The Effect of State and City Green Policies on the Market Penetration of Green Commercial Buildings

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Abstract Pro-green building policies originated in the not-for-profit sector, and have worked their way into public policy since their inception in the early 1990s. These policies generally include Leadership in Energy and Environmental Design (LEED) for new construction and ENERGY STAR for ongoing building operations. Additional policy at the state and local level are present, and take many forms, including: (from weak to strong) blandly supporting these two main green paradigms; suggesting guidelines without teeth; leading by example with green public buildings; providing financial incentives; and mandating green outcomes by a certain date. The main question addressed in this research is: How do these policies affect the market penetration of green buildings in various commercial markets throughout the United States?

Pro-green building policies originated in the not-for-profit sector in the early 1990s, and have worked their way into public policy. These policies generally include Leadership in Energy and Environmental Design (LEED) for new construction and ENERGY STAR for ongoing building operations. There are additional policies at the state and local level that take many forms, including: (from weak to strong) blandly supporting these two main green paradigms; suggesting guidelines without teeth; leading by example with green public buildings; providing financial incentives; and mandating green outcomes by a certain date. The main question addressed here is: How do these policies affect the market penetration of green buildings in various commercial markets throughout the United States?

To address the research question, we conducted a literature review of scholarly papers on the topic. Next, searched the Internet for state and local green policies. After identifying the state of California and the city of Chicago as leaders, we interviewed representatives of those governments. Next, we accessed CoStar data on office and retail buildings to determine the percentage that are classified as green (both LEED and ENERGY STAR) in the top 130 U.S. markets. We present these market penetration rates overall, and over time, for these top markets and for California. We close with observations on green policies that seem to work, plus address emerging trends and opportunities for future research.

Background on Green and Green Policies

The United State Green Building Council (USGBC) was established in 1993 as a non-profit entity interested in promoting sustainable development. The USGBC developed the LEED standards in 1998. LEED is a green building rating system that looks at the design, construction, and operation of buildings. LEED was developed from a checklist of recommended construction practices to include development as well. The LEED rating system is an ongoing collaborative process between architects, builders, and building owners and operators. The USGBC released LEED Version 3 on April 27, 2009, which among other things incorporates regional issues. Special emphasis on water management in dryer states is one example of a LEED V.3 modification.

ENERGY STAR is also a measurement of green, developed in 1992 through the efforts of the United States Environmental Protection Agency. First created for the U.S., several other countries have now adopted the program including, Japan, Austria, the European Union, and New Zealand. The focus of the ENERGY STAR program is to reduce energy consumption thereby lowering greenhouse emissions. ENERGY STAR measures energy efficiencies for operating buildings and building systems, as well as equipment used inside buildings and homes. ENERGY STAR is incorporated into LEED standards for the renovation of existing buildings.

Green Globe is a set of international standards initially endorsed by 182 Heads of State at the United Nations Rio De Janeiro Earth Summit in 1992. Green Globe is a worldwide benchmark program developed for industry. The elements of benchmarking go beyond a physical structure to include energy, water, waste, community, paper, cleaning, and pesticides. Green Globe has been applied to the international tourism industry.

Founded in 1989, Green Seal is a non-profit entity helping set standards for the service industry and individual products. Green Seal's first green standards were issued in 1991. Their first product certifications were done in 1992. For example, Green Seal has established guidelines for hotels and restaurants. Green Seal has also developed green standards for office products and construction materials, as well as cleaning products and items used in food service.

Thus, the green building has grown in popularity and importance, and has been substantially influenced by non-profit involvement. The grass roots level push for green was heard by politicians and public policy began to take place.

The intent of this paper was to look at how public policy promoted the development of green buildings. There are four levels of public policy to review: federal, state, county, and city. Different levels of public policy are driven by different forces. Within each government level there are two methods to create policy: executive orders and legislation. A combination of the two works best. Executive orders get the ball rolling. Legislative processes involve more people in the commitment to green.

From a private (developer or building operator) viewpoint, there are various motivations for being ''Green.'' These are in order of importance: cost savings,

public perception, public policy, and ''it's the right thing to do.'' How an entity values each of these motivators depends on whether the entity is the operator, tenant, owner, or developer of a building.

There are also various definitions for being green. Under ENERGY STAR, being green means lowering operating energy use. Under LEED, being green means building for operating efficiencies and/or to lower the carbon footprint during the building process.

A reduction in operating costs is the chief motivator to being green. Often companies are motivated to reduce costs without the green label. Studies have shown that having a green label demands higher rents, possibly as an offset to lower operating costs for the tenant. Studies have also shown that large companies value the perception of green. Larger companies often appeal to public opinion as part of their image. Particularly in today's markets, consumers are interested in whether companies ''do the right thing'' as an overall reflection of the entities moral compass.

The question that this paper addresses is: How does public policy encourage building (or converting an existing building to) green? In areas of the country where green makes economic sense (dry and sunny primarily), there is less need for public policy. Perhaps there is also less need for public policy in large cities where public image is important. But in smaller communities or those in weaker economies that compete with each other for businesses, there is a reluctance to implement any policy that would discourage building by making it more expensive. For ease of use and staffing efficiencies, is it better to implement public policy at the state or local level? Policy at the federal level, while helpful, does not take into account regional differences related to climate, water resources, and economic difficulties.

