	0.1086	0.1140	0.0542
2011	0.0173	0.0367	0.1084	0.1138	0.0541
2012	0.0173	0.0367	0.1083	0.1137	0.0541
2013	0.0173	0.0367	0.1082	0.1136	0.0540
2014	0.0173	0.0366	0.1081	0.1135	0.0540
2015	0.0172	0.0366	0.1081	0.1135	0.0540
2016	0.0172	0.0366	0.1080	0.1134	0.0540
2017	0.0172	0.0366	0.1079	0.1133	0.0539
2018	0.0172	0.0365	0.1078	0.1132	0.0538

TABLE 7.8: PER SQUARE FOOT MAINTENANCE BY CERTIFICATION LEVEL / SQ. FT

Maintenance Savings ($/sq. ft)					
Year	**LEED Certified**	**LEED Gold**	**LEED Silver**	**LEED Platinum**	**Green**
2005	0.3893	0.2010	0.3703	0.3888	0.3202
2006	0.3887	0.2006	0.3697	0.3882	0.3197
2007	0.3882	0.2004	0.3692	0.3876	0.3192
2008	0.3874	0.2000	0.3685	0.3869	0.3186
2009	0.3875	0.2000	0.3685	0.3870	0.3187
2010	0.3872	0.1999	0.3682	0.3866	0.3184
2011	0.3866	0.1995	0.3676	0.3860	0.3179
2012	0.3862	0.1993	0.3673	0.3856	0.3176
2013	0.3859	0.1992	0.3670	0.3853	0.3173
2014	0.3856	0.1990	0.3667	0.3850	0.3171
2015	0.3856	0.1990	0.3667	0.3850	0.3171
2016	0.3853	0.1989	0.3664	0.3847	0.3168
2017	0.3848	0.1986	0.3660	0.3843	0.3165
2018	0.3843	0.1984	0.3655	0.3838	0.3161

8 Tax Contributions by State

In order to further explore the economic impact analysis conducted in this report, we analyzed the tax contributions by state from LEED construction. We calculated this by leveraging data from individual income, corporate income, and real property tax by state. The analysis provides estimates of state tax revenues associated with LEED construction in a given year. However, it does not account for state tax revenues associated with previous LEED projects. Early LEED buildings could significantly add to state tax revenues through property tax as well as income taxes for ongoing operations. Thus, the numbers herein are underestimates of the full LEED related tax contribution.

KEY TAKEAWAYS

$8.4 billion in total state tax contributions projected to relate to LEED construction in 2018

This is up from $5.4 billion of total state tax contributions attributed to LEED construction in 2014

$4.82 billion in state income tax projected to relate to LEED construction in 2018

Assumptions

We made several assumptions given the available data:

- The ratio between total construction spend and total LEED spend is the same for the ratio between total construction selling prices and total LEED construction selling prices by state.
- Incentives were excluded from this analysis, as reliable data are not readily available. Moreover, they are often paid on varying dates and vary greatly by state and locality.
- Sales taxes were also excluded, as most states generally do not tax certification or credentials.

Analysis

In 2014, LEED-related employment directly contributed $1.09 billion of individual income tax and is expected to increase to a $1.5 billion contribution by 2018. Corporate income tax contributions totaled $689.5 million in 2014 and should increase to $1.06 billion by 2018 while total state income tax (corporate plus individual) in 2014 was $3.35 billion and is expected to increase to $4.82 billion by 2018.

In 2014, state LEED-related property taxes contributed approximately $2.06 billion and are estimated to increase to $3.62 billion in 2018. Total state tax contributions related to LEED building construction totaled $5.4 billion in 2014 and are forecasted to increase to $8.4 billion in 2018.

TABLE 8.1: STATE TAX CONTRIBUTIONS (2015-2018, $, MILLION)

