

**Breaking New Ground in Building Green:
The Role of City Policy and Regulation in a Building Industry Market Transformation**

By

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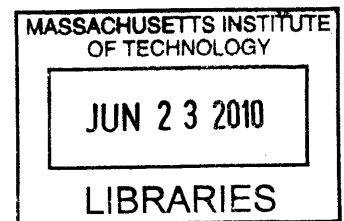
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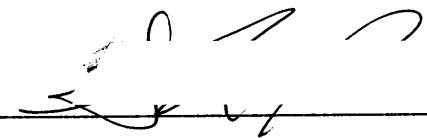
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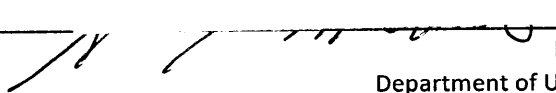
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Abstract

With a growing awareness of the need for a widespread reduction in the use of natural resources, including energy and water, buildings have been identified as a key component of America's, and the world's, drain on these finite resources. However, changing building practices that have been the norm for more than a century has proven to be a difficult task, with many challenges and interests to be accounted for.

Implementing green building policies has not yet become a standard practice in most U.S. cities. This study looks at various policy approaches and outcomes that aim to address the impediments to a market transformation towards greener building. Among the cities that boast a significant amount of green buildings certified by a third-party rating system, many different factors and dynamics, with varying participation and responses from the public, private and non-profit sectors have resulted in different outcomes with respect to green building in that particular city. This study looks at the green building policy and implementation landscape in four cities: Boston, Boulder, Pittsburgh and San Francisco. Each of these case studies offers a robust look at how green building policies were created, both the process and the implementation, and the building industry's response to these policies and programs. In addition, it looks at other players and circumstances that contributed to the dynamics that surfaced in that city.

Primarily, the goal of this study is to glean lessons from these four cities, to draw some general conclusions about what elements effective green building policy incorporates and the process and implementation strategies that resulted in success in practice. The conclusions also identify the supporting factors that play an indispensable role in a successful outcome. Ideally this study may offer some general guidance for cities that are considering how best to approach this particular challenge and aid in structuring a green building policy that will produce concrete results.

The general findings of this study are that effective green building policy should facilitate a market transformation in the building industry towards greener development through mechanisms that address both the supply and demand of green building products and services. Successful policies were designed to stimulate market potential so the practice of greener building would ultimately be profitable to developers, building professionals and valued by consumers. The obstacles to green building becoming a norm in the building industry can be initially overcome by thoughtful, tailored policy and can be ultimately sustained by pure market forces.

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Thesis Reader: Karl F. Seidman, Senior Lecturer in Economic Development

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Chapter 1: Introduction and Background

A. Climate Change and the Built Environment

The issue of mitigating and ultimately halting the effects of climate change due to greenhouse gas emissions has come to the forefront of current policy-making priorities. The U.S. federal government, through the policies of the Obama administration, has established mandatory goals for greenhouse gas emission (GHG) reductions for the nation. President Obama has committed the United States to reducing CO₂ emissions by 17% below 2005 levels by 2020 and by 83% by 2050 (Obama 2010).

Subsequently the greater question is no longer if we need to make changes to our energy use but rather what the appropriate and most effective strategies might be to actually meet these ambitious and necessary goals.

It has become clear over time that buildings and built space in general play an undeniably critical role in the unprecedented amounts of carbon being dumped into the atmosphere everyday. 48% of energy consumption and greenhouse gas emissions in the United States can be attributed to buildings (Nassen 2007). 76% of electricity generated by power plants is used to operate buildings (Architecture 2030 2007) and 8-12% of all greenhouse gas emissions can be traced back to the production of building materials (American Institute of Architects 2006).

According to a study by McKinsey & Co., the potential for energy use reduction is 35% in the residential sector and 25% in the commercial sector. The entirety of the

potential in the residential sector lies in making buildings more efficient and 76% of the energy reduction potential in the commercial sector lies in the improved performance of buildings (McKinsey & Co. 2009). There is a need for both retrofitting existing buildings for improved energy efficient and creating high performance standards for any new construction that occurs in the future. While the immediate potential lies heavily in the existing building stock, there is an urgency to address the issue of new buildings. If the construction of inefficient, resource-depleting buildings continued, the U.S. and the world as a whole will ultimately be faced with the same task of retrofitting these buildings in the next 50 to 100 years. If new construction and existing buildings are both aggressively addressed now, the buildings that stand today will be improved and any future building stock will not contribute to the issue of inefficient built space in the future. Alternatively, if efficient standards for new construction are not adopted now, a cat and mouse game of retrofitting existing buildings will ensue, with the inefficient building stock always one step ahead of the efforts to retrofit. Additionally, it is much more costly and technically difficult to conduct a deep retrofit an existing building to meet the same standard as an efficient new construction project. Buildings can reach a higher level of performance with lower costs and construction time if they are built well in the first place.

In a 'green scenario' outlined in Greening Our Built World: Costs, Benefits and Strategies by Greg Kats where "green design and construction become the industry standard, and green buildings (including more rapid retrofits of existing buildings) drive relatively rapid and sustained increases in energy efficiency and renewable energy" CO₂

emissions from buildings would decrease by 14% below 2005 levels by 2025 and by 60% by 2050. This demonstrates that a significant amount of the GHG reductions target laid out by Obama can be met by the systematic and widespread greening of buildings in the United States (Kats 2010). Another study published in *Science* states “the greatest potential for an effective near-term mitigation wedge for climate change comes from energy conservation and efficiency improvements in the built environment” (Pacala 2004).

As is with many practices that translate into a greater benefit for the public good than any one individual person or organization, in order for this extensive move to green building from traditional building construction to be achieved, some form of policy intervention will be necessary. As one of the case studies in this analysis demonstrates, this is not always true, but given that a substantial switch to green building has not organically happened and is proving to not occur at a rate that would ensure the reduction percentages cited by Kats and needed for significant climate change mitigation, the role of policy may be critical.

U.S. cities have only recently, in the past decade or so, started undertaking aggressive promotion of green building practices. Partially in light of the emphasis being put on this issue by the Obama administration and the international community as well, as highlighted by the attention the 2009 United Nation’s Climate Change Conference in Copenhagen received as well as due to the creation and implementation of large scope state or citywide climate change action plans. The variation in approach to green building from city to city is vast, with some municipalities establishing no formal goals,

programs or policies and with some ambitiously pushing the limits of green building standards within their city limits.

B. Defining Green Building

Green building, as a term, can be defined in a myriad ways with respect to the specific actions and prescriptive practices of building a green building. However, as a general concept, green building is simply a way of building that minimizes the environmental and human health impacts of the building both during construction and subsequent operation. Traditional buildings negatively impact the environment and human health and comfort in a number of ways.

- Indoor climate control provided by mechanical heating and cooling, lighting and appliances uses energy resources
- Plumbing fixtures, irrigation and potable water needs depletes water resources
- Impervious materials on site limits infiltration of stormwater and groundwater recharge
- New materials used in construction deplete non-renewable or scarce natural resources
- Chemical use in building materials and operations affects building occupants' comfort and contributes to outdoor and indoor air contaminants

- Waste accumulation occurs during demolition and construction and during operation of the building

An additional and arguably synonymous component of this definition is the inclusion of an integrated design process. Integrated design is essentially a whole-building, systematic approach in making design decisions. This proves to be a critical piece of the green building process that is often overlooked, and has serious implications for the final product. According to Marian Keeler and Bill Burke's sustainable architecture textbook, "the integrated whole building approach, which considers life cycle at all levels, is essential to our contemporary definition of green building." (Keeler 2009). An example of the virtues of an integrated design process is the collaboration between the mechanical engineer and the architect in designing the HVAC system. If the architect is designing a super-insulated, high-performing building envelope that significantly lowers the amount of heat the building requires, the mechanical engineer should take this into account and design a much smaller heating and cooling system. If there was no cooperation and strategic thinking between the architect and the mechanical engineer, and each designed their particular piece of the building entirely separately from the other, the outcome would be much more inefficient and costly in both first costs and operations.

While there is no officially accepted definition of green building, Keeler and Burke's book provides a helpful framework for what elements any green building project strives to include in its design and construction.

- Tackle site-demolition issues and construction-and-packing-waste issues, as well as waste generated by users of the building
- Strive for efficiency in a broad area of resource use
 - Minimize the impact of mining and harvesting for materials production and provide measures for replenishing natural resources.
 - Reduce soil, water, and energy use during materials manufacture, building construction, and occupant use.
 - Plan for low embodied energy during shipment
 - Proceed logically, as the chain of materials production is traced.
- Conserve and design for the efficiency of energy consumed by powering mechanical systems for heating and cooling, lighting, and plug loads.
- Provide a “healthy” indoor environment
 - Avoid building and cleaning materials that emit volatile organic compounds (VOCs) and their synergistic interactions
 - Avoid equipment without controls or appropriate filters for particulate entry or production
 - Control entry of outdoor pollutants through proper air filtration, ventilation and walk-off mats, as well as occupant-born contaminants, such as personal care products.
 - Design a connection to the exterior providing natural ventilation, daylight, and views.

One also finds these same principles expanded upon in the United States Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) green building rating system and other third-party rating systems as well. This thesis research makes reference to a few rating systems, most notably the LEED rating system as well as the Energy Star Homes program. The other lesser-known or more local rating systems tend to be designed with reference to the LEED system and will therefore not be elaborated on in further detail in this section.

LEED Rating System

The LEED green building program is made up of multiple rating systems: Homes, New Construction, Core & Shell, Existing Buildings: Operations & Maintenance, Neighborhood Development, and the Schools, Retail and Healthcare rating system. The most commonly referenced systems in this study are New Construction, Homes and Existing Buildings.

Each rating system has a set of prerequisites that are mandatory for certification as well as a large set of optional credits that can be earned in several categories. The number of additional credits that are earned determine the level of certification. The most basic level is 'Certified' followed by 'Silver', 'Gold', and 'Platinum' levels.

In the most recent version of the LEED New Construction rating system, version 3 released in April 27, 2009, the LEED credits are broken into the following categories (USGBC 2009):

1. Sustainable Sites
2. Water Efficiency
3. Energy & Atmosphere
4. Materials & Resources
5. Indoor Environmental Quality
6. Innovation in Design

Energy Star Homes

The Energy Star Homes program is a joint endeavor of the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE). To receive an Energy Star Homes certification, the design and construction team must work with a Home Energy Rater, a pre-approved individual, who will help with the incorporation of energy efficiency measures in the design of the home. There is both a prescriptive and performance approach available to the design team. Either a specific set of measures is included in the building of the home or post-construction the building undergoes energy modeling to determine its final energy performance. This performance approach results in a Home Energy Rating Score (HERS). A home built to code with no additional energy efficiency measures will receive a HERS rating of 100. Anything below 100 indicates an

above-code energy performance and a score of 0 is awarded to a building that has no net-energy use, hence the lower the HERS number the better performing the home is. If the home achieves a HERS score of 85 or less, meaning it uses 85% as much energy as standard built to code building, the house is designated Energy Star Homes certified (Energy Star 2009).

C. Costs and Benefits: the Business Case for Green Building

The policy implications of whether constructing a green building costs more than constructing a traditional building are substantial. Depending on whether one believes they have to pay more to build green or not, the structuring of incentives, financing and marketing of green building practices are quite different. Having spoken with a number of building professionals over the course of this study, it is clear that one either adamantly believes that green building does not cost a penny more than a traditional building or strongly believes that there is a significant and often prohibitive cost hurdle to building this way that must be addressed.

When looking at the financial feasibility of green building, there are four factors to consider:

1. 'Green premium', which is the upfront additional costs of implementing green building features that go beyond constructing a simple built to-code building

2. Net Operating Income (NOI), which is the cost of operating the building post-construction once it is occupied. This includes utility bills, repairs, maintenance, etc.
3. Post-construction property values, which would capture the additional market value of a green building as compared to a traditional building
4. Other non-monetized benefits such as improved occupant health and productivity

The above four factors must be weighed against one another to obtain a more robust picture of whether green building is a financially viable undertaking. Several studies have looked at the construction costs and operational performance of green buildings. One study found that an upfront green premium of approximately 2% of total construction costs resulted in a 20% lifetime savings. If one were to invest \$100,000 in a \$5 million dollar project, the payback would be \$1 million over the course of the building's use (Kats 2003).