Previous Studies on Green Buildings

May and Koski (2007) divided state level green policies into two sub categories: policies that have been mandated by gubernatorial executive orders and those that have been subject to legislative enactment. Nine states including New York, New Jersey, and California have policies mandated by executive orders, while six states including Oregon and Washington have policies subject to legislative enactment. According to May and Koski, the provisions include state incentives for constructing green buildings, mandates for adherence to LEED provisions for new facilities, and requirements for LEED provisions for renovated buildings that meet specified size or value requirements. The authors also analyzed factors that affect adoption of a green building requirement, and whether the state adopts it through executive orders or legislative enactment. Their findings suggest that political issues such as interest-group opposition and governors' strong political powers affect adoption of green building requirements.

The National Association of Industrial and Office Properties (NAIOP, 2007) research foundation recently surveyed about 100 its members about green

buildings. It classified green building requirements into several sub-categories: policies, programs, incentives, and evaluation. According to the NAIOP classification, policies refer to regulation to meet LEED or equivalent; programs refer to technical support and training for developers; incentives refer to financial and administrative supports; and evaluation refers to performance monitoring and to disciplinary action. The survey had recommendations for facilitating private sector-driven green new construction.

Other studies on green buildings can be divided into three themes: better indoor environmental quality than conventional buildings (Paul and Taylor, 2008); barriers to the construction of green buildings (Richardson and Lynes, 2007); and the price or rent differences between green buildings and conventional buildings (Fuerst and McAllister, 2008; and Miller, Spivey, and Florance, 2008).

Paul and Taylor (2008) compared occupant comfort and satisfaction between a green building and a conventional building. To test this, they enumerated the comfort and satisfaction perceptions of the occupants of a green university building and two conventional university buildings with a questionnaire that asked occupants to rate their workplace environment in terms of aesthetics, serenity, lightning, acoustics, ventilation, temperature, humidity, and overall satisfaction. They found no evidence to believe that green buildings are more comfortable.

Richardson and Lynes (2007) explored the barriers and motivations to the construction of green buildings at the University of Waterloo in Canada. To test this, the authors conducted 13 in-depth interviews with key university individuals. Based on interviews, the authors found that a lack of internal leadership amongst stakeholders with decision-making power, a lack of quantifiable sustainability targets, an operational structure that does not reward building design with lower energy costs, and lack of communication between professional designers, facilities management, and faculty were barriers to constructing a green building at the university.

Two papers address whether there is a price or rent difference between ENERGY STAR or LEED designated buildings (green buildings) and conventional buildings (Fuerst and McAllister, 2008; and Miller, Spivey, and Florance, 2008). The authors of these two papers used the large commercial property dataset provided by the CoStar Group. Using hedonic regression models, they both found that there are green building premiums in terms of rents and building prices. These findings are promising because they indicate markets can price the benefits of investment in ENERGY STAR and LEED certification.

In addition to these papers, Clemens (2006) investigated the relationship among green performance, financial performance, and green economic incentives for small firms. He suggests that firms, especially small firms, could benefit from increased consideration of the environment and from developing and proposing green economic incentives.

Search Process

Based in part on information derived from a review of the academic literature, the research team looked at websites for the leading states and cities mentioned. The intent was to investigate government websites as an indicator of how easily green building information is to gather. The search phrase used was State/City ''Green Building Government.'' In most instances, the information on government websites is not user-friendly—dates are missing and the policy proposed is not necessarily the policy approved. While governor or mayor websites like to feature green news, actual assistance for building green is often not available.

We gathered data on the following categories: financial inducements (tax credits, feasibility studies, grants, low interest loans, and ''feebates''), a green office with staff, stated guidelines for building, requirements that school and public buildings be green, green policy on non property matters like car fleets and purchasing, mandates on energy use saving with specific date, and performance bonds for LEED. The presence or absence of these items was noted, at the state level. We then searched at the city level for the same factors. Refer to the Appendix for the search results presented by state and city.

Findings from the Website Research

Green is becoming more important as the cost of energy increases and our dependence on foreign energy sources pose security risks. The U.S. Department of Energy and the U.S. Environmental Protection Agency both promote energy efficiency. Many local governments have started green policies at the residential level, as well as for schools, public buildings, and commercial buildings. The most common form of green policy is LEED for publicly financed buildings in programs labeled ''Lead by Example.'' ENERGY STAR is more common in the western states. Examples of states that use the LEED rating system are New York, New Jersey, Pennsylvania, Maryland, Connecticut, California, Massachusetts, and Rhode Island. Examples of municipal governments that feature and use LEED are Seattle, Washington; Portland, Oregon; Chicago, Illinois; Fairfax, Virginia; Arlington, Virginia; Austin, Texas; and Santa Monica, California.

California was on the forefront of green with policy in 2004. It was the first state to propose green building guidelines, adopting LEED and ENERGY STAR guidelines in 2004. As a result, there is relatively little redundancy at the local level. Hawaii, being a relatively uniform market, also has statewide guidelines.

A factor in building green buildings is the availability of information on green criteria. Making this information readily available to help educate the building industry, as well as the general public is of paramount importance. Government assistance, particularly at the local level, is key. Financial assistance at any level is helpful. Offices of Environment or other dedicated personnel can help a builder navigate technical and financial hurdles.

Various climate environments serve as motivators for green as well. Cities that experience may days of sunshine can utilize solar panels. Cities with less water

access have higher water costs, which motivate water conservation. Warmer climates use more electricity for air conditioning, motivating building users to provide shade and green roofs.