State Tax Contributions (2015-2018, $, million)				
State	**Individual Income Tax**	**Corporate Income Tax**	**Property Tax**	**Total State Tax**
Alabama	*39.16*	*49.72*	*62.26*	*151.14*
Alaska	*5.98*	*67.71*	*57.75*	*131.45*
Arizona	*163.43*	*34.46*	*448.60*	*646.49*
Arkansas	*32.43*	*24.16*	*263.68*	*320.27*
California	*3,692.41*	*617.40*	*3,266.58*	*7,576.39*
Colorado	*327.53*	*41.34*	*n/a*	*368.88*
Connecticut	*167.96*	*48.77*	*n/a*	*216.73*
Delaware	*5.77*	*17.10*	*n/a*	*22.87*
Florida	*31.34*	*143.57*	*0.05*	*174.97*
Georgia	*322.20*	*53.46*	*473.45*	*849.11*
Hawaii	*44.72*	*3.90*	*n/a*	*48.62*
Idaho	*32.33*	*80.28*	*n/a*	*112.61*
Illinois	*1,751.91*	*336.60*	*148.48*	*2,236.99*
Indiana	*68.21*	*40.73*	*1.72*	*110.66*
Iowa	*45.27*	*20.25*	*n/a*	*65.52*
Kansas	*49.74*	*24.78*	*31.27*	*105.79*
Kentucky	*33.80*	*26.39*	*114.47*	*174.66*
Louisiana	*15.09*	*14.31*	*3.82*	*33.22*
Maine	*28.28*	*11.23*	*16.54*	*56.05*
Maryland	*413.86*	*61.06*	*1,000.55*	*1,475.48*
Massachusetts	*735.43*	*174.26*	*4.74*	*914.42*
Michigan	*264.95*	*153.00*	*1,743.00*	*2,160.94*
Minnesota	*262.05*	*59.79*	*556.53*	*878.38*
Mississippi	*42.35*	*35.80*	*9.06*	*87.21*
Missouri	*113.08*	*26.96*	*13.83*	*153.86*
Montana	*13.64*	*18.92*	*65.07*	*97.63*
Nebraska	*23.68*	*16.46*	*0.03*	*40.16*
Nevada	*n/a*	*n/a*	*1,457.89*	*1,457.89*
New Hampshire	*9.58*	*54.83*	*141.40*	*205.81*
New Jersey	*370.08*	*190.78*	*5.65*	*566.50*
New Mexico	*33.16*	*16.91*	*39.47*	*89.54*
New York	*1,577.27*	*296.60*	*n/a*	*1,873.87*
North Carolina	*285.16*	*118.97*	*n/a*	*404.13*
North Dakota	*2.98*	*31.65*	*0.14*	*34.77*
Ohio	*226.80*	*n/a*	*n/a*	*226.80*
Oklahoma	*24.88*	*58.86*	*n/a*	*83.74*
Oregon	*493.76*	*75.93*	*25.89*	*595.58*
Pennsylvania	*409.20*	*232.19*	*43.31*	*684.70*
Rhode Island	*20.25*	*6.79*	*1.72*	*28.76*
South Carolina	*73.92*	*33.05*	*5.08*	*112.05*
South Dakota	*0.14*	*1.09*	*n/a*	*1.23*
Tennessee	*30.32*	*62.21*	*n/a*	*92.54*

Texas	*n/a*	*n/a*	*n/a*	*n/a*
Utah	*75.87*	*22.66*	*n/a*	*98.54*
Vermont	*27.03*	*31.00*	*912.30*	*970.33*
Virginia	*394.85*	*41.41*	*31.62*	*467.89*
Washington	*n/a*	*n/a*	*1,984.14*	*1,984.14*
West Virginia	*10.47*	*17.90*	*n/a*	*28.37*
Wisconsin	*201.22*	*146.54*	*108.24*	*456.00*
Wyoming	*n/a*	*n/a*	*77.91*	*77.91*

Note: Italics indicate that data is a projection

9 Conclusions

Green and LEED construction have proven themselves as an economic stimulus, adding significantly to the GDP, jobs, and labor earnings throughout the United States. The projections of this report indicate that this positive economic contribution will continue and will grow in the future. In addition, those choosing to pursue high-performance building construction are well positioned to take advantage of the monetary savings and robust economic benefits. This economic impact also means significant environmental and social benefits are being generated to protect the people and the planet. Green construction, green jobs, and the resulting state and national benefits continue to rise, as this study projects that green construction will generate an additional $303.4 billion in GDP, 3.9 million jobs, and $268.4 billion in labor earnings in the coming years 2015-2018. LEED specifically is projected to contribute an additional $108.8 billion in GDP, 1.4 million jobs, and $95.7 billion in labor earnings in the coming years 2015-2018. Moreover, LEED is projected to provide estimated energy benefits from 2015-2018 equivalent to avoiding annual greenhouse gas emissions from 1.8 million passenger cars or the CO_2 emissions from 960 million gallons of gasoline consumed.

National Green Construction Cumulative Direct Economic Impact
From 2011-2014, the green construction market has:
- Generated $167 billion in GDP
- Supported over 2.1 million jobs
- Provided $148 billion in labor earnings

From 2015-2018, this study predicts that green construction will:
- Generate an additional $303 billion in GDP
- Support 3.9 million jobs
- Provide $268 billion in labor earnings

National LEED Construction Cumulative Direct Economic Impact
From 2011-2014, LEED-related construction spending has:
- Generated $81 billion in GDP
- Supported 1.1 million jobs
- Provided $71 billion in labor earnings

From 2015-2018, this study forecasts that LEED-related construction spending will:
- Generate an additional $109 billion in GDP
- Support 1.4 million jobs
- Provide $96 billion in labor earnings

Appendix A: Glossary of Terms

This glossary defines terms used throughout the Green Building Economic Impact Study. It includes industry-specific language and differentiates commonly used terms for the context of this report.

Analysis of Covariance (ANCOVA): A linear model which blends Analysis of Variance (ANOVA) and regression. ANCOVA evaluates whether population means of a dependent variable (DV) are equal across levels of a categorical independent variable (IV) often called a treatment, while statistically controlling for the effects of other continuous variables that are not of primary interest, known as covariates (CV), or nuisance variables.

Bottom-Up Approach: An approach to an analysis which involved the piecing together of multiple systems to give rise to a more complex systems.

Corporate Income Tax: A tax based on net taxable income as defined under federal or state law.

Covariance Matrix: A matrix which helps illustrate the strength of the correlation between two factors.

Demand Factors: Factors which drive a consumer's desire and willingness to pay a price for a specific good or service.

Direct Economic Impact: The initial economic changes to the impacted industry (e.g., a general contractor who constructs a green building).

Economic Contraction: A general slowdown in economic activity affected by macroeconomic indicators such as GDP (gross domestic product), investment spending, capacity utilization, household income, business profits, and inflation fall, while bankruptcies and the unemployment rate rise.