Another study of 180 buildings found green premiums from 0-18% with a median of 1.5%. The majority of the buildings reported a cost premium of 0-4%. In this same study, more platinum LEED buildings reported green premiums from 0-2% than high premiums of 10% or more. Kats argues that this is evidence that "the cost premium depends more on the skill and experience of the design and construction team and on the choice of green strategies than on the level of greenness. Architects, engineers, contractors and owners of green buildings almost universally report that early integration of green goals into the design process is crucial for achieving cost-effective design." (Kats 2010).

In a well-cited study by the international building consulting firm Davis Langdon, it was found that the construction costs of green buildings fell into the same range of budgets of non-green buildings of a similar type. Additionally, projects that incorporated sustainability measures earlier on in the design process reported lower premiums over all (Davis Langdon 2007).

Despite the evidence to the contrary, there remains a perception that green building does cost more. One survey found that business leaders reported that they believed green building is more expensive than conventional design by 17%, on average (World Business Council for Sustainable Development 2007). Within the building industry this belief has also persevered, as a survey of construction professionals reported that of all the 700 respondents more than 80% called out “higher first costs” as a primary deterrent in pursuing green building (McGraw Hill 2008).

A common, and highly pertinent, argument made about green buildings is that the cost savings over time are significant enough to not only pay back the initial green premium but to result in an additional return on the investment. The study of 180 buildings discussed above also gathered information on reported energy and cost savings over time. The median energy-use reduction was 34% as compared to a conventional building. When compared with an ASHRAE 90.1, an industry standard for HVAC system design, baseline building, the LEED certified level buildings had median savings of 23%; silver level buildings reported 31%; gold level reported 40%; and platinum level reported 50% savings. Water savings were reported by 120 buildings in the study and were found to range from 0-94% with a median of 39%. 21% savings were

reported for certified buildings, 36% for silver, 39% for gold, 55% for platinum. The study found that the cost to implement these water conserving measures were as low as .2% of total construction costs.

A study conducted by the Enterprise Green Communities program found that 27 residential buildings that met the Green Communities criteria (a system of credits and certification similar to LEED for affordable housing) required \$1,917 per dwelling unit on average to implement the energy and water efficiency measures, which resulted in lifetime utility cost savings of \$4,851. The conservation measures resulted in a net positive payback of \$2,900 per dwelling unit (Bourland 2009).

The financial benefits of energy and water conserving measures in green buildings are further magnified when rising energy and water costs are accounted for. Average U.S. retail electricity prices for commercial buildings have increased by 6% per year (EIA 2010) and natural gas prices have gone up 7% per year (EIA 2010) from 2004 to 2008. From 2002-2007 municipal water rates increased a total of 27% (Clark 2007). Kats notes "even if energy price stay flat (i.e. at 2%, the long-term inflation rate), discounted energy savings alone exceed the average green premium after five to eight years."

For builders and developers who design and construct projects with the intent to sell or rent and not be a part of long-term operations and management of the building, the benefit of lowered operating costs loses much of its appeal. For this sub-group of developers, a compelling financial benefit of green building can be found in the increased property value associated with a green certification.

A 2005 McGraw-Hill survey of building industry professionals reported that of

those who responded, on average they expected 7.5% higher property values for green buildings (McGraw Hill 2006). A subsequent McGraw-Hill survey conducted in 2008 reported a 10.9% expected increase in value for a green building (McGraw Hill 2008). According to a real estate study spanning September 2007 to February 2010, third party verified new homes with an environmental certification in the City of Seattle sell for 22% more per square foot in 12% less time. Environmentally certified homes in King County, from November 2009 through February 2010, comprised 37% of the new home market and sold for \$85,550 more per home (GreenWorks Realty 2010).

With regard to softer benefits, the argument has also been made that an additional incentive to business owners operating commercial buildings is that green buildings can result in higher productivity and lowered illness and absentee rates among building occupants due to the improvements in indoor environmental air quality (Fisk 2000). Green building principles emphasize occupant's health and comfort. 14% of the credits in the LEED rating system pertain to indoor air quality improvements.

D. Problem Statement and Analytic Approach

This thesis work aims to answer the question of how we can best approach implementing green building policy to create effective and widespread change, given the obstacles this particular issue poses. The first step to formulating the question and exploring its possible solutions is to understand what those obstacles are, who the players are and why a policy intervention might be needed. Likewise, it is important to

identify the benefits and virtues of moving towards green building and why this may be a necessary change for the public good. With this foundation as a guide, it is easier to understand the specific elements a policy must address to be successful. After framing the benefits, costs and challenges, this paper will present and analyze four case studies. In particular, each case study explores the political and social environment of the city and its region, the green building policies that have been implemented and how they were created, and how the private, non-profit and government sectors negotiated and responded to these policies.

Each case study identifies aspects of the city's approach that proved to be vital in the success of the promotion of green building, as well as what factors contributed to a failure in implementation. In addition, this study explores various types of policy approaches that have been taken and what in particular worked and how. The final conclusions of this paper offer a summary of findings that can be gleaned from these case studies and a synthesized set of recommendations for the process, formulation and content of city-wide green building policy implementation.

A note about the case studies presented in this document:

The four case studies that contribute to this study were conducted through interviews and analysis of primary sources including written legislation as well as reports, journal articles and other electronic online sources. The interviews primarily informed the understanding of the political and social dynamics on the ground that

played out in the policy-making process as well as the dynamics contributed to general attitudes and perceptions about green building in the city. Therefore, the more subjective parts of the following analyses reflect the views of the individuals who were interviewed and do not necessarily convey the beliefs and actions of all of the city's residents and decision makers.

Chapter 2: Promotion of Green Building Through City Policy

A. Stakeholders and Interests in the Implementation of Green Building

A primary motivation of this study is to understand how the many individuals, organizations and sectors that have a stake in the building industry play into the dynamics of facilitating widespread green building practices in a city. The key stakeholders include government entities, private developers and building professionals and green building and environmental non-profit organizations.

City policy can be a powerful and unique tool in the promotion of green building on a large scale. Cities have strong jurisdiction over their built space and can very concretely mandate the minutiae of building standards through zoning codes, building codes and review processes. Additionally, cities are small enough units of population that policies can be more tailored to the nature of that city's particular community, yet simultaneously cities can have a strong influence on a larger state or nation-wide agenda.

There are a number of potential motivations for city governments to be interested in green building. Concretely defined greenhouse gas reduction goals, either through a climate change action plan or other policy means, provide an impetus to city government to achieve high performance building on a large-scale. There is little financial stake on the part of the city government in greening private buildings, but the incentive lies more in positive outcomes for the city's residents and a sound reputation

in the larger national dialogue about greening goals. It must be recognized, however, that cities often act out of self-interest rather than more altruistic inclinations. A city government may be hesitant to consider implementing green building policies for fear of losing a competitive edge over other cities, and discouraging developers and corporations from locating in their city. It is likely that this fear will become minimal over time as more cities are either mandated by higher state or federal powers to reach certain energy reduction or building quality goals, and as the number of cities that do have strong green building policies grows, the issue of lost competitive edge becomes relatively irrelevant. How the city frames its green agenda deeply affects how motivated a city government may be to create meaningful policies and programs rather than 'greenwash' approaches, those programs that are essentially just for appearances and not results-oriented.

Private developers cannot be uniformly categorized in terms of their attitudes and perceptions towards green building. There are generally two overall motivations to build green or not, one is financially driven and the other one is driven by beliefs of what high performance building entails. Ultimately, no private entity will undertake a project that is not financially viable. Therefore, private developers who are motivated to build green believe strongly in the business case and financial returns green building offers. The early adopters of green building practices in the building industry tend to also be motivated by a belief that green building is simply good, high-quality building and should be the standard for any construction project. Therefore there is a percentage of green building professionals who do not require an additional push to build green and

will do so regardless of external policy requirements or incentives. However, there is also a strong faction of building professionals who are not naturally motivated to build green that must be specifically targeted when formulating a policy or program.

In terms of the non-profit green building world, there are generally two types of organizations that work to promote green building. The first type works to disseminate general information about moving towards greener building and more environmentally friendly practices in general, and appeals primarily to the marketing, image and awareness surrounding green building. The second type of organization works on a more technical level with building industry professionals and aids in the hands-on design and construction of green building. An organization like this works to build capacity and expertise within the building industry and expand the market for green building services and products through this avenue rather than appeal to the larger collective population within a city. Non-profit organizations fit into the big picture as entities that are neither financially nor politically motivated and therefore can prove to be exceptionally flexible, useful support mechanisms.

B. Obstacles to Implementing Green Building Policy

A green building policy must specifically and effectively address each obstacle, whether perceived or substantiated, and take into account the natural concerns and responses of individuals who are affected. It is therefore critical to have an understanding of the systematic obstacles to the construction of greener buildings in

order to address them appropriately for more sustainable building to take hold in a permanent and widespread manner. The factors that can potentially impede the implementation of green building practices are summarized below.

- Financial considerations: the perception that 'green' costs more
 - Greener products and materials can have higher costs
 - It is expensive to incorporate green measures into building plans later on in the design process
- Adherence to the 'status quo' in the building industry
 - If a construction company or design firm is already well-established in traditional building practices, there is little incentive to branch out and offer something new
 - A lack of technical expertise in the building industry to easily and successfully build green buildings
- Market impediments
 - If there isn't perceived demand for green building, building professionals are especially disinclined to pursue incorporating this expertise into their services.
 - If green buildings are not valued more than traditional buildings in the market there is little incentive for building professionals to put in extra time or money into creating a greener building.
- Misaligned interests

- Unrealized payback and split-incentive when a developer is not involved in operations and maintenance of a building
- Split incentive between landlords and tenants in rental properties hinders maximum efficiency in building operations

C. Overview of Policy Approaches

The possible policy approaches to promote greener building that are explored in this paper include both incentive schemes as well as regulatory mechanisms. The relationship between these two approaches and the relative efficacy of each is looked at in detail within each case study.

Incentives do not mandate any particular practices but do offer the voluntary option of meeting a particular standard and subsequently receiving some sort of advantage or benefit. These can be either monetary or non-monetary incentives and include,

1. Expedited permitting
2. Density bonuses and zoning allowances
3. Tax credits or subsidies
4. Rebates
5. Third-party certifications

Incentive schemes are designed to tap into some financial benefit, whether it be direct or indirect. A developer may be interested in a density bonus if they are building in an area with high-property value and robust real estate demand and can receive a substantial amount of monetary compensation as a result of increased FAR. Property tax credits offer a more direct financial benefit, as do rebates. Some cities opt to host their own certification programs that offer a label to a home or property that meets a higher standard of building.

Regulatory mechanisms are generally achieved through building or zoning code amendments and can be either performance-based or prescriptive. Performance-based requirements mandate meeting a certain level of performance, often demonstrated through a third-party verification and certification. Prescriptive requirements offer a recipe of sorts of individual measures that must be undertaken in the project, such as low-flow plumbing fixtures, a certain amount of insulation, etc. A prescriptive requirement generally does not entail demonstrating a particular outcome to meet the criteria.

Chapter 3: Case Study of Boston, MA

A. Mayor Menino's Green Building Task Force

Process and Participation

In 2003, Mayor Menino formed a Green Building Task Force facilitated primarily by the Boston Redevelopment Authority (BRA). The goal of the task force was to formulate recommendations for policies to help Boston meet its environmental goals. The task force was made up of several representatives of the building industry as well as experts in various aspects of green building in both the public and private sector including architects, planners, real estate developers, academics and policymakers.

The task force, along with the mayor himself, advocate for the business case for green building. In the final report, the task force outlines the benefits of green building including the rising cost of materials and energy and the increased productivity of children and workers occupying healthier buildings. Mayor Menino, in his introductory letter in the task force's final report and recommendations, explains his stance on green building and its perceived challenges, "High performance green building is just a fancy description for good building. It's good for your wallet, it's good for the environment, and it's good for people." The task force as a group also argues that green building should make economic sense for all builders and developers, and that only policies with sunset terms, which will initially incentivize green building but will phase out over time, are needed to begin a green building revolution in Boston.

Recommendations

In its final report the task force outlined seven principle areas green building policies and programs in Boston should address. The recommendations emphasize the integrated design process, the financial benefits of green building and a market transformation over time.