Among cities, Chicago stands out as having a substantial number of green buildings. After reviewing literature on green building concentrations, a focal point of this research addressed why Chicago ranked 6th in the number of green buildings and 16th in green building market penetration. Certainly, the climate in Chicago did not lend itself so easily to obtaining a Green LEED rating: what Chicago has is public policy. Specifically, Chicago has a Department of Environment, with a green agenda established in the 1990s and that moved to the next level in 2005.

CoStar Data and Results

The main focus of this paper is to link public policy with the presence of green buildings, calculated as a market penetration rate (green buildings/total buildings in the market). To do this, we used CoStar, Inc.'s database system (www.costar.com). CoStar provided the number of commercial green buildings by U.S. states and markets. The data sets collected from CoStar, Inc. include: (1) the number of commercial green buildings by state; (2) the number of commercial green buildings and the number of commercial buildings constructed or renovated in a particular year; (3) commercial green buildings in California; and (4) market penetration in Chicago. The green status was determined by identification of properties with checked boxes for ''LEED or ENERGY STAR'' in the property search.

We developed market penetration results for commercial green buildings in 138 U.S. city markets by collecting the total number of office and retail buildings from CoStar. A total of 112 markets have at least one green building and 47 markets have more than 10 green buildings. We focused on the smaller group for our analysis. City results were aggregated up to the state.

Exhibit 1 shows the top 20 states, by number of green buildings. We found 3,112 green office or retail buildings in the CoStar database in the U.S., as of March 26, 2009. Each building was in the CoStar database as having rental vacancy and ''green'' status. California was ranked as the top state followed by Texas, Colorado, Illinois, and Pennsylvania. California has 746 commercial green buildings, including 691 office and 55 retail buildings. This figure is not the market penetration rate, but rather shows concentrations of green buildings in various markets.

Exhibit 2 shows more detail of the same data, breaking green out into its subcomponents of ENERGY STAR (focused on building operations) and LEED (focused on building construction) in the top 20 U.S. states. There are 664 ENERGY STAR-labeled commercial buildings in California, which is approximately 90% of the total number of green buildings in California. Among other top states, Michigan, Maryland, and Oregon are the only three states where

Exhibit 1 | Top 20 States by Number of Green Buildings

		Office		Retail		Office+Retail	
Ranking	State	Number	Valid %	Number	Valid %	Number	Valid %
1	CA	691	26.53%	55	10.87%	746	23.97%
2	TX	285	10.94%	90	17.79%	375	12.05%
3	CO	155	5.95%	21	4.15%	176	5.66%
4	IL	113	4.34%	22	4.35%	135	4.34%
5	PA	73	2.80%	35	6.92%	108	3.47%
6	MA	96	3.69%	10	1.98%	106	3.41%
7	WA	88	3.38%	16	3.16%	104	3.34%
8	VA	78	2.99%	19	3.75%	97	3.12%
9	FL	88	3.38%	7	1.38%	95	3.05%
10	MN	81	3.11%	12	2.37%	93	2.99%
11	OH	48	1.84%	41	8.10%	89	2.86%
12	GA	73	2.80%	13	2.57%	86	2.76%
13	NY	80	3.07%	6	1.19%	86	2.76%
14	OR	64	2.46%	20	3.95%	84	2.70%
15	DC	80	3.07%	2	0.40%	82	2.63%
16	MI	63	2.42%	16	3.16%	79	2.54%
17	NC	51	1.96%	24	4.74%	75	2.41%
18	NJ	50	1.92%	21	4.15%	71	2.28%
19	AZ	57	2.19%	4	0.79%	61	1.96%
20	MD	43	1.65%	10	1.98%	53	1.70%

Notes: The source is CoStar. N = 2,801 buildings.

LEED-certified buildings are more numerous than ENERGY STAR-labeled buildings.

Exhibit 3 shows the top 20 U.S. markets by green market penetration as of January 2009. For green office buildings, Hawaii is ranked at the top, with a 3.5% green market penetration rate followed by Houston, San Francisco, Orange, CA, and Denver, which all had green market penetration rates between 2.0% and 3.3%. For green retail buildings, Austin is ranked at the top, with 0.7% green market penetration rate followed by Charlotte, Erie, Portland, and Cleveland. In terms of its green market penetration rate, Chicago was ranked as the 16th highest for green office buildings. Chicago is an anomaly because it is a northern market. Chicago has 130 total commercial green buildings, which ranks it 6th in the number of green buildings.

Exhibit 4 shows the percentage of ENERGY STAR and LEED buildings in the top 20 markets. Orange County, San Francisco, and Los Angeles (all in California)