Economic Impact: The effect of an event on the economy in a specified zone, here defined at both the state and national level. This study analyzes the economic impact of construction, green construction, and LEED construction.

Exponential Smoothing: A statistical technique for detecting meaningful changes in data by ignoring the fluctuations irrelevant to the purpose at hand. To accomplish this, older data is given progressively-less relative weight (importance) whereas newer data is given progressively-greater weight.

Forecast: The process of attempting to predict the future condition of the economy which involves the use of statistical models.

Full Time Equivalent (FTE): A number that indicates the workload of an employed person in a way that makes workloads comparable across various contexts.

Green Construction Market: Dodge Data & Analytics (formerly McGraw-Hill Construction) defines green building as "one built to LEED standards, an equivalent green building certification program, or one that incorporates numerous green building elements across five category areas: energy efficiency, water efficiency, resource efficiency, responsible site management and improved indoor air quality. Projects that only feature a few green building products (e.g., HVAC systems, waterless urinals) or that only address one aspect of a green building, such as energy efficiency, are not included in this calculation."

Green Jobs: McGraw-Hill defines green jobs in one of two ways. **Green Design Job:** "Involves more than 50% work on green projects or designing uniquely green systems on any building. Examples include designing green roofing systems or solar energy systems." **Green Construction Job:** "Involves installing a uniquely green system or doing work that requires different skills to meet green goals. Examples of uniquely green systems include composting toilets and solar panels, and an example of a job that would require different skills to meet green goals is a painter who uses products that require different ventilation systems."

Gross Domestic Product (GDP): A broad measurement of a nation's overall economic activity, including the monetary value of all the goods and services produced within a country's borders during a specific time period.

Heating, Ventilation and Air Conditioning (HVAC): The technology that controls indoor environmental comfort. Its goal is to provide thermal comfort and acceptable indoor air quality.

Indirect Economic Impact: The increased economic activity generated for downstream businesses that provide supplies and raw materials for the industries directly affected (e.g., the general contractor purchases supplies from steel and lumber companies).

Individual Income Tax: A tax that governments impose on personal financial income.

Induced Economic Impact: The economic impact from the increased income of households that are directly and indirectly affected by green building expenditures (e.g., employees of the general contractor, the steel supplier, and the lumber supplier use their additional income from green construction spending to purchase products and services from food and gas to healthcare and education).

Labor Earnings: The wages earned from labor, here referring to those wages earned in construction, green construction, and LEED construction.

Leading Indicators: A measurable economic factor that changes before the economy starts to follow a particular pattern or trend. Leading indicators are used to predict changes in the economy.

Linear Regression: An approach for modeling the relationship between a scalar dependent variable "y" and one or more explanatory variables (or independent variables) denoted "x".

Marginal LEED Cost: The additional cost incurred when LEED standards are used in construction.

McGraw-Hill Construction (MHC): McGraw-Hill Construction has been renamed Dodge Data and Analytics, and offers data, analytics, news and intelligence services regarding the North American construction industry.

Model: A theoretical construct representing economic processes by a set of variables and a set of logical and/or quantitative relationships between them. Models are built to compress complex data inputs to present easily digestible data and associated forecasts.

Monte Carlo Simulation: A technique used to approximate the likelihood, or probability of a certain outcome by running multiple trial runs, called simulations, using multiple variables.

Multiplier: When relating to economics, a multiplier is a factor by which an increment of income exceeds the resulting increment of savings or investment.

Property Tax: A tax on physical property that the owner of said property is required to pay.

R (Statistical Modeling Tool): A software environment for statistical computing and graphics.

Regression: A statistical measure that attempts to determine the strength of the relationship between one dependent variable (y) and a series of independent variables.

Multivariate Regression: A statistical tool used to derive the value of a variable from several other independent, or predictor, variables.

Tableau: An interactive data visualization tool.

USGBC: U.S. Green Building Council, sponsor of the report.

Year over Year (YoY): A method of evaluating two or more measured events to compare the results at one time period with those from another time period (or series of time periods), on an annualized basis.

Appendix B: IMPLAN Background and General Methods

This appendix provides additional information. The IMPLAN modeling system combines the U.S. Bureau of Economic Analysis Input-Output (IO) Benchmarks with other data to construct quantitative models of trade flow relationships between businesses and between businesses and final consumers. The IMPLAN input-output accounts are based on industry survey data collected periodically by the U.S. Bureau of Economic Analysis and follow a balanced account format recommended by the United Nations. The IMPLAN modeling system has been in use since 1979 and is currently used by over 500 private consulting firms, university research centers, and government agencies.

Each industry that produces goods and services generates demands for other goods and services. Multipliers describe these iterations (IMPLAN Manual, 2003). Multipliers can be described through the following definitions.

- **Direct** effects are the initial change to the industry or institution in question.
- **Indirect** effects are the changes in inter-industry purchases as they respond to the new demands of the directly affected industries. The direct change creates increases in economic activity for downstream businesses that support these direct industries.
- **Induced** effects are the increases in household income expenditures generated by the direct and indirect effects.

A Social Accounting Matrix (SAM) multiplier, as modeled by IMPLAN, is defined as the sum of the direct, indirect and induced effects, divided by the direct effect. It shows the amount of additional economic activity generated by the direct economic stimulus. Therefore, multipliers closer to one indicate very little additional activity generated, and larger multipliers indicate more downstream or rollover (i.e., indirect and induced) economic activity.

