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THE SMART SOCIO-ECONOMICS OF BEING GREEN

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ABSTRACT

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. Both residential and non-residential building sectors have experienced growth since 2011, creating essential jobs and noticeably contributing to GDP. Green construction represents a portion of building activity as a whole and its growth rate has outpaced general construction over the past few years. 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. 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. Green building has received increased attention over the past decade from both environmental economists and policymakers. This article presents an overview of green building economics and policies through a survey of the theoretical and empirical evidence concerning green buildings. This study aims to provide a methodical analysis of the economic value of green Building constructions at the national and state levels

1. Industry Brief:

Green building is steadily becoming one of the fastest Growing sectors within every economy. Property owners can build and manage smarter, healthier, more resilient buildings while saving money on energy and water bills; a combination that enhances their triple bottom line while creating a more pleasant, productive and healthier occupant and worker experience. 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 green 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 green certified buildings.

According to a recent report released by the U.S. Green Building Council, green construction's growth rate is rapidly outpacing that of conventional construction, and by 2018, green construction will support more than 3.3 million U.S. jobs – more than one-third of the entire U.S. construction sector – and generate \$190.3 billion in labour earnings. Green building rating systems have been around for decades, but the last ten years have seen aggressive consumer demand and market uptake in policies and practices.

2. Impacting the Triple Bottom Line

<p>Green jobs are good jobs.</p>	<ol style="list-style-type: none"> I. It is projected that by 2018, construction of green buildings will support more than 3.3 million U.S. jobs, more than one-third of the entire U.S. construction sector. II. Total combined state earnings related to LEED building construction projects alone are estimated to total \$8.4 billion by 2018. III. To further the education of building industry workers with regards to sustainability, many accreditation programs help teach the specific ins and outs of green building and the green building rating systems that are standard in the field.
<p>Green buildings save money for businesses and homeowners.</p>	<ol style="list-style-type: none"> I. According to the National Federation of Independent Business, energy costs are one of the top three business expenses for over a third of small businesses. Combine that with water usage, and costs rise even further. Companies look to green building strategies to improve their bottom line. II. One study found that green building reduced operating costs by 13.6 percent for new construction projects and 8.5 percent for existing buildings – while at the same time, new construction projects saw building values increase by 10.9 percent and existing building projects saw an increase of 6.8 percent.
<p>Green buildings protect the economy from the cost of environmental degradation.</p>	<ol style="list-style-type: none"> I. Green buildings, and the sustainable way they are built, are critically important to our environment. Buildings account for 39 percent of CO2 emissions in the U.S., which contributes heavily to climate change worldwide. II. Energy-efficient buildings can have a profound effect on the overall carbon footprint of the U.S. economy. This can protect the U.S. economy and U.S. jobs against damages from climate change. Building occupancy accounts for 41 percent of total U.S. energy usage – more than industry or transportation. III. LEED-certified buildings use roughly 25 percent less energy than non-LEED buildings. By 2025, this gradual change would reduce emissions by 146 million metric tons, nearly seven percent of the carbon reductions the U.S. committed to for that year.
<p>Green buildings contribute to occupant sat-</p>	<ol style="list-style-type: none"> I. Another upside to green building and certification programs is occupant

isfaction and productivity.	<p>satisfaction. Recent scholarly studies have found that workers in Green certified buildings of the same institution were more productive and engaged in their work than co-workers in non-Green buildings, and that Green buildings correlated with better recruitment and retention rates.</p> <p>II. This is not an idle concern – according to one study by the Centre for American Progress, the average cost of replacing an employee who earns less than \$50,000 a year can reach 20 percent of their annual salary. The cost of losing an executive can be many times worse – as much as a staggering 213 percent of their salary.</p>
Governments are saving money with green building.	<p>I. Third-party green building certification for projects represents an easy way for local, state and federal governments to cut expenses while proving to citizens that they are responsible stewards of both taxpayer dollars and the environment.</p> <p>II. Over 3,700 state and local government projects are currently pursuing LEED certification, with nearly 3,000 already certified. Much of this is due to legislation passed at both the federal and state levels that incentivizes or requires more energy-efficient building projects.</p> <p>III. Several state and local governments have passed legislation requiring LEED certification for new government-owned buildings or have otherwise incentivized LEED projects. For example, the District of Columbia adopted new construction codes in 2013 which require that all new buildings over 10,000 square feet, except for single-family homes, will have to meet new sustainability requirements, such as achieving LEED certification. At the federal level, there are more than 1,950 LEED-certified projects.</p>