The concrete recommendations offered by the task force include:

- Partner with media, non-profit organizations and academic institutions to provide enhanced education, awareness and training to building professionals and city staff about the process and benefits of green building.
- Create a pre-development loan fund and revolving loan fund facilitated by the city that would award projects funding to engage in an early-stage integrated design process to ensure the most cost-effective and time-efficient green design. In addition, require integrated project planning as part of the BRA's review process.
- Work with utilities to provide more effective, far-reaching programs to individuals who wish to adopt greener design for their projects
- Create a city program to recognize exemplary green building projects as well as a marketable local certification standard for residential buildings.
- Work with retailers and producers of green products as well as area trade and labor associations to help expand the market for these goods and services.

- Require LEED silver level certification for all city-owned or city-funded projects.
- Require a LEED certifiable standard for Article 80 projects, namely all private projects going through the BRA's review process.

Members of the task force raised the issue of developers who design and construct a project to be sold to homeowners or other individuals and the challenge this poses to the business case for green building. Developers would have a limited financial incentive to undertake the construction of an initially more costly green building if they would not reap the benefits of decreased operating costs. The task force briefly touched on this issue and concluded that it was an issue that would need to be further developed, but that the ideal solution would be found in the fact that as awareness and information about green building is successfully disseminated to the general public, the market will put a premium on green buildings that will be realized in a higher price charged by the developer. In this way, developers would have a financial incentive to create a greener building.

B. Current Green Building Policies

Based on the recommendations of the Mayor's Green Building Task Force, the current policies in Boston with regard to green building standards and programs are that city-owned projects or projects where the city was involved in funding or land acquisition a LEED silver certifiable standard must be met. The requirements for private

development are in the form of a zoning law, Article 37, and call for a LEED certifiable standard to be met by all new construction and substantial renovation projects over 50,000sqft. The law does not require that the project actually achieve certification from the USGBC but that a professional experienced in the LEED rating system signs off that the project would achieve certification if the plan and construction specifications were submitted to the USGBC. However, it is often relatively easy and does not incur much additional cost for a project to pursue actual certification, especially if it is only for the LEED certified level and not a more comprehensive standard such as LEED silver, gold or platinum.

Under the new regulations, to date there have been 30 projects completed that comply with the Article 37 green building requirement, which totals to 4 million square feet of buildings. As of right now, 18 of those 30 projects are known to be officially certified or seeking USGBC certification. The city has another 48 projects under review for this requirement. 25 of these 40 projects are seeking official USGBC certification.

In total, to date Boston has 61 USGBC certified projects, totaling over 10 million square feet of building space. Of these 61, four buildings are platinum level certified, 16 gold level certified, 28 silver level certified and 13 are certified.

In response to the task force's findings, the city has established the Boston Interagency Green Building Committee (IAGBC), which is comprised of representatives from the BRA, the Environment Department, the Boston Transportation Department (BTD), the Inspectional Services Department (ISD) and the Mayor's Office. The IAGBC reviews project submissions to ensure they are meeting the new green criteria of Article

37. When the BRA receives materials for a project seeking a permit, the part of the application that pertains to the LEED requirement will be sent directly to the IAGBC for review, which results in a minimal loss of efficiency in the larger project review process.

C. Response from the Private Sector

According to the individuals who work with private developers at the BRA to meet the green building requirements that pertain to their project, developers have received the standards well and there has been little pushback or frustration in working to meet the requirement. This is in large part attributed to the fact that the task force brought real estate industry stakeholders into the discussion and shaping of the policies. Over the two years the policies were being formulated and solidified, additional focus groups were consulted on the content and implementation of the policy and how it would affect their business. By the time the nearly final version of the policies had been completed, the final focus group that was convened was made up of prominent local developers who had a great deal of influence in the Boston building industry. Five out of the six individuals at this focus group gave their approval for the policies, citing that the advanced notice and the fact that building professionals had been so heavily involved in the process and the fact that the city had shown that it wanted to account for the concerns of the private sector made it much easier for them to consent to the implementation of the policies.

Some green building advocates felt the requirements didn't go as far as they would have liked and campaigned for a more prescriptive standard where particular measures would be called out and mandated in the building design. However, BRA facilitators of the task force felt that it was important to maintain the builder and developer's autonomy in how they wish to achieve the required standard, and that this was a key component of garnering support for the policies from the industry.

D. Addressing Existing Buildings

The city has not formally convened a task force or tackled the issue of greening existing buildings and rental properties through policy. However, Boston does have a large amount of buildings going through the LEED Existing Buildings (EB) certification program. Private commercial buildings in particular have been pursuing the LEED EB certification quite actively. Prominent businesses began the trend by greening their large commercial buildings in Boston including Beacon Capital Partners One Beacon Hill office building and the Equity Office Properties office spaces. According to Greg Shay, the president of Equity Office's Boston region "we're doing this from a social responsibility perspective, but it's also become necessary to maintain tenants. It's gotten to the point where not taking action is foolish" (GreenSource 2008). This perception is corroborated by other analyses of the real estate market. "If you aren't at least meeting LEED standards in new construction, there's an increasing risk-one likely to accelerate in the next five years-that your project may falter. Most cutting-edge

developments in the years ahead will.... look to exceed LEED-not just meet it (Ernst & Young 2007).

This comment alludes to a recognized trend that commercial buildings find it particularly marketable to be certified green; the LEED brand carries a great deal of weight in the commercial building world. In fact, rental prices for LEED certified office space are on average 10% higher when controlling for other quality indicators (Miller 2008). Anecdotally, achieving LEED certification is not associated with the same increase in rental prices for homes. Other green building certification programs, on the other hand, do carry some weight in the residential world and are associated with incremental increases in rental value.

The many institutions Boston boasts also play a role in the stock of buildings going through a green overhaul. Many universities, colleges and schools are interested in marketing themselves as green institutions with healthy indoor environments for students and staff and a low environmental impact. In addition, other prominent institutions such as museums are invested in greening for both the image and marketing value as well as for the environmental benefit. The Children's Museum of Boston underwent a comprehensive greening process in May 2008. These well-known institutions aid in making green building a more widely recognized practice in Boston and have moved the city towards a total building market transformation.

E. Support from Non-profit Organizations

Boston has highly active non-profit sector involvement in the green building agenda. Non-profit organizations in Boston dedicated to this cause work to both provide education and training for green building professionals but also have played an important role in pushing policy forward to require greener buildings in the city.

The Green Roundtable, the Boston chapter of the USGBC, played a pivotal role as special advisors to the Mayor's Green Building Task Force and has worked to enforce and promote the policies that have been implemented. The organization views policy work as the most effective vessel for change and has a formalized approach to policy creation through the Sustainable Policy and Planning Program (SPP). The program is made up of three primary components. The first is the availability of free technical assistance to any Massachusetts community that is working to meet the terms of green building policy requirement or incentive program. This assistance includes outreach to local policy-makers to work towards incorporating green building goals into a strategic planning process for the community as a whole over time. In addition, assistance comes in the form of education and training for individuals in the local building industry to promote green building practice within the private sector as well as resources and awareness for public sector staff. The second component of SPP is to host policy summits for local government officials to come together, share models and lessons learned for the creation and implementation of green building policy. Finally, SPP works to regularly disseminate resources, networking and learning opportunities through the Nexus Resource Center, a clearinghouse of information on green building policy-making.

The Boston green building world is further enhanced by a number of non-profit organizations that primarily work to assist in the actual process of designing and constructing a green building. New Ecology, Inc. (NEI) works closely with developers and design teams, including architects, mechanical engineers, civil engineers and general contractors, to begin and follow through with the integrated design process. NEI facilitates discussion early on in the schematic design phase to encourage green measures to be implemented into the initial building plans to allow for a smooth, whole-building approach to green design which minimizes cost premiums and ultimately creates a greener building overall. Many developers who are either required to meet a certain green standard due to the new city legislation or who wish to incorporate green building into their real estate portfolios for marketing purposes or due to a belief in the environmental benefits, are eager yet somewhat lost as to how to proceed. Organizations like NEI work to bridge that gap and make the process as palatable and seamless as possible to encourage developers and builders to continue to pursue green building after their first attempt.

F. The Green Communities Act

Challenges of the regulatory approach

Massachusetts state legislation has also recently taken an aggressive approach to issues of energy reduction in built space. In 2008 Governor Deval Patrick passed the Massachusetts Green Communities Act, which outlines energy use standards the city as

a whole must reach in the near future and measures to aid in that goal. The legislation also provides criteria for a new program for municipalities to incorporate certain policies and actions to become more sustainable communities and be designated a 'green community'.

The broad energy goals laid out in the act are:

- Meet at least 20% of the state's electric load with renewable sources of energy
- Reduce fossil fuel use in buildings from 2007 levels by 10% by 2020
- Reduce greenhouse gas emissions by 20% from 1990 levels by 2020
- Create a strategic plan to reduce total energy consumption in the state by 10% by 2017

The rest of the act outlines additional measures that pertain to the creation and distribution of renewable energy as well as other specific statewide measures aimed at reducing energy and fossil fuel consumption.

The act also opens up a pool of approximately \$7 million to be rationed out to municipalities in Massachusetts that adopt the necessary policies to be designated a 'green community' and can thus receive the state funding for energy efficiency improvement projects. The criteria generally boil down to four requirements for the municipality to meet: 1. Expedited or priority permitting for alternative energy projects, 2. Implementing an energy performance standard for municipal buildings, 3. Purchasing fuel-efficient vehicles and lastly 4. Adopting the Massachusetts building energy 'stretch'

code. The 'stretch' code is an amendment to the existing state building energy code that requires a higher standard of efficiency performance for buildings. By adopting the stretch code the municipality is agreeing to have these more stringent energy standards apply to all new construction that takes place within the city or town limits.

A second part of the act that has important implications for utility companies as well as cities and towns looking for funding to green their built space is the requirement for utility distribution companies to "consider all available energy resources when purchasing power, and mandates they purchase the most cost-effective and stable resources, with the goal of procuring all cost-effective energy efficiency and conservation prior to the acquisition of more expensive supply from more traditional sources." This essentially means a utility company will be required to buy any energy efficiency measure that costs less than providing the energy that would otherwise be saved with new energy generating sources. The cost of providing new infrastructure for additional energy generation has been increasing and presents a significant cost hurdle to utility companies to meet additional energy demand over time. Utility companies do therefore have some incentive to fund the implementation of energy efficiency measures in buildings. An example of the high costs is demonstrated by the proposed construction of a new coal power generating plant by the Otter Tail Power Company in South Dakota. The final project budget, including transmission, is expected to cost \$1.6 billion (Chupka 2007).

Reactions to what the Green Communities Act has to offer have been mixed. Towns considering whether the program is something they want to pursue have been weighing the benefits and costs of implementation. Approximately 100 towns and cities are currently considering implementing the Green Communities Act criteria but none have officially received the designation yet.

The difficulty with this particular program can be demonstrated with the example of Newburyport, a town in northern Massachusetts. Newburyport is considering adopting the stretch code and working towards the 'green community' designation. The debate is fueled by skeptics that argue that in this particular economic climate establishing more stringent building standards will make construction considerably more expensive and will make the town a less desirable place for construction to take place as compared to other Massachusetts towns. This particular case highlights the importance of education and awareness about the actual costs and benefits of green building that the Boston Green Building Task Force emphasized in their findings. The information the public bases their opinions and decisions on with regard to green building policies deeply affects how far these policies can go. These opinions may not be grounded in a sound understanding of the practice of green building. This therefore suggests that it is equally important to educate the general public in addition to the building industry when working to establish more stringent building standards.

Reconciling Regulation and Incentives

In Wayland the adoption of the Green Communities criteria posed an additional conundrum. The construction of a new school building in the town brought the tension between regulation and incentives to the forefront. The town came to the decision that the new school building should be built to be as energy efficient as possible and could capitalize off of the money the project would receive from Nstar, the utility company providing services to the area, for energy efficiency upgrades. Nstar would be required to pay for certain energy efficiency measures as mandated by the Green Communities Act, if they proved to be cost-effective when comparing utility savings to the cost of providing the energy that would otherwise be saved.