The United States data file was obtained from the Minnesota IMPLAN Group (MIG). The model was then constructed and the multipliers created for the national area data. The IMPLAN methodology is explained for each of the categories of economic contribution. Green and LEED certified construction in Section 2 and Section 7(Savings).

Appendix C: Green & LEED Methodology Data Tables

TABLE C.1: NEW GREEN CONSTRUCTION SPENDING BY ASSET TYPE ($ MILLIONS)

New Green Construction Spending ($ Millions) contd. below								
Year	**Health Care**	**Manufacturing**	**Educational & Vocational**	**Highways & Streets**	**Commercial**	**Non-residential**	**Single-family residential**	**Multi-family residential**
2005	478	54	924	44	713	238	1715	4002
2006	1620	457	3132	449	1674	980	2244	5236
2007	2179	354	4873	1095	3362	1036	2504	5842
2008	3115	1459	7009	1066	5629	1192	3271	7632
2009	3200	1430	7200	799	8348	1439	2635	6149
2010	3339	793	7512	1071	11088	1400	2205	5145
2011	3652	880	9505	953	14221	3002	2693	6284
2012	4504	711	12243	1348	14805	4369	4522	10550
2013	5342	500	11277	1081	19089	3664	6588	15372
2014	4806	749	12016	1974	28327	4574	7570	17664
2015	5592	872	12600	2296	24882	11129	9900	23100
2016	7217	1125	13200	2964	34932	14305	12870	30030
2017	7607	1186	13200	3124	32545	13877	15420	35980
2018	8330	1299	13800	3421	33099	14428	18075	42175

TABLE C.2: NEW GREEN CONSTRUCTION SPENDING BY ASSET TYPE (CONTD.) ($ MILLIONS)

Maintenance & Repair Green Construction Spending ($ Millions) contd.				
Year	**Non-residential**	**Residential**	**Others**	**Total**
2005	540	1282	10	10000
2006	1598	1520	91	19000
2007	3753	2654	348	28000
2008	5228	3097	303	39000
2009	14064	5715	520	51500
2010	21829	6649	968	62000
2011	27935	8023	852	78000
2012	24131	9928	888	88000
2013	27307	15040	740	106000
2014	33537	16766	1311	129296
2015	36716	22000	1531	150618
2016	47186	28600	1976	194404
2017	45610	34267	2083	204898
2018	47303	40167	2280	224376

TABLE C.3: HISTORICAL INDEX FOR CONSTRUCTION COST BY YEAR

Year	Historical Index Construction Cost
2005	146.70
2006	156.20
2007	165.00
2008	171.00
2009	182.50
2010	181.60
2011	185.70
2012	194.00
2013	196.90
2014	203.00
2015-18	206.70

Source: (RSMeans 2015 Square Foot Cost Book)

TABLE C.4: LOCATION COST FACTORS FOR CONSTRUCTION BY STATE

Construction Location Cost Factors		
State	**Residential**	**Non-Residential**
Alabama	0.76	0.82
Alaska	1.27	1.21
Arizona	0.85	0.87
Arkansas	0.75	0.79
California	1.13	1.09
Colorado	0.88	0.91
Connecticut	1.11	1.10
District of Columbia	0.93	0.97
Delaware	1.02	1.04
Florida	0.83	0.87
Georgia	0.77	0.82
Hawaii	1.23	1.19
Idaho	0.90	0.92
Illinois	1.08	1.06
Indiana	0.92	0.92
Iowa	0.83	0.87
Kansas	0.83	0.87
Kentucky	0.88	0.90
Louisiana	0.80	0.83
Maine	0.94	0.93
Maryland	0.87	0.90
Massachusetts	1.15	1.11
Michigan	0.94	0.95
Minnesota	0.92	1.01
Mississippi	0.77	0.81

Missouri	0.94	0.97
Montana	0.88	0.90
Nebraska	0.87	0.89
Nevada	0.98	0.98
New Hampshire	0.93	0.92
New Jersey	1.13	1.11
New Mexico	0.83	0.87
New York	1.14	1.13
North Carolina	0.84	0.80
North Dakota	0.77	0.84
Ohio	0.94	0.94
Oklahoma	0.78	0.82
Oregon	0.99	0.99
Pennsylvania	0.95	0.98
Rhode Island	1.10	1.08
South Carolina	0.85	0.81
South Dakota	0.75	0.79
Tennessee	0.78	0.84
Texas	0.82	0.84
Utah	0.80	0.86
Vermont	0.94	0.93
Virginia	0.93	0.87
Washington	0.99	0.98
West Virginia	0.94	0.97
Wisconsin	0.99	0.98
Wyoming	0.81	0.87

Source: (RSMeans 2015 Square Foot Cost Book)

TABLE C.5: CONSTRUCTION SPENDING BY ASSET TYPE ($/FT^2)

Construction Spending by Asset Type ($/ft^2)			
Year	**Educational Facilities**	**Higher Ed**	**K-12**
2005	131.24	131.80	130.96
2006	139.74	140.34	139.44
2007	147.61	148.24	147.30
2008	152.98	153.64	152.65
2009	163.27	163.97	162.92
2010	162.46	163.16	162.12
2011	166.13	166.84	165.78
2012	173.56	174.30	173.19
2013	176.15	176.91	175.78
2014	181.61	182.39	181.22
2015	*184.92*	*185.71*	*184.53*
2016	*184.92*	*185.71*	*184.53*
2017	*184.92*	*185.71*	*184.53*
2018	*184.92*	*185.71*	*184.53*