Exhibit 2 | Percentage of ENERGY STAR and LEED in Top 20 States

State	ENERGY STAR	LEED	Both	Total	ENERGY STAR (%)	LEED (%)	Both (%)
CA	664	66	16	746	89.01%	8.85%	2.14%
TX	333	39	3	375	88.80%	10.40%	0.80%
CO	130	37	9	176	73.86%	21.02%	5.11%
IL	104	24	7	135	77.04%	17.78%	5.19%
PA	55	51	2	108	50.93%	47.22%	1.85%
MA	76	22	8	106	71.70%	20.75%	7.55%
WA	70	32	2	104	67.31%	30.77%	1.92%
VA	73	22	2	97	75.26%	22.68%	2.06%
FL	78	16	1	95	82.11%	16.84%	1.05%
MN	81	10	2	93	87.10%	10.75%	2.15%
OH	67	19	3	89	75.28%	21.35%	3.37%
NY	63	22	2	87	72.41%	25.29%	2.30%
GA	66	18	2	86	76.74%	20.93%	2.33%
OR	37	44	3	84	44.05%	52.38%	3.57%
DC	72	9	1	82	87.80%	10.98%	1.22%
MI	34	44	1	79	43.04%	55.70%	1.27%
NC	64	11	0	75	85.33%	14.67%	0.00%
NJ	42	29	0	71	59.15%	40.85%	0.00%
AZ	51	8	2	61	83.61%	13.11%	3.28%
MD	23	25	5	53	43.40%	47.17%	9.43%

Notes: The source is CoStar. $N = 2{,}801$ buildings.

were ranked at the top, where the percentage of ENERGY STAR is higher than LEED rank. Only Portland, Oregon has a higher percentage of LEED buildings. This underscores the dominance of California in the green area.

Moving along to the market penetration of green buildings over time, Exhibit 5 is a graph that indicates the year of designation of green buildings as a percentage of the total number of green buildings. The darker line indicates the designation trend in the U.S. and the lighter line indicates the designation trend in California. Overall, the trends are quite similar. From the table, it can be observed that there many designations in the U.S. and California since 1997. However, designations in California have sharply decreased since 2004. It may be that other economic conditions are in play, or that a saturation point has been reached. More research is needed here.

The remainder of this paper examines California and Chicago in more detail.

Exhibit 3 | Top 20 Markets by Market Penetration as of January 2009

	Office				Retail			
Ranking	Markets	Green	Total	Green / Total	Markets	Green	Total	Green / Total
1	Hawaii	19	539	3.53%	Austin	26	3682	0.71%
2	Houston	140	4256	3.29%	Charlotte	13	2507	0.52%
3	San Francisco	116	3695	3.14%	Erie	3	612	0.49%
4	Orange (CA)	138	5245	2.63%	Portland	26	5718	0.45%
5	Denver	146	6139	2.38%	Cleveland	22	7700	0.29%
6	Washington D.C.	165	8538	1.93%	Denver	20	7941	0.25%
7	Portland	67	3792	1.77%	Pittsburgh	17	7432	0.23%
8	Minneapolis / St. Paul	77	4837	1.59%	San Antonio	19	8662	0.22%
9	Los Angeles	244	15335	1.59%	Washington D.C.	20	10897	0.18%
10	New York City	50	3556	1.41%	Hampton Road	10	6553	0.15%
11	Dallas	111	7922	1.40%	Nashville	9	5983	0.15%
12	Charlotte	34	2463	1.38%	Bakersfield	2	1567	0.13%
13	East Bay / Oakland	68	5070	1.34%	Sacramento	8	6576	0.12%
14	Seattle	79	6099	1.30%	Bremerton	1	835	0.12%
15	Duluth	4	339	1.18%	Kansas City	5	4413	0.11%
16	Chicago	112	10696	1.05%	Houston	12	10848	0.11%
17	Sacramento	47	4668	1.01%	Cincinnati / Dayton	12	10921	0.11%
18	Boston	95	9671	0.98%	Northern New Jersey	18	16729	0.11%
19	South Bay / San Jose	39	4393	0.89%	Columbus OH	5	4740	0.11%
20	Austin	22	2855	0.77%	Louisville	3	3050	0.10%

Notes: The source is CoStar. $N = 2{,}024$ buildings.

Exhibit 4 | Percentage of ENERGY STAR in the Top 20 Markets (by Total Green Buildings)

Market	ENERGY STAR	LEED	Both	Total	ENERGY STAR (%)	LEED (%)	Both (%)
Los Angeles	236	18	4	258	91.47%	6.98%	1.55%
Washington D.C.	144	34	7	185	77.84%	18.38%	3.78%
Denver	122	35	9	166	73.49%	21.08%	5.42%
Houston	137	13	2	152	90.13%	8.55%	1.32%
Orange (CA)	131	9	0	140	93.57%	6.43%	0.00%
Chicago	101	22	7	130	77.69%	16.92%	5.38%
San Francisco	109	7	3	119	91.60%	5.88%	2.52%
Dallas	101	16	1	118	85.59%	13.56%	0.85%
Boston	76	21	8	105	72.38%	20.00%	7.62%
Portland	38	52	3	93	40.86%	55.91%	3.23%
Minneapolis/St. Paul	78	9	1	88	88.64%	10.23%	1.14%
Philadelphia	45	39	2	86	52.33%	45.35%	2.33%
Seattle	66	18	1	85	77.65%	21.18%	1.18%
Atlanta	64	14	2	80	80.00%	17.50%	2.50%
East Bay/Oakland	63	7	5	75	84.00%	9.33%	6.67%
Northern New Jersey	39	23	0	62	62.90%	37.10%	0.00%
Phoenix	49	8	2	59	83.05%	13.56%	3.39%
Sacramento	39	15	1	55	70.91%	27.27%	1.82%
New York City	46	4	1	51	90.20%	7.84%	1.96%
Detroit	27	21		49	55.10%	42.86%	0.00%