3. Policy Opportunities

Although private sector approaches like LEED rely on voluntary participation, federal, state, and local governments have promulgated a wide range of policies explicitly aimed at promoting green building. Government incentives provide a path that states and localities can take to support the green building economy. We focus here on policies that encourage adoption of whole-building green strategies to reduce life cycle impacts of the built environment, rather than single-characteristic policies.

In addition to government policies that incentivize or require more energy-efficient building projects, or government-based financing mechanisms, Govt. supports proposals to boost funding for renewable energy and energy efficiency and backs efforts to reform the nation's chemical laws. These proposals include:

Clean Energy Victory Bonds	<p>I. Clean Energy Victory Bonds are an investment vehicle that allows Americans to invest in one of the fastest growing sectors in the global economy, as well as a means to collectively provide a secure and sustainable energy future, create jobs, and regain our competitive advantage in clean energy technology.</p> <p>II. For as little as \$25, every American could invest in the energy sources that are needed to move our economy forward.</p>
Chemical Policy Reform	<p>I. Companies are also concerned about toxic chemicals that can affect the health and well-being of employees.</p> <p>II. Addressing this issue requires meaningful reform of toxic chemicals laws, with the help of the Companies for Safer Chemicals Coalition, to keep harmful chemicals out of the marketplace and support healthier, safer alternatives that have less impact on the environment and human health.</p>

State Power Plans	<ol style="list-style-type: none"> I. Even as the Clean Power Plan is being fought in the courts, several states are implementing energy policies to reduce carbon emissions and accelerate the transition toward renewables. II. The states are utilizing a range of potential policies from carbon tax, renewable energy and energy efficiency portfolio standards to advance green buildings.
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3.1. Mandates for LEED certification

As shown in table 1, a large number of green building policies mandate LEED certification or equivalent design and performance for a particular sector. Most often these requirements apply to government buildings, as is the case for 24 states, 30 counties, and 170 cities. While government procurement requirements are common at the state level, requirements for the commercial sector tend to be found at municipal or county levels. Only Connecticut, through its state building code, requires major commercial developments to achieve at least LEED Silver, although nearly 60 cities have similar requirements.

TABLE-1: SUMMARY OF GREEN BUILDING POLICIES ACROSS U.S. STATES, COUNTIES, AND CITIES

	Common designs	Impacted U.S. regions			
		States	Counties	Cities	Total U.S. population, %
Mandate	LEED/equivalent: government	24	30	170	57.77
	LEED/equivalent: residential	3	12	76	11.33
	LEED/equivalent: commercial	1	10	58	7.60
	GreenPoint/LEED checklist for permit	0	0	51	3.52
	LEED AP required on design team	0	2	17	1.31
Incentive	Grants for certification costs	5	1	14	22.60
	Property tax abatement, exemption, credit, rebate, or refund	10	10	11	21.08
	Fee reduction or rebate	1	10	46	9.16
	Expedited permitting	1	13	48	7.97
	Density (floor area ratio) bonus	0	3	54	2.70
	Publicity	0	2	18	1.19
	Height bonus	0	0	20	0.64
Other	Symbolic gestures	3	5	59	4.87
	Energy emphasis	34	12	42	66.72
	Water or open space emphasis	0	2	10	0.53
	Multiple certifiers incentivized	17	14	83	46.15
	Incentive tiered by certification level	3	8	37	9.18
	Incentive tiered by building size	5	0	15	8.66
	Incentive tiered by building vintage	0	0	2	0.02

Note: The number of jurisdictions with each policy is presented alongside the total number of people residing within these jurisdictions as a percentage of the U.S. population.