During the same time period that the plans for the school were taking shape, Wayland was also embroiled in the debate to adopt the stretch code or not in order to be designated a 'green community'. If Wayland did choose to adopt the stretch code, the baseline energy performance the new school building would have to meet would be significantly elevated. In turn, what would be considered a cost-effective energy efficiency upgrade for the building would become more limited as going above and beyond the established baseline would have less financial benefit once the baseline itself became more energy efficient. Whether Nstar would consider the basic building code or the new stretch code as a baseline would have serious implications for how much money the town could expect to receive for the school and would affect the town's decision to adopt the stretch code at all. Ultimately, after a great deal of back and forth between the town's energy committee and representatives from Nstar, Nstar

agreed to use the basic building code as a baseline for considering cost-effective energy efficiency upgrades and subsequent funding.

This particular situation highlights the need for thoughtful policy formulation when creating regulatory standards and incentives to promote green building. While regulation and incentives can be at odds with one another, as demonstrated in the Wayland example, foreseeing the potential misalignments between the requirements and the incentive scheme and making the proper amendments to the policy to avoid the conflict all together can easily avoid this problem. This is something policymakers should keep in mind when packaging regulatory mechanisms with incentives in one policy.

G. Conclusions from the Boston Case

The Boston case presents an example of a city that utilized a comprehensive process that included all stakeholders when designing green building goals and policies and particular emphasized the private sector.

Individuals who participated in the process of designing the policies that were ultimately implemented in Boston felt that, if anything, Boston presented a more challenging environment for these types of policies to be created. Unlike other cities on the west coast, Boston, as a city, is not as naturally inclined towards strong environmentalism. Additionally, due to the fact that the city has a great deal of history, status quo tends to have even more inertia when it comes to trying to establish transformative policies. Boston possesses the same, if not more, struggles that any

other city would face in implementing this type of change. Given this, the process model of Boston's Green Building Task Force could likely be applied to other cities with equally successful outcomes.

The private sector buy-in played an important role in the requirements being approved with relatively few complaints. The process was also executed over a longer period of time, which allowed for a gradual growth in understanding of why these policies are necessary and allowed for preparation in the building industry and future development plans.

By engaging the private sector, the city of Boston recognized the importance of developers' and building professionals perceptions and experiences with implementing green building and therefore early on worked to design a policy that would result in the marketability of green building and speak to private developers' bottom line. The city took the opportunity to work with the private sector representatives to demonstrate how green building could be an equally financially viable option. The review process conducted through the BRA for all projects also now requires materials from the project team indicating that early strategic design meetings had taken place to emphasize the importance of integrated design approach to financial and environmental goals.

Additionally, the strong non-profit presence was an indispensable resource in translating policy into concrete outcomes by providing honed and comprehensive technical assistance and support through the development process to building professionals, particularly with a focus on affordability in green building strategies.

Boston also stands as a powerful example of how the content of the policy itself need not be the main purpose or driving force in a strategic promotion of green building. The standard in the city of Boston is relatively lenient, requiring only a LEED certifiable building. However, many builders and developers, in accordance with the new law, engaged in more sustainable building practices for the first time, which allowed them to build experience and a toolbox of strategies to apply to future projects, such that subsequent construction projects by the same builder or architect could be done at a much lower premium.

Chapter 4: Case Study of Boulder, CO

A. The Culture and Demographics of Boulder

The city of Boulder has a reputation, both anecdotal and evidence-based, for being a highly progressive community, particularly with respect to environmental issues. This stems in part from the fact that it is a smaller community that is largely defined by its proximity to institutions of higher learning. There is a culture of adopting new ideas earlier on and with less dissent from the general population. It is possible that this 'culture' may play a significant role in the advancement of green building in Boulder, and is something unique to this city. However, there are other factors that pushed green building in the city that grew from other more common mechanisms and efforts than solely from this rather nebulous concept of 'culture'.

B. Current Green Building Policies

The first piece of legislation Boulder passed to move towards more sustainable building was a green residential building code in 1996 that required the implementation of certain sustainability measures in new construction and building additions. In 2001 changes were made to this legislation and it was renamed the Green Points and Green Building program. This program laid out mandatory criteria that all residential new construction and rehabilitation projects had to adhere to as well as a system of

awarding additional points for design and performance that went beyond the baseline efficiency standards. The criteria addressed energy performance, water conservation and other common green building measures. Amendments and changes requiring more stringent standards have been added to the program since 1996 in 2001, 2003, 2004, and 2006.

The most recent changes took place in November 2008 and are the green building standards construction must meet at this time. It utilizes both the Home Energy Rating Score (HERS) ratings and the IECC 2006 Energy Code as reference points for meeting the efficiency requirement. The table below outlines the HERS score each type of building is required to meet in new construction projects, followed by the requirements for additions and substantial remodeling projects.

Type of Project	Square Footage	HERS Index (max.)	Energy Efficiency Thresholds Above Code (2006) (min.)
New Construction	Up to 3,000	70	30%
	3,001-5,000	60	50%
	5,001 and up	35	75%
Multi-Unit Dwellings	Applies to all	70	30%

Total Conditioned Area	HERS Index	Increased Efficiency Above IECC
Up to 3,000	100	15 percent
3,001-5,000	85	30 percent
5,001 and up	70	50 percent

Each type of building is required to obtain a minimum number of Green Points in addition to meeting the energy efficiency standards above. Green Points are awarded for features such as water-conserving landscaping and plumbing, stormwater

management, high efficiency mechanical systems, Energy Star appliances, environmentally preferable materials, renewable energy infrastructure, waste management and recycling programs. These additional Green Points measures are similar to and modeled after those in the LEED rating system. An additional Green Point is awarded for every HERS index point below the required baseline HERS score. A multi-family residential building over 3,000 sq. ft. is required to achieve 30 Green Points, over 2000 sq. ft. needs 20 and over 1000 sq. ft. needs 10 Green Points.

The structure of this program addresses a few issues that policy-makers believed were problematic. The first was that the LEED for Homes system has not been as heavily utilized and incorporated into residential building practices as LEED rating systems aimed at commercial buildings and therefore would not be the best system to anchor a residential building policy. The other prominent residential energy efficiency standard is through the Energy Star Homes program. However, policy-makers found this standard to be less stringent than they would like for the Boulder policy. The Energy Star Homes program requires receiving a HERS rating of 85 or lower. Therefore the policy was informed by this program and the metrics it uses but were designed to be stand-alone policies that only required a HERS rater to verify energy efficiency compliance. Obtaining a HERS rating from a qualified HERS rater costs approximately \$1000-\$3000 and is therefore not an unreasonable or prohibitive expense.

The city has considered implementing an incentive that allows for expedited permitting for constructing greener buildings, but this has not been formulated or passed yet. The emphasis has been put primarily on regulation rather than incentive

policies. The building codes are reviewed often and upgraded and have provided some of the most stringent standards in the country for new buildings to meet.

The city of Boulder is also interested in actively addressing the issue of rental properties and the split-incentive of incorporating energy efficiency measures in this setting with proposed legislation moving forward in mid-2010. The program, called SmartRegs, is one of the first rental property efficiency upgrade programs of its kind in the country. The current proposal provides an extensive market-based approach to upgrading existing, inefficient building infrastructure, built before 2001, through several possible avenues. Rental property owners would be required to show compliance with either a performance-based or prescriptive path when renewing a rental license, which occurs every 5 years. The performance path requires demonstrating that the building meets a HERS score of 120. Given that a building built to current code standards would receive a HERS score of 100, even though a score of 120 technically demonstrates worse performance than this baseline, for an older building that was built to meet a much less stringent standard this is still a significant improvement. The prescriptive path requires meeting a minimum number of points through implementing several possible upgrades such as air sealing and insulation upgrades, HVAC improvements and installation of water and energy efficient appliances. The program requires achieving 20 points. For a reference point, air sealing is worth 3 points, additional insulation is worth 15 points, and window replacements can be worth up to 12. The necessary upgrades will most likely cost on average \$1000.

The program proposes alternatives to meeting the 20 points or HERS score requirement. The owner can choose to buy four years of carbon offsets equal to 3 tons of carbon emitted per year. The prevailing Colorado Carbon Fund rate for these carbon offsets is \$20 per ton. This would result in the owner paying \$240 in lieu of meeting the retrofit requirements. Owners can choose to meet a portion of the 20 points and pay for the remaining points using the conversion of .15 tons of carbon per point not earned.

The final piece of the proposed plan allows the rental owner to participate in the city funded “Two Techs and a Truck” program to receive the full required 20 points. The program provides a standard package of property upgrades implemented by a team of energy auditors and technicians to achieve an 8-30% reduction in a home’s energy use.

The policies addressing new construction have been met with little to no resistance from the building and development community, whereas the SmartRegs program is receiving a significant amount of controversy due to the fact that property owners have little direct financial benefit from upgrading their properties. However, given that Boulder’s housing stock is approximately 50% rental, this is a vitally important issue in the effort to reduce overall energy use in the city. SmartRegs is currently moving through an intensive public process including several community meetings and stakeholder feedback in an effort to design a program that is both fair and aggressive enough to achieve significant energy reduction gains.

C. The Boulder Climate Action Plan

Boulder recognized the importance of strategic planning and goals in mitigating the effects of climate change through carbon emission reduction early on. In May 2002, the Boulder City Council passed Resolution 906, which called for the reduction of greenhouse gas emission by 7% below 1990 levels by 2010. This translates roughly into a 24% reduction between 2005 and 2012. In addition to setting the emissions reduction goal, in 2005 the creation of the Boulder Climate Action Plan provided concrete guidance on how these goals were to be met. The plan outlined responsible parties, strategic planning, funding, and coordination of efforts and highlighted buildings as a key component to the planning efforts for climate change. This emphasis was due in part to the fact that buildings were recognized as a large contributor to the greenhouse gas emissions in Boulder, where the residential and commercial GHG contributions make up approximately 47% of the total emissions in the city (Boulder Climate Action Plan).

The plan methodically addresses each of the above sectors and offers several options by which that particular sector could work towards the required changes. By giving green building an important place in the Boulder Climate Action Plan, policies aimed at more sustainable building were not only a logical next step but also a mandated one. The Climate Action Plan ultimately played an important role in the expedited manner key policymakers and the building industry worked to pass green building policies.

D. Boulder's Connection with Regional Policies

The county of Boulder has implemented green building policies aimed at all residential development that are packaged within a program called Boulder County BuildSmart. The program was initially implemented in May 2008 and consisted of extremely stringent and ambitious energy efficiency targets. The policy required residential buildings over 3,000 ft. to meet a certain HERS score determined by a sliding scale. As the house grew in size the required HERS rating dropped from 60 to 40 to 25 to 10. A HERS score of 10 implies a near net zero energy building (a HERS score of zero is a true net zero energy building). Therefore this policy was essentially requiring a net zero energy standard for large multi-family developments, which is quite difficult to achieve without significant additional funding and highly tailored building expertise. Given this, the policy was met with frustration and resistance from the building company and in the following years the policy requirements were amended to a more achievable standard. The most recent standard, revised in late 2009 required a 4,000 sq.ft. house to meet a HERS 70 rating, a 6,000 sq.ft. house to meet a HERS 50 rating. Houses 8,000 SF and above do not need to achieve a score lower than a HERS 30. A HERS 30 rating, while still extremely energy efficient and ambitious, is more reasonable than a HERS rating of 10 or lower.

The first version of the BuildSmart requirements offered only a performance path to show compliance, whereas the newest version of the policy provides a prescriptive approach as well which also aides in making the policy more accessible to builders and developers. Due to the initial over ambitious nature of the county policy,

this avenue of green building promotion lost significant credibility in that people felt it was too strict a requirement too soon, without support systems in place to help developers and builders cost effectively meet the requirement. The county was forced to backtrack on the initial policy they introduced due to its infeasibility. The city of Boulder has taken a different approach than the county's approach by introducing policies that required less stringent standards to be met and then amended the policy over time to increase the standards incrementally.

With respect to statewide policies the city believes that they tend to be more progressive and would like to set a higher standard than what Colorado state policies offer. The city of Boulder is unique even among other progressive cities in Colorado and believe that is appropriate to set policies for their own constituency given that they have a deeper understanding of the city-wide culture and what is feasible for development standards in the city versus policies that trickle down from the state government.