Source: (RSMeans 2015 Square Foot Cost Book)

TABLE C.6: CONSTRUCTION SPENDING BY ASSET TYPE ($/SQ.FT)

Construction Spending by Asset Type ($/ft^2)			
Year	**Health Care**	**Laboratory**	**Other**
2005	138.05	157.56	112.08
2006	146.99	167.76	119.34
2007	155.27	177.21	126.06
2008	160.91	183.66	130.64
2009	171.73	196.01	139.43
2010	170.89	195.04	138.74
2011	174.75	199.45	141.87
2012	182.56	208.36	148.22
2013	185.29	211.47	150.43
2014	191.03	218.03	155.09
2015	*194.51*	*222.00*	*157.92*
2016	*194.51*	*222.00*	*157.92*
2017	*194.51*	*222.00*	*157.92*
2018	*194.51*	*222.00*	*157.92*

Source: (RSMeans 2015 Square Foot Cost Book)

TABLE C.7: CONSTRUCTION SPENDING BY ASSET TYPE ($/SQ.FT)

Construction Spending by Asset Type ($/ft^2)			
Year	**Single-Family Home**	**Multi-Family Residential**	**Warehouse and Distribution**
2005	74.71	92.12	68.34
2006	79.55	98.09	72.76
2007	84.03	103.61	76.86
2008	87.08	107.38	79.65
2009	92.94	114.60	85.01
2010	92.48	114.04	84.59
2011	94.57	116.61	86.50
2012	98.80	121.82	90.37
2013	100.27	123.64	91.72
2014	103.38	127.47	94.56
2015	*105.26*	*129.80*	*96.28*
2016	*105.26*	*129.80*	*96.28*
2017	*105.26*	*129.80*	*96.28*
2018	*105.26*	*129.80*	*96.28*

Source: (RSMeans 2015 Square Foot Cost Book)

TABLE C.8: CONSTRUCTION SPENDING BY ASSET TYPE ($/SQ.FT)

Construction Spending by Asset Type ($/ft^2)			
Year	**Single-Family Home**	**Multi-Family Residential**	**Warehouse and Distribution**
2005	74.71	92.12	68.34
2006	79.55	98.09	72.76
2007	84.03	103.61	76.86
2008	87.08	107.38	79.65
2009	92.94	114.60	85.01
2010	92.48	114.04	84.59
2011	94.57	116.61	86.50
2012	98.80	121.82	90.37
2013	100.27	123.64	91.72
2014	103.38	127.47	94.56
2015	*105.26*	*129.80*	*96.28*
2016	*105.26*	*129.80*	*96.28*
2017	*105.26*	*129.80*	*96.28*
2018	*105.26*	*129.80*	*96.28*

Source: (RSMeans 2015 Square Foot Cost Book)

TABLE C.9: CONSTRUCTION SPENDING BY ASSET TYPE ($/SQ.FT)

Construction Spending by Asset Type ($/ft^2)			
Year	**Office**	**Office: Mixed Use**	**Retail**
2005	112.39	112.39	74.28
2006	119.67	119.67	79.09
2007	126.41	126.41	83.55
2008	131.01	131.01	86.59
2009	139.82	139.82	92.41
2010	139.13	139.13	91.95
2011	142.27	142.27	94.03
2012	148.63	148.63	98.23
2013	150.85	150.85	99.70
2014	155.53	155.53	102.79
2015	*158.36*	*158.36*	*104.66*
2016	*158.36*	*158.36*	*104.66*
2017	*158.36*	*158.36*	*104.66*
2018	*158.36*	*158.36*	*104.66*

Source: (RSMeans 2015 Square Foot Cost Book)

TABLE C.10: CONSTRUCTION SPENDING BY ASSET TYPE ($/SQ.FT)

Construction Spending by Asset Type ($/ft^2)			
Year	**Military Base**	**Datacenter**	**Warehouse and Distribution**
2005	157.61	157.56	68.34
2006	167.82	167.76	72.76
2007	177.27	177.21	76.86
2008	183.72	183.66	79.65
2009	196.08	196.01	85.01
2010	195.11	195.04	84.59
2011	199.51	199.45	86.50
2012	208.43	208.36	90.37
2013	211.55	211.47	91.72
2014	218.10	218.03	94.56
2015	*222.08*	*222.00*	*96.28*
2016	*222.08*	*222.00*	*96.28*
2017	*222.08*	*222.00*	*96.28*
2018	*222.08*	*222.00*	*96.28*

Source: (RSMeans 2015 Square Foot Cost Book)

TABLE C.11: CONSTRUCTION SPENDING BY ASSET TYPE ($/SQ.FT)

Construction Spending by Asset Type ($/ft^2)			
Year	**Public Assembly**	**Religious Worship**	**Service**
2005	112.08	101.78	115.15
2006	119.34	108.37	122.60
2007	126.06	114.47	129.51
2008	130.64	118.64	134.22
2009	139.43	126.62	143.25
2010	138.74	125.99	142.54
2011	141.87	128.84	145.76
2012	148.22	134.59	152.27
2013	150.43	136.61	154.55
2014	155.09	140.84	159.34
2015	*157.92*	*143.41*	*162.24*
2016	*157.92*	*143.41*	*162.24*
2017	*157.92*	*143.41*	*162.24*
2018	*157.92*	*143.41*	*162.24*