Sources: Author calculations based on policy data provided by USGBC, IEA, and DSIRE.

3.2. Incentives and symbolic gestures

Although about half of all U.S. states have a LEED requirement for at least some buildings (usually public buildings), incentive programs are also common. As shown in table 1, five states offer limited grants to cover certification costs, while ten states offer some form of state tax relief for certifying firms. Kentucky is among a handful of states that offer only symbolic gestures promoting certification (i.e., without providing financial, human, or information resources to incentivize green building).

There is much greater diversity in incentive structure at the municipal level. Local governments employ a variety of innovative policy designs and incentives, including property tax reassessment moratoriums, green funds, parking incentives, electric bill discounts, green roof mandates, recertification requirements, and mandatory investment in any option with a positive return on

investment. Development density bonuses, such as exceptional height or floor area ratio permissions, are available in more than 70 cities, and more than 90 cities offer expedited permitting or fee reductions or rebates. Finally, 25 cities have approved modest financial incentives in the form of grants and tax relief. Although these cash incentives provide very direct incentives, funding for these programs is extremely limited (Kingsley 2008).

As shown in table 1, many incentive programs are tied to the building's characteristics. The most common approach to dividing incentives by category is through the LEED certification level itself, a policy used in nearly 50 jurisdictions to encourage higher tier achievement in green building. Five states and 15 cities vary incentives with the size of the proposed building, providing more incentives for green activity in larger developments. In contrast, the cities of Portland, ME and Wilmington, OH structure their policy levels by the age of the building, targeting renovations of old and potentially less efficient structures.

3.3. Links to other planning goals

Rather than focusing solely on environmental externalities, green building policies are often linked to other urban planning goals that address market failures in other parts of the built environment. Several towns and counties emphasize green building certification as a route to smart growth or community planning (San Francisco, CA; Blaine, ID; Germantown, TN; and seven others), and a general "public benefit" (Rolling Hills Estates, CA; Milford, MI; Newcastle, WA). Others (such as several counties in the Southeast) pursue green building policies to promote job creation or economic stimulus. In other regions, particularly in the Northwest, policies have been created to mitigate problems related to affordable housing and the need to retrofit existing buildings.

3.4. Federal Green Building Policies

Federal green building policies have been scarce compared with local programs. Nevertheless, public procurement policies for high-performance buildings have been implemented through various legislation and executive orders. In fact, federal procurement policies often rely explicitly on LEED as a benchmark or requirement. For example, the U.S. Department of Agriculture mandates LEED Silver and the U.S. Department of Energy requires LEED Gold for all newly constructed buildings, but the Departments of Defence and State simply encourage adherence to LEED without strict requirements for certification tiers.

In related actions, the Energy Independence and Security Act of 2007 required new federal buildings to reduce energy consumption, and the General Services Administration (GSA) was asked to evaluate certifiers and recommend the most comprehensive programs. This law resulted in the GSA recommendation that federal agencies use either LEED or a similar certification (Keller 2011). In addition, the Energy Policy Act of 2009 allocated \$31 billion to green buildings and conservation.

Public procurement policies may also influence the private sector. Simcoe and Toffel (2014) found local spillover effects from public procurement of green buildings that stimulate private sector green building practices. Although these effects are identified for local policies, they suggest the potential for spillovers from federal policies. Diffusion and peer effects affect certification rates among neighbours and produce clusters of green buildings in urban areas and in states with a strong environmental ethic (Cidell 2009; Kahn and Vaughn 2009). The spillover effect observed from green government buildings to other sectors could be a sign that certification can help shift norms in the building industry, because green building practices are easier to adopt as builders follow the lead of initial certifiers (Matisoff 2015). Green government buildings and housing (see table 1) have also promoted LEED's diffusion to less affluent neighbourhoods.