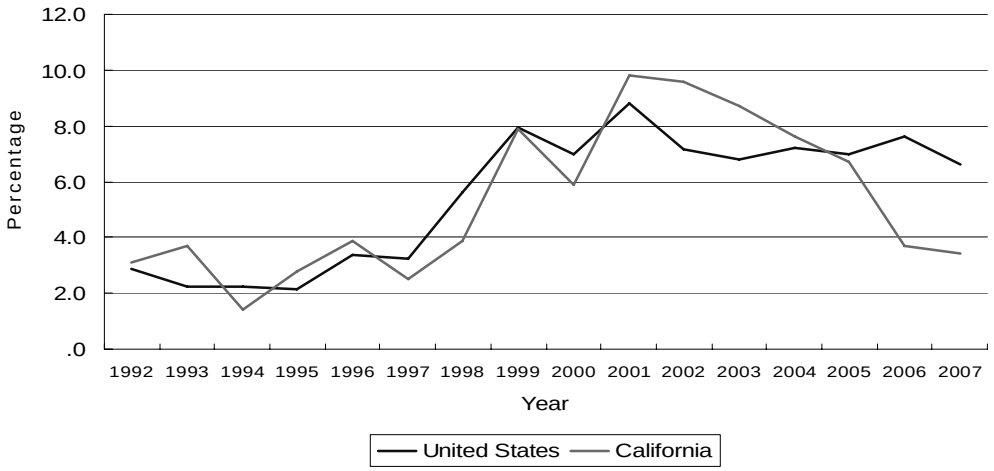
Notes: The source is CoStar. $N = 2{,}156$ buildings.

California

In the 1980s, California went through a process to site landfills. Public awareness was heightened to the growing need to handle California's increasing population's waste needs. In 1989, state landfills were at capacity. Thus, the motivation for green in California partly grew out of the need to reduce waste. Over 22% of the material going into landfills was construction and demolition debris (Dick, 2009). The green movement in cities was moving concurrently with the state. California put executive orders in place in 1999 requiring the reduction in landfill waste. The state then worked with cities on how to implement this requirement. Using LEED building standards was the natural choice to have an immediate positive impact on landfill capacity. Using recycled content products was also encouraged.

Green building codes were established and mandated for publicly funding projects. Local jurisdictions are encouraged to modify these building codes to adapt for

Exhibit 5 | Year of Designation of Green Buildings as a % of Total Green Buildings



seismic, climate or resource differences. Some financial incentives were established at the beginning, but these programs are no longer funded.

Mandates were not required for private developers in the beginning. Rather, private developers were encouraged to follow suit. California provides technical assistance. California websites include contact names and information about all aspects of green. The recent state climate reduction bill AB32 (2006) mandates carbon emission limits. Green buildings are expected to meet these carbon limits.

California is not only motivated to go green to decrease waste but also to reduce energy consumption. Over the last 30 years, California has led the nation with energy policy. It has been successful: state energy use is flat despite a large rise in population (Dick, 2009). This has been accomplished through green education. Building owners have been taught to tighten up their buildings and use efficient HVAC systems.

State Green Building Codes are coming. It took 20 years for the green standard to be common for new construction. Green is fairly common in new residential, although we did not address residential green in this paper. Rehabbing buildings to green standards is also a common practice in California (Dick, 2009).

Exhibit 6 shows market penetration of green buildings in each market in California. The ratio of green buildings and total commercial buildings in Orange County is 1.3%, indicating that this percentage of total buildings has been designated as ENERGY STAR or LEED. Just for offices, however Orange County follows San Francisco (3.1%) with 2.6%.

Chicago

In Chicago, the Department of Environment was established in 1992 as a regulatory arm to address brownfields, illegal dumping, etc. In 1999, executive

Exhibit 6 | Green Buildings in California

	Office			Retail			Total		
Markets	Green	Total	Green / Total	Green	Total	Green / Total	Green	Total	Green / Total
Bakersfield	2	889	0.22%	2	1567	0.13%	4	2456	0.16%
East Bay / Oakland	68	5070	1.34%	7	11267	0.06%	75	16337	0.46%
Inland Empire (CA)	27	4879	0.55%	6	10150	0.06%	33	15029	0.22%
Orange (CA)	138	5245	2.63%	2	5238	0.04%	140	10483	1.34%
San Francisco	116	3695	3.14%	3	8844	0.03%	119	12539	0.95%
Los Angeles	244	15335	1.59%	14	28046	0.05%	258	43381	0.59%
Sacramento	47	4668	1.01%	8	6576	0.12%	55	11244	0.49%
South Bay / San Jose	39	4393	0.89%	4	5667	0.07%	43	10060	0.43%
CA Total	681	44174	1.42%	46	77355	0.07%	727	121529	0.58%

Notes: The source is CoStar.

orders mandated that publicly-financed buildings be LEED silver certified. In 2001, Chicago built the first LEED platinum municipal building and the third LEED platinum building in the U.S. Chicago felt strongly that they needed to lead by example, and that this would help others follow their lead.

In 2004, Chicago developed the Green Building Agenda. Chicago encourages LEED design for all new buildings. But since green does not stop at new buildings, Chicago works with existing building owners and operators to rehab buildings to incorporate ENERGY STAR efficiencies.