Source: (RSMeans 2015 Square Foot Cost Book)

Appendix D: IMPLAN Results for Green Construction

TABLE D.1: GREEN CONSTRUCTION GDP NET ECONOMIC IMPACT ($, BILLIONS) (SPENDING - SAVINGS)

Green Construction GDP Net Economic Impact ($, billions) (Spending - Savings)			
Year	Direct	Indirect	Induced
2005	4.71	5.71	5.66
2006	8.66	10.25	10.29
2007	12.40	14.67	14.73
2008	17.16	19.70	20.14
2009	22.64	25.59	26.38
2010	27.11	30.50	31.48
2011	33.56	37.55	38.87
2012	36.89	41.98	43.06
2013	43.78	49.92	51.19
2014	53.17	59.40	61.59
2015	*60.73*	*68.92*	*70.82*
2016	*77.52*	*87.30*	*90.09*
2017	*79.79*	*91.16*	*93.36*
2018	*85.44*	*98.40*	*100.35*

TABLE D.2: CONSTRUCTION EMPLOYMENT NET ECONOMIC IMPACT (SPENDING - SAVINGS)

Green Construction Employment Net Economic Impact Jobs (Spending - Savings)			
Year	Direct	Indirect	Induced
2005	62,000	66,000	65,000
2006	113,000	112,000	117,000
2007	162,000	157,000	168,000
2008	225,000	210,000	229,000
2009	296,000	272,000	300,000
2010	354,000	322,000	358,000
2011	438,000	397,000	442,000
2012	482,000	447,000	490,000
2013	575,000	539,000	583,000
2014	699,000	637,000	701,000
2015	*797,000*	*746,000*	*806,000*
2016	*1,018,000*	*945,000*	*1,025,000*
2017	*1,049,000*	*997,000*	*1,063,000*
2018	*1,124,000*	*1,082,000*	*1,143,000*

TABLE D.3: GREEN CONSTRUCTION LABOR EARNINGS NET ECONOMIC IMPACT ($, BILLIONS) (SPENDING - SAVINGS)

Green Construction Labor Earnings Net Economic Impact ($, billions) (Spending - Savings)			
Year	**Direct**	**Indirect**	**Induced**
2005	4.15	3.36	3.22
2006	7.62	6.05	5.85
2007	10.91	8.65	8.37
2008	15.11	11.64	11.45
2009	19.99	15.04	14.99
2010	23.93	17.88	17.89
2011	29.62	22.01	22.10
2012	32.54	24.66	24.48
2013	38.69	29.31	29.10
2014	46.94	34.90	35.01
2015	*53.66*	*40.42*	*40.26*
2016	*68.50*	*51.19*	*51.21*
2017	*70.61*	*53.42*	*53.07*
2018	*75.67*	*57.64*	*57.05*

Appendix E: IMPLAN Results for USGBC Impact

TABLE E.1: LEED CONSTRUCTION GDP NET ECONOMIC IMPACT ($, BILLIONS) (SPENDING - SAVINGS)

LEED Construction GDP Net Economic Impact ($, billions) (Spending - Savings)			
Year	**Direct**	**Indirect**	**Induced**
2005	1.36	1.30	1.48
2006	2.02	1.98	2.22
2007	3.41	3.50	3.81
2008	6.45	6.27	7.06
2009	14.60	14.32	16.02
2010	20.36	20.64	22.61
2011	20.69	21.22	23.08
2012	18.87	19.71	21.23
2013	20.30	21.28	22.87
2014	20.76	22.04	23.55
2015	*24.70*	*27.60*	*28.60*
2016	*26.30*	*29.40*	*30.46*
2017	*28.03*	*31.33*	*32.46*
2018	*29.81*	*33.32*	*34.52*

TABLE E.2: LEED CONSTRUCTION EMPLOYMENT NET ECONOMIC IMPACT (SPENDING - SAVINGS)

LEED Construction Employment Net Economic Impact Jobs (Spending - Savings)			
Year	**Direct**	**Indirect**	**Induced**
2005	18,000	13,000	17,000
2006	27,000	19,000	25,000
2007	45,000	35,000	43,000
2008	85,000	62,000	80,000
2009	193,000	144,000	182,000
2010	267,000	209,000	257,000
2011	271,000	216,000	262,000
2012	247,000	199,000	241,000
2013	266,000	216,000	260,000
2014	272,000	224,000	268,000
2015	*319,000*	*281,000*	*325,000*
2016	*340,000*	*299,000*	*346,000*
2017	*362,000*	*318,000*	*369,000*
2018	*386,000*	*339,000*	*392,000*

TABLE E.3: LEED CONSTRUCTION LABOR EARNINGS NET ECONOMIC IMPACT ($, BILLIONS) (SPENDING - SAVINGS)