4. 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 national scope 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 201-2018, with 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.

TABLE-2: NATIONAL GREEN CONSTRUCTION SPENDING

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

FIGURE-1: NATIONAL GREEN CONSTRUCTION SPENDING (\$)

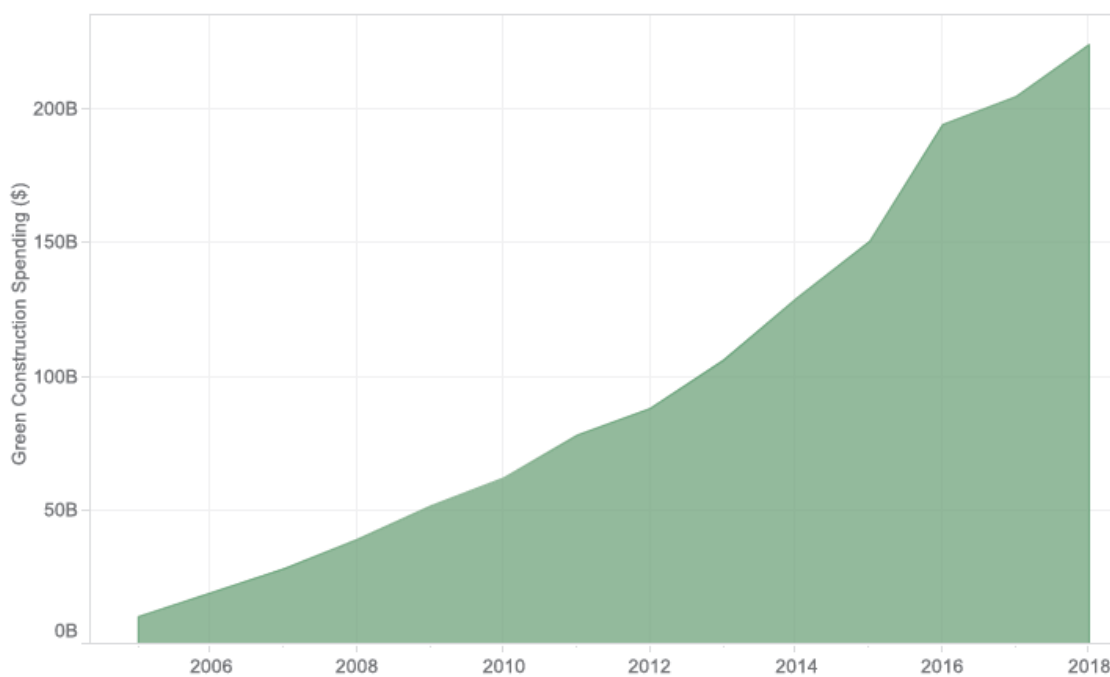


TABLE-3: SUMMARY OF NET IMPACT OF NATIONAL GREEN CONSTRUCTION EXPENDITURE

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

Figure-2: TOTAL DIRECT, INDIRECT AND INDUCED IMPACT ON NATIONAL GREEN CONSTRUCTION ON EMPLOYEMENT (JOBS)