In 2009, the Department of Environment helps developers and citizens build and operate green. Citizens are shown how to disconnect downspouts and install rain barrels. Businesses are directed through technical programs. People in the office are trained to work with all questions and problems. A hotline number is available to direct all calls. The City of Chicago does not believe in large financial incentives. They encourage green by offering technical assistance, faster permitting, density bonuses and green roof grants. As we have seen elsewhere, when financial incentives are offered, the change desired is not long lasting unless the financial incentives are retained. Current Chicago standards are LEED silver plus.

Chicago is looking beyond the buildings to operation and maintenance of the businesses in these buildings. Chicago is working with a new concept, Green Seal, on the greening of products and business operations. Green Seal is a non-profit that sets standards for products and services. Green Seal has established green criteria or products such as paint, paper, cleaning supplies, office supplies, construction materials, and more. Green Seal sets standards for services such as food preparation, lodgings, and construction. Chicago is currently working with Green Seal to green 13 hotels in the downtown area.

Other green focal areas for Chicago are a Climate Action Plan, related to infrastructure and transit. Chicago has recently passed legislation to reduce carbon emissions. Infrastructure projects include greening of alleys and driveways with permeable pavements and French drains. Better coordination is being sought with MPOs to direct transportation dollars in efficient ways.

According to Chicago Energy Czar Sadhu Johnston, it helps that Mayor Daley had been in office since 1988. Without term limits, the mayor can put energy into long-term issues. This has certainly paid off for Chicago. Chicago has a reputation for green. Companies with ties to green technology want to locate there or hold conferences there. Chicago's commitment to green can be a lesson to other cities looking to grow and expand (Johnston, 2009).

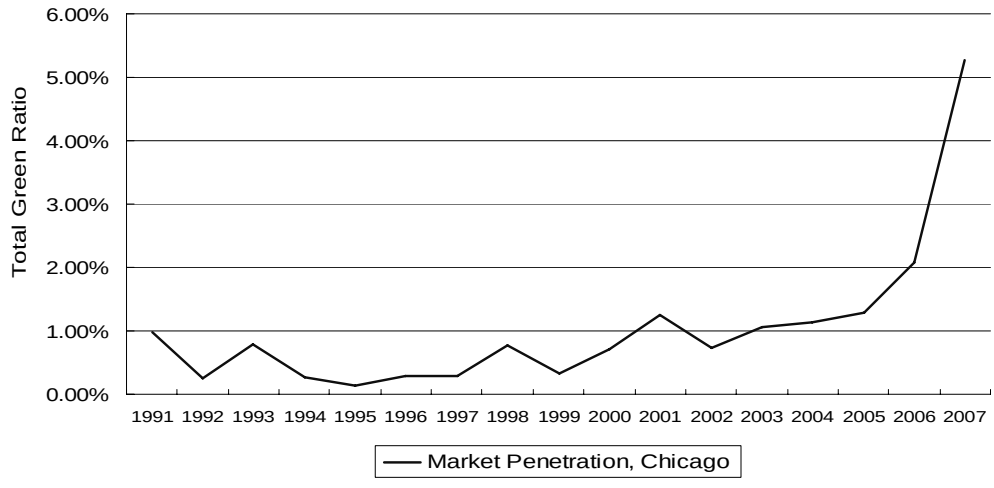
In the context of these policies, Exhibits 7 and 8 show the trend of market penetration of green buildings in Chicago since 1990. The table and the graph show that between 1990 and 1997 the increase rate was almost flat. However, the market penetration had been slowly increasing after 1998, and sharply increased since 2003. This implies that the green policies have been effective in inducing green buildings in the Windy City.

Exhibit 7 | Market Penetration in Chicago since 1990

	Total Offices Constructed or Renovated	Green	Green / Total
1990	931	10	1.07%
1991	821	8	0.97%
1992	786	2	0.25%
1993	766	6	0.78%
1994	743	2	0.27%
1995	724	1	0.14%
1996	699	2	0.29%
1997	672	2	0.30%
1998	648	5	0.77%
1999	611	2	0.33%
2000	556	4	0.72%
2001	477	6	1.26%
2002	407	3	0.74%
2003	379	4	1.06%
2004	351	4	1.14%
2005	311	4	1.29%
2006	241	5	2.07%
2007	152	8	5.26%
2008	82	1	1.22%

Notes: The source is CoStar. $N = 79$ green buildings.

Exhibit 8 | Green Building Market Penetration in Chicago
(green / total constructed, by year)



Note: There are 130 green buildings in Chicago. Of these, the designation year could only be inferred for only 79 green buildings. This graph is based on these 79 buildings, so some data are missing.

Conclusion

The green movement started with U.S. Green Building Council (USGBC), a non-government agency. The development and promotion of LEED standards by USGBC has influenced public policy. More cities and states cite LEED standards as their definition of green. Only recently have local governments started to look at their regional needs, strengths, and weaknesses to help develop individualized standards. The western states, i.e., California, Colorado, and Arizona, place water conservation as an equally high or higher priority than other energy-saving criteria.

The most common form of public policy is to require LEED for all public buildings. Several states call this ''Lead by Example'' and specify that government buildings and/or school buildings be LEED certified or ENERGY STAR rated or both.

For ease of use and staffing efficiencies, it is perhaps better to establish public policy at the state level and enforce it at the local level. Virginia cites the Dillon Rule, which states that building codes are exclusively the providence of state government.

Movements are often from the bottom up (USGBC and LEED) but policy is influential wherever it comes from (federal, state to local).

Executive orders are a quicker method for encouraging green. Legislation gets bogged down in politics. Working through different political agendas often results in green legislation going nowhere.