LEED Construction Labor Earnings Net Economic Impact ($, billions) (Spending - Savings)			
Year	**Direct**	**Indirect**	**Induced**
2005	1.19	0.78	0.84
2006	1.78	1.18	1.26
2007	3.00	2.08	2.17
2008	5.67	3.73	4.01
2009	12.85	8.45	9.11
2010	17.93	12.12	12.85
2011	18.22	12.47	13.12
2012	16.60	11.62	12.07
2013	17.85	12.55	13.00
2014	18.30	12.99	13.39
2015	*21.72*	*16.25*	*16.26*
2016	*23.13*	*17.31*	*17.32*
2017	*24.64*	*18.45*	*18.45*
2018	*26.21*	*19.62*	*19.63*

Appendix F: Tax Contributions by State

TABLE F.1: ANNUAL INCOME TAX BY STATE ($, MILLIONS)

Annual Income Tax by State ($, millions)					
State	**2014**	**2015**	**2016**	**2017**	**2018**
Alabama	10.7	18.5	22.0	23.4	24.9
Alaska	6.6	24.2	15.5	16.5	17.5
Arizona	48.4	21.1	55.3	58.9	62.6
Arkansas	13.7	1.3	17.3	18.4	19.6
California	905.6	936.8	1054.5	1123.5	1195.1
Colorado	93.7	45.0	101.3	107.9	114.8
Connecticut	40.9	35.1	56.8	60.5	64.3
Delaware	5.5	0.0	7.2	7.6	8.1
Florida	37.0	20.3	48.4	51.5	54.8
Georgia	97.1	13.3	113.3	120.7	128.4
Hawaii	23.0	5.9	13.4	14.2	15.1
Idaho	3.9	2.9	34.3	36.5	38.9
Illinois	389.5	591.9	467.9	498.5	530.2
Indiana	34.1	13.3	29.9	31.8	33.9
Iowa	18.5	10.0	17.4	18.5	19.7
Kansas	14.6	27.3	14.8	15.7	16.7
Kentucky	22.7	5.2	17.2	18.3	19.5
Louisiana	14.6	2.8	8.3	8.9	9.4
Maine	9.5	3.7	11.2	11.9	12.7
Maryland	111.9	133.8	106.7	113.6	120.9
Massachusetts	168.0	127.6	244.5	260.5	277.1
Michigan	35.4	56.0	113.2	120.6	128.3
Minnesota	103.8	35.4	89.5	95.4	101.5
Mississippi	16.9	25.8	16.4	17.4	18.6
Missouri	27.2	14.6	39.2	41.8	44.4
Montana	3.8	4.5	8.8	9.4	10.0
Nebraska	11.0	0.2	12.5	13.3	14.2
Nevada	0.0	0.0	0.0	0.0	0.0
New Hampshire	9.5	1.3	19.7	21.0	22.4
New Jersey	102.4	123.5	136.7	145.7	155.0
New Mexico	9.0	7.8	13.2	14.1	15.0
New York	450.0	277.3	499.1	531.8	565.7
North Carolina	67.9	74.9	102.9	109.7	116.7
North Dakota	4.1	2.4	10.1	10.7	11.4
Ohio	64.6	42.3	57.7	61.5	65.4
Oklahoma	8.4	6.2	24.2	25.8	27.5
Oregon	54.4	39.2	165.9	176.7	188.0
Pennsylvania	93.5	169.5	147.5	157.2	167.2
Rhode Island	7.0	3.0	7.5	8.0	8.5

South Carolina	15.6	10.0	30.3	32.3	34.4
South Dakota	0.4	0.0	0.4	0.4	0.4
Tennessee	25.9	18.9	23.0	24.5	26.1
Texas	0.0	0.0	0.0	0.0	0.0
Utah	19.6	16.9	25.5	27.2	28.9
Vermont	2.9	9.2	15.3	16.3	17.3
Virginia	114.1	47.5	121.5	129.5	137.7
Washington	0.0	0.0	0.0	0.0	0.0
West Virginia	4.8	0.0	8.9	9.4	10.1
Wisconsin	34.5	0.3	108.6	115.7	123.1
Wyoming	0.0	0.0	0.0	0.0	0.0

TABLE F.2: ANNUAL PROPERTY TAX BY STATE ($, MILLIONS)

Annual Property Tax by State ($, millions)					
State	**2014**	**2015**	**2016**	**2017**	**2018**
Alabama	7.6	12.9	15.4	16.4	17.5
Alaska	5.2	19.0	12.1	12.9	13.7
Arizona	111.6	47.9	125.3	133.5	142.0
Arkansas	64.8	6.2	80.5	85.8	91.2
California	698.4	710.0	799.2	851.5	905.8
Colorado	0.0	0.0	0.0	0.0	0.0
Connecticut	0.0	0.0	0.0	0.0	0.0
Delaware	0.0	0.0	0.0	0.0	0.0
Florida	0.0	0.0	0.0	0.0	0.0
Georgia	124.6	16.8	142.8	152.1	161.8
Hawaii	0.0	0.0	0.0	0.0	0.0
Idaho	0.0	0.0	0.0	0.0	0.0
Illinois	28.2	42.1	33.3	35.4	37.7
Indiana	0.5	0.2	0.5	0.5	0.5
Iowa	0.0	0.0	0.0	0.0	0.0
Kansas	6.2	11.4	6.2	6.6	7.0
Kentucky	43.6	10.0	32.7	34.8	37.0
Louisiana	1.9	0.4	1.1	1.2	1.2
Maine	4.0	1.6	4.7	5.0	5.3
Maryland	239.9	281.8	224.7	239.4	254.6
Massachusetts	0.9	0.7	1.3	1.4	1.4
Michigan	149.5	233.3	472.0	502.8	534.9
Minnesota	182.5	61.3	154.8	165.0	175.5
Mississippi	2.0	3.0	1.9	2.0	2.1
Missouri	2.7	1.4	3.9	4.1	4.4
Montana	7.7	8.9	17.6	18.7	19.9
Nebraska	0.0	0.0	0.0	0.0	0.0
Nevada	23.4	948.2	159.3	169.8	180.6
New Hampshire	20.9	2.8	43.3	46.2	49.1