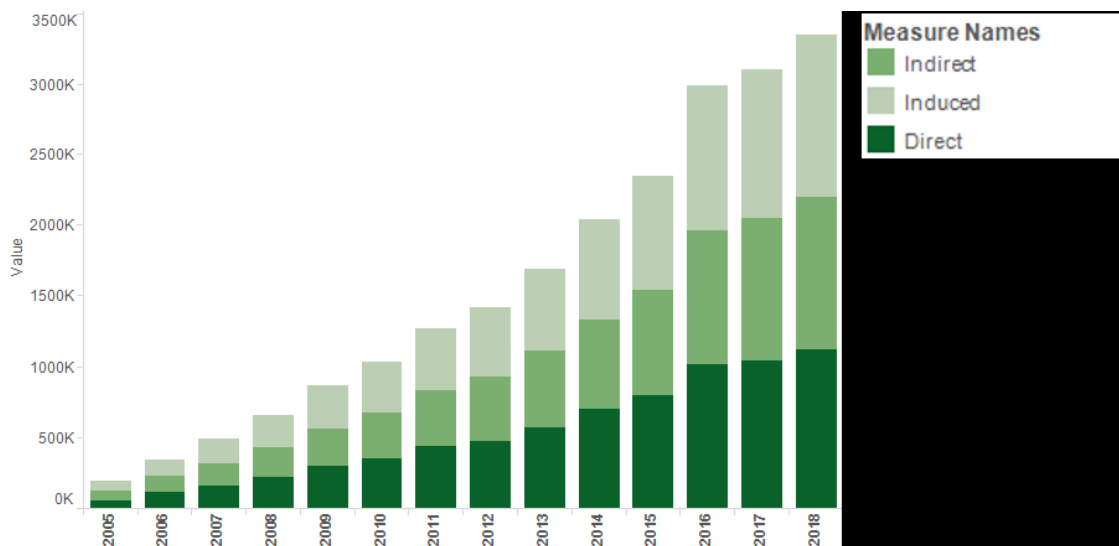


Table-4: TOTAL IMPACT OF NATIONAL GREEN CONSTRUCTION ON EMPLOYEMENT (JOBS)

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

FIGURE-3: TOTAL DIRECT, INDIRECT AND INDUCED IMPACT ON NATIONAL GREEN CONSTRUCTION ON GDP (\$)