Starting with publicly financed new buildings including schools is the best way to 'Lead by Example' and gain knowledge about the green building process. This knowledge is valuable when working with businesses and developers. Change is hard and having the regulators hands to hold makes going green easier. New buildings offer more positive public relations. Work with rehabs and renovations by pointing out cost savings demonstrated in the new buildings.

Bucking the current political trend, it appears that longer term limits for politicians may encourage a longer range outlook for policy and change.

Financial incentives should be for new buildings only and carefully written legislation. Las Vegas wrote legislation in 2005 that benefited special interest groups. The dollars for green in Las Vegas were so oversubscribed that the law was rewritten in 2007. Financial incentives cannot always be maintained and the changed behavior is not permanent.

Non-profits play an important role in education and outreach. The USGBC is an important creator of LEED guidelines. Local builders associations provide updates on new green technologies and opportunities. The aforementioned NAIOP survey included a summary of city and state green building policies. These non-profits serve their constituents and members by providing the latest information on this niche and growing market (NAIOP, 2007).

Governments need to ''LEED'' by example and set high standards. They should ideally incorporate green into every aspect of the government agency—fleets, cleaning products, operations, etc. Green Seal can provide guidelines for this area of operations. A better source for green building criteria is the USGBC websites at either the national or local level. Often local builder association websites offer green building guidance as this is a competitive edge for its members. USEPA and DOE both offer information on green initiative linking a searcher to the state or local source. The information on ENERGY STAR is largely at the consumer level.

Under the assumption that requiring public buildings and schools to be green is the most common form of public policy, future research should focus on how local or state governments have encouraged these buildings, and the role of financial incentives. Moreover, future research should include detailed and valuable datasets of green public buildings and schools.

Appendix

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Alaska	State								
Arizona	State								
Arizona	Phoenix							Housing	
Arizona	Scottsdale	http://www.scottsdaleaz.gov/site4.aspx	In process of mandatory policies	Solar energy			2003– ENERGY STAR		Green Building Program
Arizona	Tucson	http://www.tucsonaz.gov/ocsd/sustainability/building/	Climate Protection Agreement		Promote sustainable building practices				
California	State	http://www.green.ca.gov/default.htm and www.green.ca.gov	Executive Order S-20-04	4	LEED & ENERGY STAR	Encourage schools to be Green	To be 20 % more efficient by 2015	Purchasing	Renewable energy program
California	State	http://www.greenbuildings.dgs.ca.gov/							California Integrated Waste Management Board
California	Berkley						LEED silver 2006		

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
California	Los Angeles	www.highbeam.com/doc/1G1-158170948.html–59						Airport	
California	Oakland						>$3million must have LEED–2005		
California	San Francisco	sfenvironment.org/our_programs/topics.html?ti=19–32k		Rebates	LEED and Green Point				Environment Commission–1992
California	Santa Monica	http://greenbuildings.santa-monica.org/	Sustainable City Program–1994					Waste handling–2008	
Colorado	State	http://www.colorado.gov/energy/			Recommend LEED	increase efficiency	High Performance Certification Program (HPCP)		Governor's Energy Office
Colorado	Boulder								
Colorado	Colorado Springs								

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Colorado	Denver	http://www.greenprintdenver.org/green/index.php	Green Print Denver		Encourage			Sustainability Programs	Greenprint Denver
Colorado	Durango								
Colorado	Eagle County	http://www.eaglecounty.us/commDev/ecobuild.cfm	ECO Build					ENERGY STAR	Colorado Energy Office
Colorado	Ft. Collins	http://fcgov.com/greenbuilding/?departments	Integrated Design Assistance Program					ENERGY STAR	Green Building Program
Colorado	Longmont	http://www.ci.longmont.co.us/bldginsp/adopted/	Build Green–2007		residential			ENERGY STAR	
Colorado	Telluride	http://www.telluride-co.gov/home/index.asp?page=311	Green Building Code		Residential			ENERGY STAR	
District of Columbia	Washington	green.dc.gov/green/cwp/view,a,1231,q,460953.asp–50k	Green Building Act–2006	Performance bond	Mandated by 2012		LEED silver		Metropolitan Washington Council of Governments
Florida	State				yes–2008				

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Florida	Miami Dade County	http://www.miamigov.com/msi/pages/ and http://www.miamidade.gov/district08/smart-growth-plan.asp			Yes				Office of Sustainable Initiatives
Florida	Orange County				Voluntary				
Florida	Sarasota							Cleaning products	
Georgia	State								
Georgia	Atlanta	http://www.atlantaga.gov/client_resources/greener%20atlanta/atlanta%20green%20city%20initiatives%20-06.04.07.pdf	Green City Initiatives				City Financed LEED silver–2003		
Hawaii	State	www.hawaii.gov	Lead by Example	General Excise Tax Exemption			Guidelines	Fleet	
Hawaii	Honolulu	www.honolulu.gov		1 year property tax exemption–2004					