New Jersey	1.0	1.2	1.4	1.5	1.6
New Mexico	7.2	6.1	10.4	11.1	11.8
New York	0.0	0.0	0.0	0.0	0.0
North Carolina	0.0	0.0	0.0	0.0	0.0
North Dakota	0.0	0.0	0.0	0.0	0.0
Ohio	0.0	0.0	0.0	0.0	0.0
Oklahoma	0.0	0.0	0.0	0.0	0.0
Oregon	2.5	1.8	7.5	8.0	8.5
Pennsylvania	6.4	11.4	10.0	10.6	11.3
Rhode Island	0.5	0.2	0.5	0.5	0.5
South Carolina	0.8	0.5	1.4	1.5	1.6
South Dakota	0.0	0.0	0.0	0.0	0.0
Tennessee	0.0	0.0	0.0	0.0	0.0
Texas	0.0	0.0	0.0	0.0	0.0
Utah	0.0	0.0	0.0	0.0	0.0
Vermont	46.4	144.3	240.1	255.8	272.1
Virginia	8.4	3.4	8.8	9.4	10.0
Washington	251.1	264.4	537.6	572.8	609.3
West Virginia	0.0	0.0	0.0	0.0	0.0
Wisconsin	10.9	0.1	33.8	36.0	38.3
Wyoming	1.0	28.6	15.4	16.4	17.5

TABLE F.3: TOTAL ANNUAL TAXES BY STATE ($, MILLIONS)

Total Annual Taxes by State ($, millions)					
State	**2014**	**2015**	**2016**	**2017**	**2018**
Alabama	18.3	31.4	37.4	39.9	42.4
Alaska	11.8	43.2	27.6	29.4	31.3
Arizona	160.0	69.1	180.5	192.3	204.6
Arkansas	78.5	7.5	97.8	104.2	110.8
California	1604.0	1646.8	1853.7	1975.0	2100.8
Colorado	93.7	45.0	101.3	107.9	114.8
Connecticut	40.9	35.1	56.8	60.5	64.3
Delaware	5.5	0.0	7.2	7.6	8.1
Florida	37.0	20.3	48.4	51.5	54.8
Georgia	221.7	30.0	256.1	272.8	290.2
Hawaii	23.0	5.9	13.4	14.2	15.1
Idaho	3.9	2.9	34.3	36.5	38.9
Illinois	417.7	634.0	501.1	533.9	567.9
Indiana	34.7	13.5	30.4	32.3	34.4
Iowa	18.5	10.0	17.4	18.5	19.7
Kansas	20.8	38.7	21.0	22.3	23.8
Kentucky	66.3	15.2	49.8	53.1	56.5
Louisiana	16.5	3.2	9.4	10.0	10.6
Maine	13.5	5.3	15.9	16.9	18.0
Maryland	351.9	415.6	331.3	353.0	375.5

Massachusetts	168.8	128.3	245.8	261.8	278.5
Michigan	185.0	289.3	585.1	623.4	663.1
Minnesota	286.3	96.7	244.4	260.4	276.9
Mississippi	18.9	28.8	18.3	19.5	20.7
Missouri	30.0	16.0	43.1	45.9	48.8
Montana	11.5	13.4	26.3	28.1	29.9
Nebraska	11.0	0.2	12.5	13.3	14.2
Nevada	23.4	948.2	159.3	169.8	180.6
New Hampshire	30.3	4.0	63.1	67.2	71.5
New Jersey	103.4	124.7	138.1	147.2	156.5
New Mexico	16.1	13.9	23.7	25.2	26.8
New York	450.0	277.3	499.1	531.8	565.7
North Carolina	67.9	74.9	102.9	109.7	116.7
North Dakota	4.1	2.4	10.1	10.8	11.5
Ohio	64.6	42.3	57.7	61.5	65.4
Oklahoma	8.4	6.2	24.2	25.8	27.5
Oregon	56.9	40.9	173.4	184.7	196.5
Pennsylvania	99.9	180.9	157.5	167.8	178.5
Rhode Island	7.5	3.2	8.0	8.5	9.0
South Carolina	16.3	10.5	31.8	33.8	36.0
South Dakota	0.4	0.0	0.4	0.4	0.4
Tennessee	25.9	18.9	23.0	24.5	26.1
Texas	0.0	0.0	0.0	0.0	0.0
Utah	19.6	16.9	25.5	27.2	28.9
Vermont	49.3	153.5	255.4	272.1	289.4
Virginia	122.6	50.9	130.3	138.9	147.7
Washington	251.1	264.4	537.6	572.8	609.3
West Virginia	4.8	0.0	8.9	9.4	10.1
Wisconsin	45.3	0.4	142.4	151.8	161.4
Wyoming	1.0	28.6	15.4	16.4	17.5

Appendix G: References

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