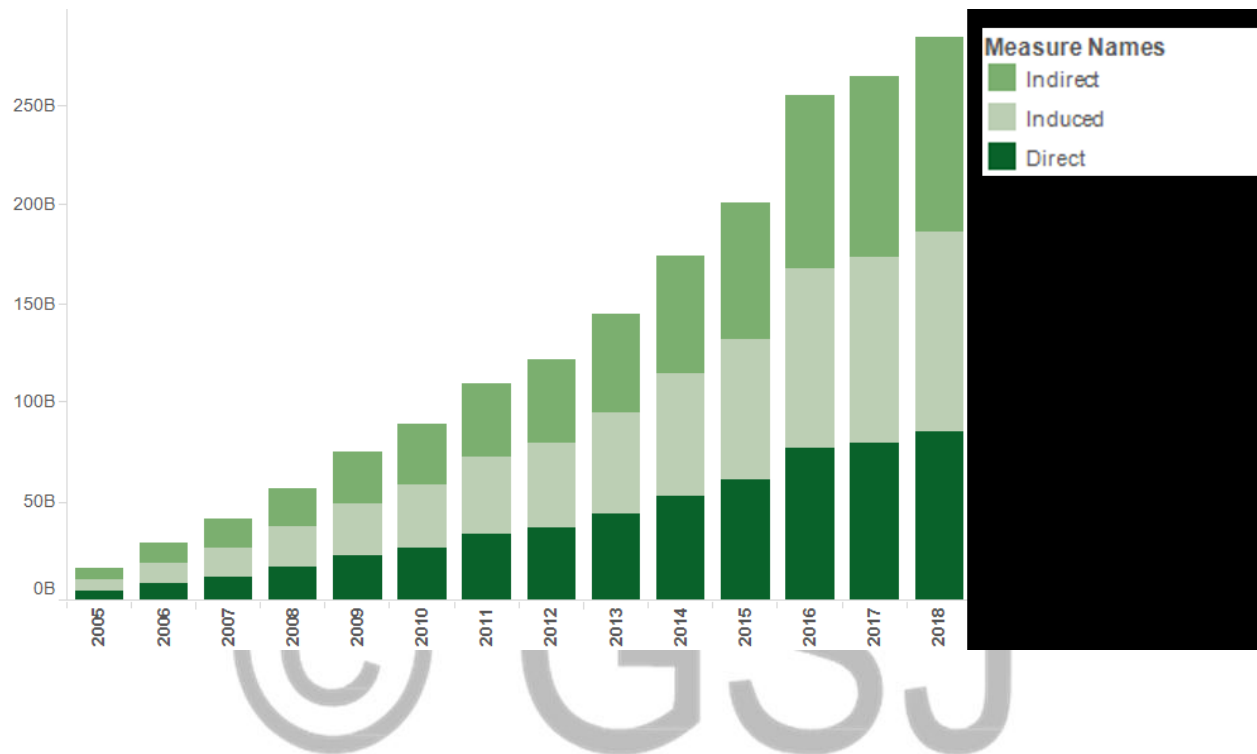


TABLE-5: TOTAL IMPACT OF NATIONAL GREEN CONSTRUCTION ON GDP (\$, BILLIONS)

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

FIGURE-4: TOTAL DIRECT, INDIRECT AND INDUCED IMPACT ON NATIONAL GREEN CONSTRUCTION ON LABOUR EARNINGS (\$)

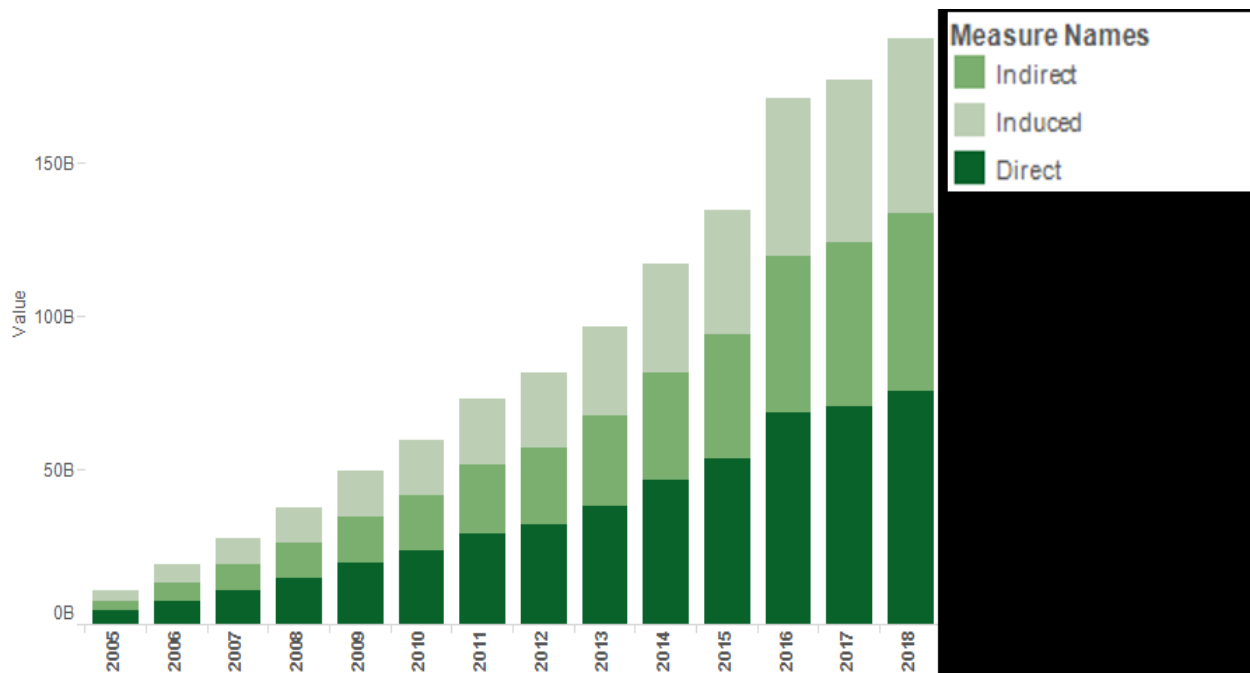


TABLE-6: TOTAL IMPACT OF NATIONAL GREEN CONSTRUCTION ON Labour Earnings (\$, BILLIONS)

Total Impact of National Green Construction on Labour 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

5. Selected Savings

Green buildings result in real, quantifiable savings such as energy savings and maintenance labour as well as other benefits such as better quality of air and worker satisfaction. 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, and \$149.5 million in water and \$715.3 million in Maintenance savings.