E. The Boulder Green Building Guild

When the city of Boulder was in the process of updating their building and energy codes and creating the updated Green Points program, green building professionals in the area recognized the need to accompany changing standards with the infusion of expanded expertise and support for the market of greener building. A small group of professionals formed the Boulder Green Building Guild (BGBG) in 2004 to

meet this need. The city of Boulder was also a founding member of the organization. BGBG is a membership organization made up of a range of building professionals including developers, contractors, architects, engineers and product manufacturers. The BGBG's main mission is to facilitate the growing market and demand for green building by providing education and training to their growing membership base and to facilitate the dissemination of the pro-green building message as well as provide a space for networking between green building professionals. The city of Boulder works with BGBG when a developer is interested in incorporating sustainable building practices in their design. The city will direct the individual to BGBG and its extensive pool of green building resources. The city finds that this method works best as they are not directly advocating for particular methods, companies, or products in the public sphere but can offer guidance through a referral to BGBG.

The city has found that incentives work best when implemented in tandem with regulations. Incentives can only push an agenda so far given the constraints on the part of developers to effectively implement incentive programs and to be aware of the programs in the first place. Both BGBG and the city of Boulder are interested in efforts to package and market incentives and funding offers. There are an array of rebates and grants available on the city, county, and state level for implementing specific green measures into an existing or new building such as compact florescent lighting (CFLs), solar energy systems and more efficient HVAC systems, but this can be confusing for a developer when there is no centralized body facilitating these incentives.

F. The Contribution from the Private Sector

The push for building ordinances, policies and incentives for sustainable building came in large part from developers and builders who were building to high standards as a baseline for all their projects. These building professionals put pressure on their political representatives to make what they viewed as simply good building practice the baseline standard for everyone. Recognizing a desire for this type of legislation, these representatives brought their constituents concerns and interests to the table when city policies regarding energy efficiency and building codes were being suggested and formulated, allowing for more robust far-reaching standards.

Private developers in Boulder are still compelled by their bottom line and how their building choices will affect their profit, in the same way that developers all over the country must account for their financial interests. However, many developers in Boulder primarily believe in the financial returns on building green and advocate that as the main reason to think about implementing these measures. The broad commitment to green building in the city does not stem solely from a more environmentally progressive attitude or 'culture' that is unique and difficult to cultivate, but rather a deeper understanding and acknowledgement of what the full cost and benefit implications are in constructing a green building. The concept of 'return on investment' is used heavily in the green building dialogue in Boulder. Both individuals in the city, BGBG and private developers refer to the 'return on investment' on building green rather than the 'payback'. The payback period is quantified as total cost to implement

efficient design divided by the incremental utility savings. If the payback period were within a reasonable range of time, the project would make financial sense to a developer. The return on investment, however, takes into account a broader range of implications including the increased value of the building, the compounded utility savings that takes into account an interest rate on those savings over time and the appreciation of utility rates. Utility rates have increased approximately 6% per year in Colorado, which is a significant percentage to factor into the analysis of the benefit of energy efficiency measures. Therefore the return on investment provides a more robust picture of whether green building practices are financially viable, and therefore green projects are subsequently perceived as a much more logical step than if one only accounted for the payback period.

G. Conclusions from the Boulder Case

Several lessons can be gleaned from the Boulder story about how to effectively use regulation to implement change in the building sector. Changes in building code and legislation occurred in a strategic manner with support from many stakeholders involved in the building industry. The success of Boulder's green building policies can be partially attributed to the fact that the city gave almost two years of notice to the building community that changes were being discussed and would be implemented in the building code in the near future. This gave building professionals the opportunity to

learn more about what green building practices entail without the threat of mandatory compliance creating frustration and ultimately poor results.

In anticipation of these changes, education and training were promptly brought into the equation, again, before any mandatory changes took place. A more genial, supportive environment was fostered around healthier, more environmentally conscious building and developers and builders were given the resources to learn more about the potential cost benefits and affordability of greening. Only once this supportive infrastructure was in place were the regulations implemented. A strong network of building professionals committed to green building had surfaced before the policies were in place, and they worked to share their strategies to implement green building in a cost effective way with other building industry businesses in Boulder.

The power of the consumer side of the green building market is also exemplified in the Boulder case. Demand for green buildings from tenants and potential homeowners played a pivotal role in expanding the market for green building services and sparked an interest in the building industry to learn about and provide this alternative approach to construction.

Chapter 5: Case Study of Pittsburgh

A. The History and Evolution of Pittsburgh

Pittsburgh has a long history of industry and manufacturing due to the fact that it lies in a highly productive coalfield and also had other ample energy resources in the form of natural gas, petroleum and lumber. Pittsburgh was known as the 'iron city' in the first half of the 1800s and the 'steel city' in the second half of the 1900s. Due to the heavy manufacturing practices in that century, Pittsburgh was then known as the 'smoky city' in the mid 1900s due to the thick, ubiquitous smog that plagued the air in the city. Once the steel mills left Pittsburgh due to international market pressures and a changing American economy, a massive urban renewal began, in the hopes of reinventing Pittsburgh and how it was perceived both nationally and by those already living there. The urban renewal efforts included strategies aimed at economic development, community and neighborhood revitalization as well as beautifying of the city. Green building practices became a natural corollary to these efforts and a key part of modernizing Pittsburgh's image and setting it apart as a desirable place to live and do business.

The most noteworthy and effective push for greener building practices in Pittsburgh came from the Green Building Alliance (GBA), a non-profit organization, and in particular its founding executive director Rebecca Flora. Flora along with a small group of like-minded professionals interested in green building pushed the city to

incorporate more sustainable practices in their future developments. The biggest accomplishment of the local government to put green building at the forefront of development in the city was arguably the completion of the David L. Lawrence Convention Center as a LEED Gold level certified convention center in 1999. The building was a landmark within a larger downtown redevelopment effort and proved to not only be an example of green building but an example of deep sustainability and extensive resource conservation. The center has a large-scale grey water system that recycles 50% of the building's water and the placement of skylights allows for natural lighting for 75% of the center's exhibition spaces. Rebecca Flora of GBA served on the design committee for this project and she and other advocates within GBA and other non-profit organizations were able to convince city and county officials of the value of a green convention center for both environmental goals as well as to create a certain progressive, green image for the city. Subsequently an international design competition was held for the building and called specifically for the incorporation of deeply sustainable design. Given the desire on the part of city leaders to reinvent the image of the city, the construction of the LEED Gold convention center proved to successfully convince individuals in the city government to further pursue other sustainably built public projects as a means of achieving this. Other LEED certified publicly funded buildings that followed the convention center include an addition to the Pittsburgh Children's Museum. Over time the city government's commitment to green building has been sustained. Mayor Ravenstahl, the current mayor of the city, sees 'going green' as an important part of the identity and growth of the city moving forward.

A big push also came from the private sector, an example of which is PNC Financial Services Group. PNC bank has been a pioneer in designing and constructing LEED certified buildings in the greater Pittsburgh metro region. The PNC Firstside Center was the largest LEED building in Pittsburgh when it was built in 2000. Since then PNC has constructed the largest 2,380 square foot 'green living wall' on the side of its Pittsburgh headquarters building. Currently in development is another mixed-use high-rise project by PNC in downtown Pittsburgh, called Three PNC Plaza that is aiming for LEED certification as well (PNC 2006). PNC is only the most prominent of many examples of initiative in the private sector to raise awareness about sustainable building practices as a baseline moving forward.

Currently Pittsburgh has 30 LEED certified buildings, with a wide range of types of buildings including historic preservation projects, university dormitories and retail space. Up until June 2005 had the most square footage of LEED certified built space than any other city in the United States. It has been touted to be the new 'emerald city' and has been cited as one of the most livable cities in the United States. It has clearly had successes in creating widespread interest and action in green building.

B. Current Green Building Policies

The city of Pittsburgh has adopted two pieces of green building legislation. The first bill, passed in 2007, provided a density bonus for buildings that achieve LEED certification that allows a 20% increase in height and 20% increase in floor space. The

second piece of legislation is a requirement for all publicly financed development (that is over 5,000 gross sq. ft. of occupied space or with development costs exceeding two million) to be able to attain LEED silver level certification. This also applies to renovations of city buildings with a development budget of over \$2 million.

There is also a new policy that was passed in late 2009, under the Pittsburgh code, Title 9, zoning subsection 915.06, that requires that any Tax Increment Financed (TIF) project within city limits and over 10,000 square feet or exceeding a budget of \$2 million must achieve at least silver level LEED certification.

The density bonus for LEED certified buildings has never actually been used by any private developers since it was first instituted. There are a few possible explanations for why this incentive proved to not be effective and has not been utilized heavily. The first is that there is not a high demand for density within the city of Pittsburgh. It seems that the city real estate values have not reached the level that would compel developers to obtain additional density at a premium. Additionally, the point at which developers most likely become aware of the option to build 20% higher if certain standards are met, is too far along in the design and development process to backtrack and change the existing plans and budgeting. Taking advantage of this incentive would require being able to alter plans so that the building, once constructed, would be able to meet LEED certification standards and would need to account for the additional square footage in the added density. Finally there seems to be a simple issue of disseminating the information of the available incentives to developers. They are not aware of this relatively recent addition to the building code.

The policy requiring all publicly financed buildings to be LEED silver level certified has had essentially no effect on green building in the city as in the current economic climate the city is not developing and constructing new buildings. However, the city's commitment to green building in the public sector has been demonstrated through a number of publicly owned LEED certified projects. The TIF policy was passed in the same building code supplement that included the above requirements on publicly owned buildings. Both these policies were initially met with some skepticism from the private sector due to the fact that it tied public money to a private third-party certification system. The Pittsburgh city council has been very supportive of the above legislation, unanimously passing code changes to promote greener buildings.

C. The Green Building Alliance

The Green Building Alliance was the first non-profit organization in the United States aimed solely at promoting green building practices in the commercial sector. The organization's model consists of a three-pronged approach. The first leg of services was providing education on green building practices to build developers', architects' and contractors' capacity to carry out a green building project. The second piece of GBA's mission is to engage in the development and implementation of local public policy aimed at regulating and expanding sustainable building practices in Pittsburgh and the surrounding region of Western Pennsylvania. The final piece that completes GBA's approach to promoting green building is to provide on-site and direct technical

assistance throughout the design and development process of any project pursuing sustainability measures.

With strong leadership in the 1990's and a growing membership base in the past two decades, GBA has been a pivotal piece of strengthening the culture and application of green building in Pittsburgh. The public policy leg of their operations has only been officially in action for the past one and a half years. There is a clear correlation between the time when policies were being created on the city-level without the guidance of the GBA and their extensive local knowledge and when GBA stepped in to heavily assist in the policy-making process. GBA uses its network of building and design professionals to create small task force teams to address different pieces of legislation and assess whether the proposed policy will resonate with the private sector and if not, how it can be improved to achieve the ends it hopes to. City government officials tasked with formulating green building policies work very closely with the GBA and their recommendations deeply inform policy.

GBA is also concerned with the need for market transformation within the green building industry and the products and services that arise from it. A fairly recent branch of the organization has been created to promote products and manufacturers that can be utilized in sustainable building efforts. This includes building materials, renewable energy technologies, and products with reduced chemical components. GBA works to disseminate information about these products to developers, builders and architects who have limited knowledge about how to pursue sustainable building and are looking for products to use in their green projects. This effort also simultaneously increases the

business for the companies that produce these products so they can continue to develop and provide green building tools and ideally at a lower cost as the market grows.

D. The Contribution from the Private Sector

Following the initiative of the city in greening its public buildings and due largely to the establishment and growth of the Green Building Alliance, a significant fraction of developers and building professionals have surfaced as knowledgeable and enterprising green professionals, committed to building green and disseminating the practice throughout their industries. However, these developers and contractors are not pushing the green message solely out of a social or environmental mission, but have seen that the business case for green building is a strong motivator to incorporate energy efficiency strategies in their buildings. After a few private developers began experimenting with more sustainable building they found that the overall savings they were receiving far outweighed the initial cost of implementing the more efficient design. Building professionals who believed in the economic argument for building green have been a pivotal part of creating a solid green building industry in the city of Pittsburgh by promoting the financial message and arguing that it shouldn't cost more to build green. At the Green Building Alliance a key message they have come to utilize is 'you have to show them the green before they'll go green', meaning they have found that developers are most compelled by the financial benefits of green building, and without the ability to

make this argument, the movement towards greener buildings would be a much larger hurdle to overcome.