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Illinois	State	https://www.illinois.gov/PressReleases/ShowPressRelease.cfm?SubjectID=1&RecNum=6463	Green Government Coordinating Council–2006	Yes	Green Permit Expediting Program–2006		Yes–2005	Fleet, purchasing	Department of Commerce and Economic Development
Illinois	Chicago	egov.cityofchicago.org/city/webportal/portalDeptCategoryAction.do?deptCategoryOID=-536887181...COC...–63k	The Chicago Standard–Derived from LEED	Green Roofs					Department of Environment 312-744-7606
Indiana	State		Executive Order to establish energy efficient state building guidelines		LEED, Green Globe, ENERGY STAR or ANSI				
Indiana	Bloomington	http://bloomington.in.gov/sections/viewSection.php?section_id=449	Included in Economic Development mission	Sustainable Development Incentives					Environmental Commission–Advisory

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Indiana	Evansville / Vanderburgh County	http://www.vanderburghgov.org/Index.aspx?page=1991	Executive Order on Sustainability –2007 Endorses Mayor's Climate Protection Agreement	Housing tax credits				Fleets	
Kansas	State								
Kansas	Kansas City								
Maine	State	http://www.maine.gov/cleangovt/initiatives.htm				LD 799	LD 540	Office Supplies fleets	
Maine	Portland								
Maryland	State		Green Building Program	Tax credit–2004, income tax credit–2001			Bill introduced–2003		

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Maryland	Baltimore	http://www.ci.baltimore.md.us/government/planning/sustainability/	ENERGY STAR Partner–2006		Mandated 2009		Mandated 2007/2008 for financing		Department of Planning–Office of Sustainability
Massachusetts	State	www.mass.gov/?pageID=eoeeasubtopic&L=4&L0=Home&L1=Grants+%26...Greening...Government...–17k	Leading by Example					Emission, jobs	Office of Energy and Environmental Affairs
Massachusetts	Boston	http://www.cityofboston.gov/environment/	Climate Action–2007				LEED silver	Recycling Cars/Cabs	Environmental & Energy Services
Minnesota	State			Pollution $		yes			
Minnesota	Minneapolis						LEED silver 2006		
Minnesota	St. Paul						Energy Efficiency Improvements–2006		
Nebraska	State							Homes	Nebraska Energy Office

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
New Jersey	State						Bill introduced–2004		
New Mexico	A. state	http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aias078391.pd					Executive Order 2006-001		Office of Energy
New York	State	http://www.dec.ny.gov/energy/1540.html	Green Building Initiative	Tax credits–2000					Department of Environmental Conservation
New York	Monroe County	www.monroecounty.gov/?q=node/4633–22k						Fleet, purchasing	
New York	NYC	http://www.nyc.gov/html/planyc2030/html/greenyc/greenyc.shtml	Local/Law 86–2005 required LEED						Office of Environmental Coordination
Nevada	Las Vegas			Written in 2005 and modified in 2007	yes				
Ohio	A. state	http://www.greenenergyohio.org/page.cfm?pageID=261				Voluntary	bill introduced–2003		

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Ohio	Cleveland	http://www.city.cleveland.oh.us/CityofCleveland/Home	Green Building Standards Handbook–2009					Housing	
Ohio	Franklin County	http://www.co.franklin.oh.us/fc/	Energy Conservation Proposed						
Ohio	Hamilton County								
Oregon	State	www.oregon.gov/OHCS/DO_GreenBuilding.shtml		Business Energy Tax Credit–2001 for LEED Silver				Housing	Oregon Housing and Community Services
Oregon	State	http://www.oregon.gov/ENERGY/CONS/BUS/tax/sustain.shtml		Tax credits					Oregon Department of Energy
Oregon	Portland	http://www.portlandonline.com/	Performance Green Building Policy–2007	GIF grant and fee-bate					Bureau of Planning and Sustainability

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Pennsylvania	A. state	http://www.gggc.state.pa.us/gggc/site/default.asp?gggcNav=|	1998					Cleaning products	Governor's Green Government Council
	Pittsburgh								
Tennessee									
	Memphis								
	Nashville								
Texas	State	http://www.seco.cpa.state.tx.us/re_sustain_links.htm		Up to $400,000	Voluntary	Voluntary		By city	State Energy Conservation Office
Texas	Austin	http://www.austinenergy.com/energy%20efficiency/programs/Green%20Building/index.htm	Green By Design–2000		ENERGY STAR then LEED		yes		
Texas	City of Frisco Texas	http://www.friscotexas.gov/departments/planningDevelopment/greenbuilding/Pages/default.aspx		no	LEED			residential	
Texas	Dallas	http://www.greendallas.net/	Citywide Green Building Program–2008		15% better than 2006 IECC & Cool roofs			Recycling	Green Office to be established in FY08/09

Appendix (continued)

State or City Green Building Government	Mar-08	URL	Policy Name	Financial Incentives	Building Code Guidelines	School Buildings	Public Buildings	Other Policy	Staff
Texas	Houston	http://www.greenhoustontx.gov/pdf/ordinance-greenbuilding.pdf		Green Building Resolution–2004	LEED		Encourage LEED Silver target		Quick Start Program–Office of the Mayor
Utah									
Utah	Salt Lake City								
Virginia	State		Vetoed					Residential	
Virginia	Arlington								
Virginia	Fairfax County								
Washington	A. state	http://www.ecy.wa.gov/beyondwaste/p_gb07.html	GB2–mandated in 2005		LEED	Mandates–2005	Mandates–2005	Rainwater	
Washington	Kitsap County		Code Plus						
Washington	Seattle	http://www.seattle.gov/environment/	Reduce greenhouse emission to 7% below 1990 levels					Green fleets, purchasing, pesticide reduction	Office of Sustainability and Environment

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