6. Tax Contributions by State

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 totalled \$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 totalled \$5.4 billion in 2014 and are forecasted to increase to \$8.4 billion in 2018.

FIGURE-5: ESTIMATED EQUIVALENTS FOR ENERGY BENEFITS

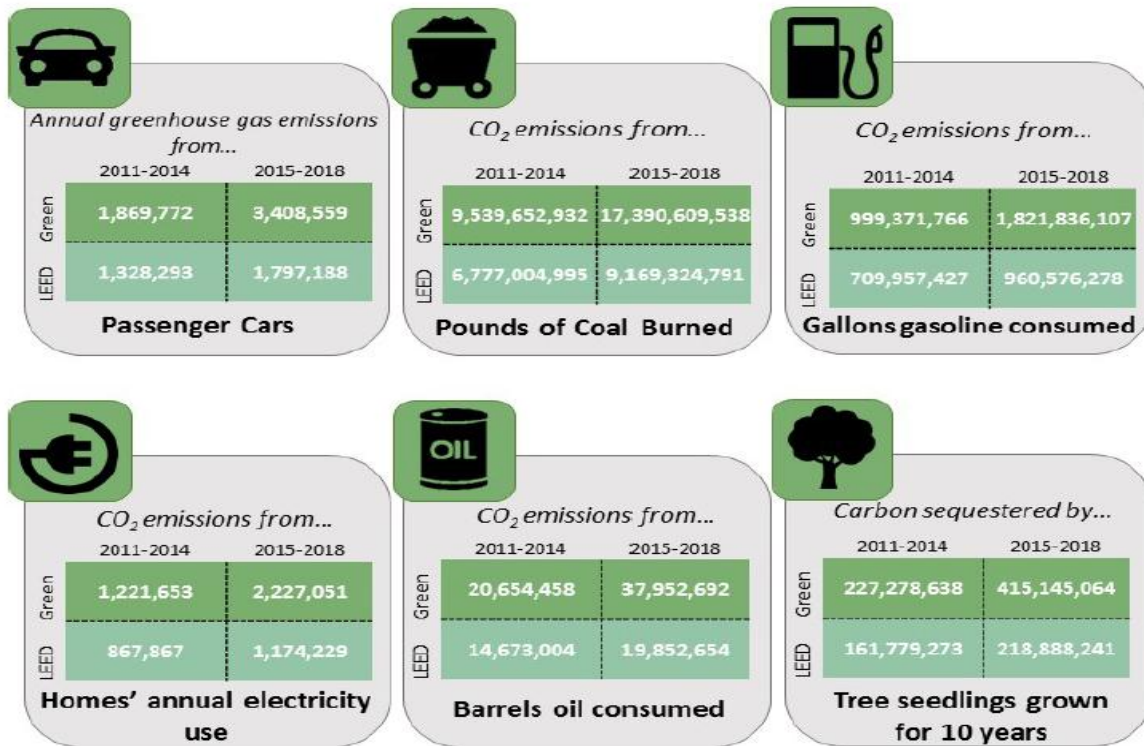


TABLE-7: SELECTED SAVINGS FOR GREEN CONSTRUCTION (\$, BY YEAR)

Year	GREEN CONSTRUCTION SAVING(\$, BY YEAR)	Year	GREEN CONSTRUCTION SAVING(\$, BY YEAR)

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

7. CONCLUSION:

This article has defined green building, summarized the theoretical motivations for green building, and reviewed evidence of green building policies and their impacts. Green construction have proven themselves as an economic stimulus, adding significantly to the GDP, jobs, and labour earnings throughout the United States. The projections of this report indicate that this positive economic contribution will continue and will grow in the future. Green building policies offer flexibility of implementation and often certify improvements to reduce information asymmetries between owners and consumers. 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 labour earnings in the coming years 2015---2018.

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