The strong network of experienced green building professionals is also facilitated in part by the technology sector that is currently flourishing in Pittsburgh as well as the many other institutes of higher learning such as Carnegie Mellon University (CMU). These institutions engage in highly productive research and development to further renewable energy technologies, sustainable building materials and construction methods to achieve healthier, high performing buildings. CMU and the University of Pittsburgh are both leaders in the energy and environmental research field with nationally and internationally recognized centers. University of Pittsburgh is home to the Mascaro Center for Sustainability Innovation, which focuses on the design and form of sustainable neighborhoods. CMU's Steinbrenner Institute for Environmental Education and Research consists of several research centers including the Center for Building Performance and Diagnostics, the Institute for Advanced Energy Solutions and the Green Design Institute. This knowledge directly feeds into the Pittsburgh building industry and provides a constant nourishment of expertise and innovation.

E. Pittsburgh Climate Change Initiatives

Pittsburgh began a climate change initiative in early 2008 that resulted in a Pittsburgh Climate Change Action Plan that was passed by the city council in late 2008 as a document to guide carbon reduction efforts. The city has a goal of 20% reduction of

greenhouse gas emissions by 2023, which translates into a reduction of approximately 1.3 million tons of greenhouse gas emissions annually.

The strong commitment to a concrete greenhouse gas emission reduction goal has played a role in encouraging and guiding greener building practices. The Green Building Alliance oversees the implementation and facilitation of the Climate Change Action Plan. This choice of leadership for the city's climate change goals indicates that Pittsburgh recognizes the significant role of buildings in emissions. With GBA coordinating the climate change initiative, construction and rehabilitation of greener buildings has inevitably become a cornerstone of the larger climate action movement in Pittsburgh. This is an important observation of the organizational structure of this plan, as some cities that have adopted climate change initiatives tend to focus on land use and transportation. It may be that the ethos of the city with regards to green building does stem from this larger collective support that this is an important component of global greenhouse gas emission reduction efforts.

F. The Role of Utility Providers

Changes in how utilities are provided to the residents of Pittsburgh have played an important, and somewhat unexpected, role in promoting greener building in Pittsburgh. In Pennsylvania the 1996 Electricity Generation and Consumer Choice Act imposed caps on the rate utility companies charged. These rate caps have been expiring for some companies and will be expiring for all utility companies by 2010. The expiration

of the rate cap has caused significant jumps in what consumers are paying for electricity, ranging from a 20% to 70% increase (PUC). The Pittsburgh area saw a 20-40% increase in rates when Duquesne Light Company's rate caps were eliminated. This hike in energy costs across the state and in the city spurred a renewed interest in incorporating energy efficiency measures into existing and new buildings. The expiration of the rate cap only strengthened the business case for green building.

The state government has subsequently imposed strict regulations on utility companies to meet energy efficiency goals. These are both to further larger energy reduction goals for the state as well as to reduce the burden of expected increased rates on consumers due to the expiration of the rate caps. The General Assembly Act 129 lays out concrete requirements on utility companies to create and implement programs aimed at improving consumer's energy efficiency through a range of strategies including rebates on high efficiency HVAC systems to load control programs for small and large commercial or industrial customers. In addition, the act outlines specific load reduction targets each utility company must meet to avoid a substantial fine of up to \$20 million. Duquesne Lighting Company would need to reduce the electricity consumption of its customers by 422,565 megawatt hours (MWH) to meet a 3% reduction target. The act requires an overall 4.5% reduction in peak load, defined as the system's top 100 hours of consumption, by May 31, 2013. Act 129 appoints the Pennsylvania Public Utilities Commission to oversee utility companies to ensure that they meet requirements laid out in the legislation.

G. Conclusions from the Pittsburgh Case

Though the local government in Pittsburgh is involved in promoting green building policies, it is mainly through the greening of prominent public buildings that the role of the public sector has been paramount. The government has not been particularly aggressive with policies, either through building code amendments or through incentives. The incentive policy that has been passed has never been used and the building code upgrades only apply to public or publicly funded buildings, which limits the scope of effect of these policies. Yet Pittsburgh still ranks as the seventh city in the nation in number of LEED certified buildings. In a New York Times article Rebecca Flora, former director of the Green Building Alliance and the current senior vice president of education and research at the USGBC was quoted, "there was no government-driven agenda here. Pittsburgh's doing green in a weak market city with existing building stock, and it's done it without government programs" (New York Times 2009). Pittsburgh presents an example of how a city can promote sustainable building standards without the aid of stringent government-led policies.

The green building movement in Pittsburgh was truly a grass roots movement, heavily facilitated by a research interest in the science and technology behind more efficient buildings as well as a strong push from the non-profit sector to prove the marketability of green building.

In the Pittsburgh case, it was not policy but the non-profit sector that worked to initially spur the market transformation towards green building. The fact that

organizations and individuals who did not have a great deal of disposable funding to put towards this cause were still able to facilitate a remarkable movement towards greener buildings in the city speaks to the concept that green building need not be propped up by funding but can evolve into an entirely financially sustainable practice.

Chapter 6: Case Study of San Francisco, CA

A. The Progression of Green Building Policies in San Francisco

The city of San Francisco has pursued an aggressive green building agenda through the use of both incentives and regulation changes to encourage builders to meet a high standard of construction. In 2004 the first piece of legislation that addressed this issue was passed which required all new construction or substantial renovations of municipal owned buildings to meet a LEED silver level certification. Though this legislation came earlier than many other cities, it was limited only to public sector buildings. In 2006 the Green Building Priority Permitting program was created and put into effect. Buildings achieving a LEED Gold level certification would be moved to the front of any queue in the permitting process, including environmental impact reviews, building inspections and public works inspections.

B. The Mayor Newsome's Green Building Task Force

Process and Participation

These policies established a precedent for the city's interest in environmental stewardship in the building industry, yet were still relatively low-impact policies. In early 2007, Mayor Newsome initiated the process of creating green building regulations on

the private sector by organizing the Mayor's Green Building Task Force. The task force was made up of ten members representing private sector interests in the building industry including developers, property owners, architects, contractors, and engineers. The task force met bi-weekly over a three-month period. All the meetings were open to visitors and the public as transparency was of the utmost importance in the process of drafting recommendations. The recommendations that the task force ultimately arrived at and included in their final report highlighted a few key elements of what the task force considered an effective and realistic approach. These primary elements of the policy recommendations were that they be, "progressive, readily implemented, introduced in phases, increasingly stringent over time, able to create incentives for buildings that exceed requirements, of sufficient scope and breadth to provide measurable impact, and initiated in 2008 and produce significant results in five years." The task force also recognized a distinction to be made between commercial and residential buildings when creating policies for green building standards. It was concluded that the commercial building industry had already established significant familiarity with green building standards and practices as compared to the residential building industry whose movement towards green building practices was fairly nascent. Therefore, recognizing these fundamental differences, standards would vary between residential and commercial buildings and buildings of different sizes as well.

After two task force meetings it was also decided that the city policies should reference an already established third-party rating system for green building rather than create a new system by which building professionals in San Francisco designed and built

their buildings. The LEED rating system was chosen in addition to the Green Points Rated system, which applies to residential buildings and is administered by the non-profit organization Build it Green. This would create consistency in the standards as well as a larger scope of recognition of the standards and a larger pool of resources available to projects to help meet those standards. The task force also found it less controversial to use a third-party rating system that is already widely accepted, as the city would not have to develop its own system that would be open to scrutiny and criticism by the public and the building industry, which could lead to a cumbersome and time-consuming process.

An additional concern of the task force as well as the city government was the potential for increased costs in the form of permitting fees or a delayed review process that may occur as a result of a green building program. If new and more stringent regulations are put in place, staff in the building inspection, planning and environmental review departments of the city will require additional training in assessing compliance with the new requirements as well as additional staff for increased demand on their time to do so. Using a third-party rating system to structure the policy around mitigates these issues somewhat. Submitting documentation created by a third-party certifying body and receiving third-party certification as proof of meeting the given requirement lends itself to a smoother design, development and approval process. City government staff responsible for reviewing projects and confirming compliance with building code standards would require no additional time and training to review new projects if a third-party organization was supplying, processing and signing off on the project design

and construction. If the building is being built to certification standards but is not pursuing actual certification, the project is required to have a Green Building Compliance Professional of Record who is an individual with sufficient background and expertise in the LEED or Green Points Rated systems. The green building professional is required to sign off on the project, along with the architect, confirming that the project meets the necessary standards. This again ensures that building inspections and permitting personnel in the city would not need additional training in green building and design.

Phil Williams, the chairman of the green building task force, found the most value in the process rather than the culmination in recommendations. He believes it is possible to replicate the model of this process in other municipalities and have tailored, effective policy outcomes using the same principles. The involvement of the private sector resulted in policies that were more rigorous and far-reaching than what the public sector alone may have formulated. The concept of buy-in from the private sector is most likely what resulted in this outcome. The act of reaching out to the building professionals and bridging the gap between government and those who experience the policies on the ground created a sense of tolerance, understanding and flexibility.

In the city of San Jose, the city government approached the green building policy issue in a different manner. They used an internal planning process, involving only select city government entities, with the department of building inspections as the primary facilitator of the creation of the policies. There was a great deal of resistance from the building and construction industry. Phil Williams participated in the second attempt in

San Jose to establish green building requirements. He brought the San Francisco model into play and opened the discussion to the private sector. The result of the second attempt was the subsequent buy-in of the private sector and significantly diminished resistance. Mr. Williams describes the sentiment of the building professionals in the task force as wanting to produce worthwhile results so the city would move forward with recommendations that were informed by private sector interests that understood the industry and the key issues. “We took it upon ourselves to recognize that if we didn’t do something good and surprise people that we would get something from the city without private sector buy-in.”

C. Current Green Building Policies

The concrete recommendations that the task force provided in their final report were ultimately adopted by the city in their entirety. The recommendations included provisions for incentive programs and policies with the particular structure of the incentive left to the discretion of the city to establish. The green building requirements currently in place in San Francisco are as follows (Mayor’s Green Building Task Force Report and Recommendations 2007):

A. New Large Commercial Buildings >25,000 sf or over 75 ft in height (offices, hotels, etc.)

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
LEED rating	Certified	Silver	Silver	Silver	Gold

Beginning in the 1st quarter of 2008, new large commercial buildings over 25,000 sf or 75 ft in height will be required to achieve LEED Certification. The requirements will increase over the next five years so that by 2012 these buildings will be LEED NC 2.2 or LEED CS 2.0 Gold certified.

B. New High-Rise Residential Buildings over 75 ft in height

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
LEED rating	Certified	Certified	Silver	Silver	Silver

Beginning in the 1st quarter of 2008 new high-rise residential buildings over 75 ft in height will be required to achieve LEED Certification. The requirements will increase over the next five years so that by 2010 buildings of this type must be LEED NC 2.2 or LEED CS 2.0 Silver certified.

C. Large Commercial Interiors & Major Alterations (25,000 sf and over)

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
LEED rating	Certified	Silver	Silver	Silver	Gold

Beginning in 1st qtr of 2008 new large (25,000 sf or more) commercial interiors & major alterations (where interior finishes are removed and upgrades to structural and M.E.P. systems are proposed) will be required to achieve LEED Certification. The requirements will increase over the next five years so that by 2012 buildings of this type must be LEED EB 2.0 or LEED CI 2.0 Gold certified.

D. New Mid-Size Commercial Buildings 5,000 sf or more and < 25,000 sf & height < 75'

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
LEED Credits	0	3	4	6	7

Beginning in 1st qtr of 2008 new mid-size commercial buildings (over 5,000 and less than 25,000 sf and less than 75' to the highest occupied floor) will complete a LEED checklist but not be required to achieve any points. In 2009, a select list of three LEED credits must be achieved, increasing to seven credits in 2011. The required credits are consistent with the credits required for the new commercial buildings 25,000 sf and over.

E. New Midsize Multifamily (5 units and over and less than 75 ft in height)

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
GreenPoints	0-	25	GPR 50	GPR 75	GPR 75

F. New Small Residential (1-4 units)

	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>
GreenPoints	0	25	GPR 50	GPR 50	GPR 75

Beginning in the 1st qtr of 2008, a voluntary program requiring a completed GreenPoint checklist will be initiated for all new low-rise residential developments (under 75 ft in height). The year 2008 is proposed as an education and orientation period for residential, so no points will be required. Beginning in 2009, twenty-five GreenPoints must be completed from the checklist. In 2010 projects must be GreenPoint Rated (50 pts.), increasing to GreenPoint Rated (75 pts.) for mid-size multifamily in 2011, and for small residential projects in 2012.

Phasing

It is evident that a unique and vital component of these regulations are that they are phased over time. The requirements in 2012 are far more stringent than the requirements in 2008. In addition, 2008 was seen as an adjustment year for smaller residential buildings and therefore have the most lenient requirements in that year as compared to commercial and larger residential buildings. The requirements for commercial buildings and larger multi-family residential buildings start at a higher standard and ramp up more significantly over the four-year time period given the already prominent role of green building practices in with these building types.

Phasing the requirements over four years and gradually increasing the standards has many strategic benefits. The task force recommended that no policy be implemented without a minimum of 120 days prior notice that the regulation will be put in place. In practice, the regulations went into effect 1.5 years after the task force drafted their report. By providing a phased plan spanning four years, building professionals are given ample time to adjust to the anticipated requirements and the changes are not perceived as a sudden shock to adjust to. Allowing for a period of time of adjustment before the policy is officially instituted also gives building professionals the opportunity to seek out assistance and resources to help them navigate potentially uncharted territory as some green building practices are significantly different from traditional design and construction.

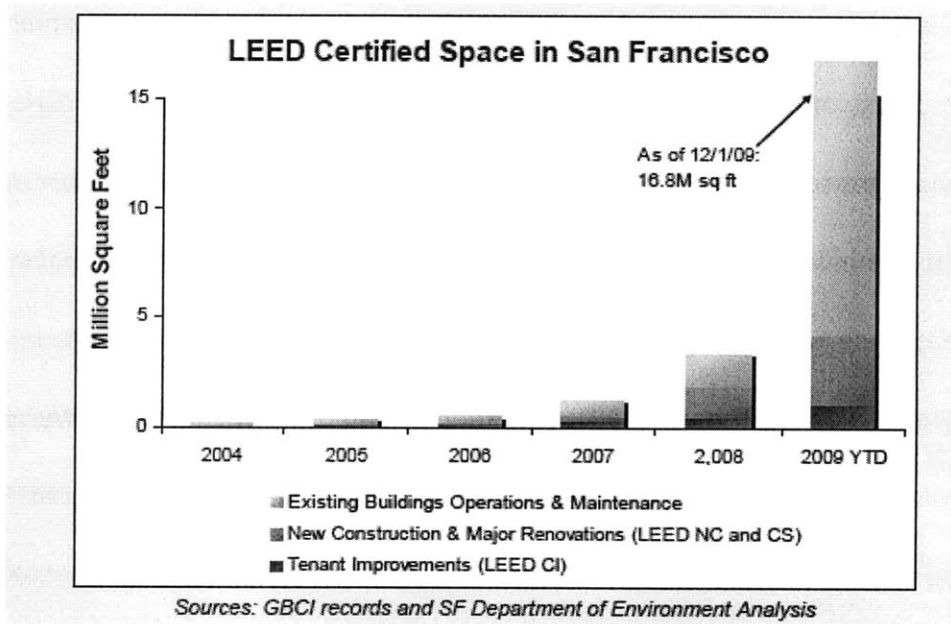
Phasing the green building requirements also addresses the phenomenon that constructing a green building has a cost premium associated with it, yet this premium is

decreasing over time as sustainable design and building becomes a mainstream practice. A general contractor of one of the largest construction firms in California and San Francisco has noted that the costs he faces to build a green building have been going down over time. It is both a matter of the green industry itself and the more widespread availability of products and technologies at more affordable price points but also the individual expertise of the building professionals working on a project. The first green project a contractor works on has a much larger cost associated with the incorporation of its green features as compared to a seasoned general contractor who has streamlined the process of implementing those same features into a project. Combining these two effects, the green building learning curve over time and the development of the market for green building products, materials and technologies, the importance of time becomes critical to the understanding of how green building regulations should be designed.

After the new regulations were rolled out based on the mayor's task force's findings, the mayor deemed the new policies as necessary and as an example for other cities to follow. "It requires a mandate in order to get people to do what's in their best interests sometimes. It's called change," said Newsom, who also predicted the new standards will have "national reach." (USA Today 2008)

D. The Existing Buildings Task Force

In 2009 Mayor Newsom convened the Existing Commercial Buildings Task Force to address the issue of the existing housing stock and its significant effect on San Francisco's greenhouse gas emissions. The final report including recommendations by the task force was completed in December 2009. The task force emphasized the role of existing buildings in meeting carbon emissions reduction goals in San Francisco, citing a goal of a 50% reduction in 20 years, or a 2.5% reduction annually.



The recommended strategies for greening existing buildings were guided by a few key principles, similar to the process of the new construction task force. These larger principles were to maximize transparency with regard to establishing and meeting energy performance goals, partner with the private sector and assist in meeting goals, attract game-changing capital through innovative financing, and lead by example by improving the performance of municipal buildings. The existing building task force

produced an extensive strategic plan for tackling energy performance of the current building stock, and attempted to address the difficult barriers to implementation of these types of policies. Whereas most policies addressing existing buildings are designed to provide strong financial incentives, the recommendations of the existing buildings task force include mandatory requirements that would be enforced on property owners of existing buildings. The suggested requirements are

- Mandatory energy audits conducted every five years for commercial buildings
- Property owners or managers must use the Energy Star program's Portfolio Manager software to track and benchmark their building's energy performance. This data would then be disclosed and made available in a city-maintained database
- Create a Green Tenant Toolkit with models and best practices for owners, managers and tenants to work to align their interests and lower overall operating costs and energy use
- Encourage sub-metering for multiple tenants in one building
- Require the city to also track and benchmark publicly owned and operated buildings as well as lead by example by implementing energy efficiency measures in these buildings
- Provide technical assistance for greening to commercial building owners and operators

- Investigate create financing options for energy efficiency such as ratepayer funded programs, mortgages or loans paid back with subsequent utility savings
- Work with commercial building owners to identify and package available funding and incentives for energy efficiency retrofiting

E. Financing and the Role of Pacific Gas & Electric

Pacific Gas & Electric (PG&E) is the primary utilities provider for the city of San Francisco. PG&E offers a program called Savings by Design which offers developers and the design technical assistance to work to create a more energy efficient whole building design as well as provides a portion of the additional funding necessary to construct the improved building design. The program has not been heavily used, primarily because it is not heavily advertised. Developers and builders in general are not aware of the program and the funding opportunity that comes along with it. For the program to be more successful, a different marketing approach will most likely need to be undertaken. Currently, PG & E does very little outreach with regard to their energy efficiency programs.

Phil Williams argues that the most important thing to be aware of when developing financing mechanisms is that one should not offer rebates and financial assistance for something that will never be economically viable in the long run. Funding should only be made available for an initial period of time and the given product should ideally become affordable over time and will no longer require the financial support to

be implemented. This is one of the ways that the importance of market transformation comes into the equation. The hope is that as green building becomes standard practice, building professionals will gain the expertise needed to streamline the green building process and minimize costs over all. Additionally, the practice of integrating green measures in an earlier schematic design phase will also become standard practice and will contribute to significantly reduced costs associated with green building. Finally, as demand grows for materials and services pertaining to green building, competition within the industry will drive prices for products and services down. The continuation and acceleration of research and development within the green building industry will also create cheaper alternative products to what are currently pricier options used in green buildings.

F. Conclusions from the San Francisco Case

San Francisco offers another example of successful private sector involvement in the formulation of green building policy, similar to the process the city of Boston engaged in. The participation of building professionals in the San Francisco Green Building Task Force was even more substantial than Boston's, given that it was exclusively made up of individuals representing the private building industry. These same individuals proved to be strong leadership in the industry, promoting policy and encouraging their colleagues to consider adopting green building practices. The individuals on the task force advocated the financial argument for green building, and

were able to successfully bridge the gap between the private and public sectors and their potentially divergent interests.

In the San Francisco case, a market transformation in the building industry towards green building was spearheaded initially by building professionals who had personally experienced the economic argument for green building to coming to fruition on many projects. It was the private sector representatives who recognized the importance of continued practice and experience with green building to reap the necessary cost savings in the green building process, and therefore pushed the city government to pass substantial requirements that would mandate all project teams to learn and implement green building principles and gain the valuable experience they need for green building to be profitable for them on future projects.

The other highly noteworthy feature of the San Francisco policies is the strategic phasing scheme. The required standard for 2012 is more stringent than anything most cities are considering, yet by starting with a more palatable requirement, the city can effectively reach such an impressive level of green building standards by 2012 with little opposition and frustration from the building industry. Though it means an additional three years before the desired standard is met, once LEED Gold is required, building professionals would have a great deal of experience with green building from having to meet other LEED standards in preceding years, that obtaining a LEED Gold level will be considerably more cost-effective and manageable than it would be today. In addition, the phasing of the policies takes into account that the market for green building will

change over the next few years and therefore approaching the issue with different requirements as time progresses is also strategic and practical.

Chapter 7: Findings and Recommendations

A. Tapping into Market Potential

The most effective way policy and regulation can be used to promote widespread green building practices in a city is by creating and supporting the conditions necessary to make a market transformation in the building industry possible. A systematic approach, which includes both policy and programmatic strategies, should aim to facilitate green building in such a manner that a continuous infusion of large-scale financial support is not needed in the private sector over time. The policy should encourage the mechanisms that would allow green building to become a self-sustaining practice, with respect to expertise in the industry as well as financially. There are primarily two components to a market transformation, one is facilitating the acquisition of the appropriate training and expertise in green building in order to realize the reduced costs associated with this experience and the second is the shift in the market to add real financial and marketing value to green buildings. This stands in contrast to a program or policy that simply pumps finite amounts of money into direct funding of green projects. While this may have its place in a larger strategy and timeline, money and time is better spent on a mechanism that facilitates a self-sustaining movement towards green building.

Addressing the supply side of green building includes both developers as well as building professionals, who can play different but equally important roles in the decision

to build green. A policy that provides building professionals with the tools and experience to streamline the green building process and ultimately lower costs will subsequently make green building a more affordable option and therefore a more attractive option for developers. With respect to this phenomenon, policy can support the process of builders, engineers and architects gaining the necessary experience to trigger this process towards affordability and market-based incentives to developers to undertake green building.

Alternatively, developers may be interested in building green due to the increased marketability of such a project and will assemble a design team that has the skills necessary to undertake the greening of a project. This process hinges on the marketability of a green building, which is ultimately a matter of what the demand for green building from the consumer side is. Homeowners, tenants and commercial property owners have the power in the market to afford additional value to a green building, if they are made aware of the benefits that go beyond what a traditional building can offer. A homeowner or tenant may be interested in the value of saved utility costs and increased durability; a commercial property owner may be attracted by the noted increased productivity of workers and children in green buildings. By virtue of these elements of a green building that are valued by consumers in the market, developers will also subsequently have a market-based incentive to be more inclined to build green.

In this greater scheme of a market transformation in the building industry, which includes inputs from both consumers and suppliers, it is important to note that there is

an ongoing evolution taking place. A market transformation is not a static condition, but rather a continuing process with many moving parts, actions and subsequent reactions within the market. For example, as demand for products and services grows, the market can support more competition and suppliers, subsequently driving the cost of this type of building further down. Given the importance of all players in the market evolution, it is important for all stakeholders to be addressed, engaged and committed to this process. Policy cannot leave one aspect of the market behind and address only the supply or the demand side exclusively in order for all the pieces to come together in synergy and result in the most desirable outcome.

B. Policy Recommendations

The idea of facilitating a market transformation through policy can be seen as somewhat abstract, however, the preceding case studies offer insights into what specific actions a policy can mandate that will concretely contribute to this transformation.

There are two angles from which policy can approach this issue. As stated above, there is the influence on cost through building professionals and the influence of consumers on increased market value for green building. These two phenomena will spur developers to build green ultimately not due to the requirement, but due to a sound understanding of what is desirable in the given market conditions.

Facilitating Affordability

An effective green building policy should facilitate affordability through the following three avenues:

1. Creates conditions that cause building professionals to take the first steps to gain experience with green building

The first, and most straightforward way that regulation is an effective tool in promoting green building is by essentially forcing building professionals and developers to gain experience with green building practices and methods. In order to acquire the experience and expertise necessary to have the costs of green building go down significantly, building professionals have to begin the process of scaling the steep learning curve. Because a particular team's initial attempts at the construction of a green building may cost more due to the inexperience of the design team, building professionals and developers may be less inclined to attempt it without a requirement by law.

2. Emphasizes and facilitates a team-based integrated design approach

The integrated design process essentially implies beginning a project with the intent to incorporate as many green building principles as possible and utilizing a whole-building approach in the design and construction as opposed to viewing individual

components of the building as separate and brought together only towards the final phases of schematic design. By doing this, decisions about design and systems can be made early on and can be made more strategically by all members of the design team collectively. By taking the whole building approach, the final product tends to cost less to construct and throughout the operation of the building. Since building green is significantly cheaper when this approach is taken, this is a key aspect to overcoming the perceived financial obstacles to sustainable building practices.

Policy can promote the integrated design approach by requiring certain meetings or charrettes to take place among all members of the design team as part of the permitting or review process that takes place in the city for any project. Checklists and written narratives of the decisions that were discussed and arrived at could also be useful as part of the content in the materials a project must provide to a review board.

3. Addresses education and technical training for green building practices in the building industry

Regulation through building code upgrades can spur the market transformation to a certain extent. By requiring the building industry to meet a higher standard it forces the process of learning how to meet this new standard. However, the regulation itself does not give guidance on how to concretely gain this knowledge and execute the necessary green building practices.

The provision of training and technical assistance can be compared to the proverb 'give a man a fish and he eats for a day, teach a man how to fish and he'll eat for a lifetime.' Rather than simply facilitating the payment of large green premiums, a policy should provide the potential framework and avenues of dissemination for the skills to efficiently and cost-effectively implement green measures. This is also particularly important because as an architect, engineer or general contractor learns the technical background and practices implementing green measures in their projects, the costs associated with doing so drop significantly. Therefore, providing technical assistance can assist with the market transformation within the green building industry by making green building services more affordable over time.

Policy can facilitate the acquisition of training and technical experience through a few different avenues. One method is to require a certified professional, such as a LEED Accredited Professional, to be a member of the design team. In this way, a source of green building knowledge is automatically at the disposal of the project team. A policy can also require that professionals in the building industry complete certain trainings, workshops, courses or certifications to demonstrate some rudimentary, or detailed, knowledge of green building principles.

This piece of a successful green building policy is best aided by other organizations and programs as detailed below in section C, such as green building non-profits or third-party certifying organizations like the USGBC.

Stimulating Demand

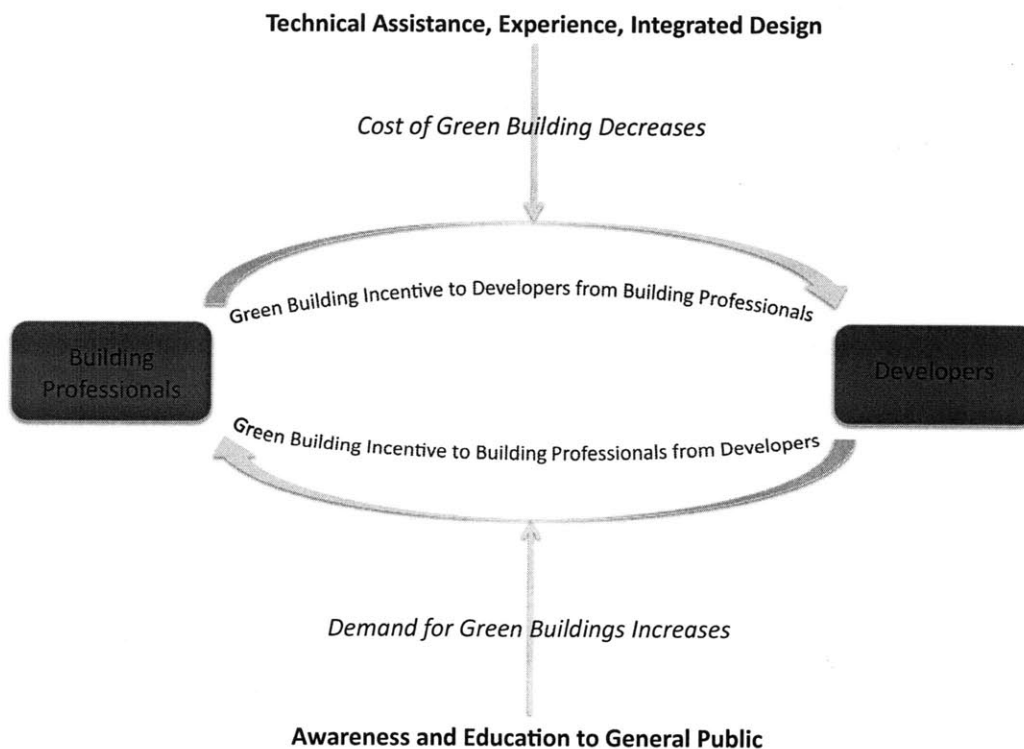
In order for consumers to attach an increased value to green buildings in the market, the concrete financial benefits as well as the non-monetized benefits of owning or operating a green building must be emphasized and made apparent. An effective green building policy should incorporate a strategy for public awareness campaigns to promote the virtues and practice of green building on a large scale with the individuals (tenants, homeowners, commercial property owners) who will demand those services and products from the building industry.

Through educating the general public, the additional valuation of a green building over a traditional building will most likely fall into place. As people understand what a green building is and the concrete benefits it provides, green will be considered an amenity, which will subsequently be factored into the price tag of a home, apartment unit or building. In cities where there is a great deal of interest and awareness about green buildings, market studies have shown that financial value is in fact placed on a greener building, both through sale prices as well as rents.

In a similar vein, as the general public becomes more aware of the benefits of green building for both themselves, their families and the environment, demand for green building in general will grow which will trigger more construction companies and architecture and engineering firms to move into providing green building services. Demand for products used in green construction will subsequently increase, encouraging the establishment of more companies that manufacture these products

which will create competition and a robust market for green building professionals, which again relates back to the concept of a market transformation.

A market transformation is both a process as well as a feedback loop. Certain responses to occurrences can further reinforce other aspects of market growth, multiplying the effects of a single action. The diagram below aims to illustrate the various actions and reactions present in the market transformation process proposed in the conclusions of this study. The items in bold are elements provided by effective policy and programmatic approaches. The italicized phrases denote an intermediary step or process.



Both the increase in the demand for green buildings and the decrease in the cost of green building feed into a loop that relates building professionals (architects, engineers, general contractors, etc.) and developers. In this diagram, the building professionals represent the suppliers of a product, the product being green building services, and the developer represents the consumer of the product. As general demand for green buildings in the property market grows, the developers wish to consume more green building services from building professionals. This fuels the growth of the green building businesses. On the other side of the loop, as building professionals gain experience and expertise, they can offer a reduced cost of green building which in turn creates demand from the developer for more of their services as well. The direction of the arrow in the loop denotes where the force is coming from, and what party it is acting on, that is driving the increased level of green building activity.

Process

Another secondary consideration in the creation of green building policy is the process by which it is created and implemented. This process can either strengthen the outcomes of the policy or hinder them. Cities that demonstrated relative success with their promotion of green building utilized the policy-making opportunity to begin the dialogue between the private sector and the city government, often through the convening of a task force to address the issue. In turn, building professionals felt that

their interests were being considered and would be incorporated into any further policy decisions.

A successful green building policy-making process utilizes and executes the following elements:

- Achieves private sector buy-in by including the private sector in decisions surrounding green building policy
- Preempts the implementation of policies with sufficient transparency and ample notice ahead of time that the policies will be put in place in accordance with a certain timeline
- Phases the requirements of the policy so they gradually work up to the most stringent standards desired

C. Supporting Actors

This study finds that regulation is a powerful tool in many respects for promoting green building in a city. However, policy is most effective in conjunction with other contributions from non-policy approaches. This includes non-governmental organizations, and non-regulatory programs and incentives.

The Role of Third-Party Green Building Programs

Third-party green building certification programs like LEED and Energy Star Homes have an important place in the formulation of green building policy. They offer ready-made performance and prescriptive approaches to constructing a high performance green building. Not only do these rating systems offer a neutral criteria for a policy to reference, that wasn't specifically created by the private or public sector within that city, it also offers a standard that is recognized nationally, and sometimes internationally as well. It allows for a more standardized definition and understanding of green building. Though there has been some criticism about the inherent conflict created by requiring third-party certification in a public policy, overall in fact, it lends a transparency to the process that would otherwise not be present. Along with this standardization also comes the availability of certifications for professionals that have widespread recognition and credibility, such as the LEED professional accreditation program.

Perhaps the most relevant contribution by these organizations is the availability of an extensive toolkit of resources to better understand and implement green building measures to achieve certification. By referencing a third-party standard like LEED in a green building policy, the city is automatically providing a far-reaching support system for the building industry to meet the new requirement without spending a cent of public money.

Utilizing Collaboration and Support from Other Sectors

In all but one case study, the non-profit sector played a key role in supporting green building in a city. As stated above, if a city will require the practice of a different type of building, resources and support mechanisms must be identified and provided. One of the most effective sources of this support is from non-profit organizations. These organizations have the benefit of being a neutral party without a financial or political stake in any particular outcome. The organization is also wholly dedicated to amassing knowledge and information and providing training and education, as opposed to an existing government agency that already has a full plate with other tasks, or a private company that would require some monetary compensation for their services. Green building non-profits have a potentially vital and indispensable role in the furthering of the green building agenda.

Strategic Use and Limitations of Incentives

The findings of this study with regard to incentive programs and policies are that these mechanisms can be useful to 'soften the blow' of transitioning to green building practices from more traditional construction, but are not sufficient as a stand-alone approach to create the necessary self-sustaining change required. If incentives are utilized, they should be strategically designed to effectively work as desired. For example, a density bonus only acts as an incentive if the building is taking place in an

area where property values are high enough to support added density in a development. If this is not the case, the incentive is essentially meaningless, as noted in the Pittsburgh case study. Similarly with expedited permitting, if there is not a great deal of new development occurring at the time, the queue for environmental reviews and the permitting process is not cumbersome enough to make expedited permitting appealing to a developer, which has occurred in San Francisco due to the current depressed housing market.

Cities should also be wary of incentive policies that offer direct financial support. These policies not only require an available pool of public funding to dip into, they also prop up the green building industry in a somewhat artificial manner. Rather than facilitating the movement towards affordability in the green building market and industry through the necessary market transformation, these policies simply pump money into projects that then are perceived as financially infeasible without the public support. They are ultimately unsustainable policies and do not solve the problem in the most transformative, efficient way possible.

However, incentives can have their place if they are designed and publicized as being a temporary option available to developers until the desired market transformation occurs, which will take time given that it requires an entire industry to evolve and adjust. It appears that these types of incentive programs offered by the city government can be viewed as the cherry on top, but not the bread and butter of a citywide green building program.

D. Limitations of the Analysis

This study looks at one aspect of the greater conversation surrounding the promotion of green building. Citywide policy is only one piece of a much larger picture where multiple levels of policy, community-based programs and many other potential models for the implementation of energy efficiency interplay. This study also only looks at four major cities in the United States. It is quite likely that many other cities in the country offer further insights as to what may or may not work in implementing citywide green building policy. This study is also a snapshot in time of the green building policy climate in these four cities. This is a field and topic that is growing and evolving rapidly, and the pertinent issues to address will likely evolve over time.

E. Conclusion

Citywide green building policy has taken on many different forms resulting in many different outcomes. Though some attempts at promoting green building through policy have failed, others have flourished and successfully achieved the desired ends through strategic formulation. An understanding of the market evolution of the building industry towards greener building practices is the most important starting point to the strategic formulation of a green building policy. This includes holistically addressing both the consumer and supplier side of green buildings through facilitating increased affordability of green building as well as promoting increased market value of green

buildings. Regulatory policy, in conjunction with support from non-profit organizations and limited financial resources, offers a great deal in facilitating a comprehensive and self-sustaining market transformation in the building industry towards more sustainable building practices.

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