VALUE AND MOTIVATIONAL THRESHOLDS

IN THE RETROFIT DECISION PROCESS

A Thesis

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ABSTRACT

Globally, buildings contribute thirty percent of the CO2 emissions yielding 8.6 billion tons annually. A majority of existing buildings in the United States, and worldwide, will need to undergo a retrofit for environmental sustainability. The aim of the research is to investigate the process and the players involved in the retrofitting of buildings, and identify the enabling and hindering factors within the relationships of key stakeholders. This study will expand upon the green business case for stakeholders involved in the retrofit of existing buildings. Toward these goals, the study employs a case study methodology with qualitative research design in which surveys and interviews are conducted with key players of retrofit projects. Results will be compared to a theoretical basis of the LEED for Existing Building and Operational Maintenance program. Through thorough analysis, the study assesses commonalities and uniquenesses within the stakeholders of different cases. The research intends to establish reasoning about the slow rate of the sustainable industry, and suggests what must occur for the system to adapt accordingly to become more applicable and to accelerate the transformation of the existing building stock, given the complexities of the built environment sector.

BIOGRAPHICAL SKETCH

Jaclyn Loren Popkin, daughter of Joan and Gregg Popkin, graduated from Horace Greeley High School in Chappaqua NY in 2007. Subsequent to her high school graduation, Jaclyn attended college in pursuit of a Bachelor of Science degree at Cornell University through the College of Human Ecology majoring in Design and Environmental Analysis, with a concentration in Interior Design. Upon her acceptance into an accelerated 4+1 year Masters program through the department of Design and Environmental Analysis, Jaclyn was able to continue to pursue her interests, majoring in Human Environment Relations, concentrating in Sustainable Design Studies while attaining a Graduate Minor in Real Estate through the Graduate Program in Real Estate.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER I - Introduction

Tragedy of the Commons

> "Picture a pasture open to all. It is expected that each herdsman will try to leap as many cattle as possible on the commons. Such an arrangement may work reasonably satisfactorily for centuries because tribal wars, poaching, and disease keep the numbers of both man and beast well below the carrying capacity of the land. Finally, however, comes the day of reckoning, that is, the day when the long-desired goal of social stability becomes a reality. At this point, the inherent logic of the commons remorselessly generates tragedy.
> As a rational being, each herdsman seeks to maximize his gain. Explicitly or implicitly, more or less consciously, he asks, "What is the utility to *me* of adding one more animal to my herd?" This utility has one negative and one positive component.
> 1. The positive component is a function of the increment of one animal. Since the herdsman receives all the proceeds from the sale of the additional animal, the positive utility is nearly +1.
> 2. The negative component is a function of the additional overgrazing created by one more animal. Since, however, the effects of overgrazing are shared by all the herdsmen, the negative utility for an particular decision-making herdsman is only a fraction of -1.
>
> Adding together the component partial utilities, the rational herdsman concludes that the only sensible course for him to pursue is to add another animal to his herd. And another; and another…But this is the conclusion reached by each and every rational herdsman sharing a commons. Therein is the tragedy. Each man is locked into a system that compels him to increase his herd without limit- in a world that is limited. Ruin in the destination toward which all men rush, each pursuing his own best interest in a society that believes in the freedom of the commons. Freedom in a commons brings ruin to all" (Hardin, 1968).

The realized threats of global warming present our society with a major challenge to take the initiative and tweak our actions so that future generations may have the freedom to live in a less polluted world towards global harmony. Reaching an equilibrium state where humans live in complete agreement with nature is the ultimate goal. Manipulating the present parasitic relationship, where humans constantly take from the environment, into one that is built upon mutualistic acts is ideal.

Buildings contribute thirty percent of the CO2 emissions, totaling 8.6 billion tons annually. The potential for reductions is most abundant with buildings than with transportation, forestry or industry. “We have the technology. The climate change battle will be won or lost with buildings” (Niclas Svenningsen, UN Environmental Program). Large and attractive opportunities exist to reduce buildings’ energy use at lower costs and higher returns than other sectors. These reductions are fundamental to support achieving the International Energy Agency’s (IEA) target of a 77 percent reduction in the planet’s carbon footprint against the 2050 baseline to reach stabilized CO2 levels called for by the IPCC: Intergovernmental Panel on Climate Change (WBCSD, 2009).

Throughout history various building life safety codes and inspection mechanisms have been implemented due to lessons learned, and in order to prevent disasters. This value of human life is pervading our culture further and reaching aspects on energy and the limited resources our planet holds. Taking account of the energy savings resulting from efficiency investments, even including those not justified economically, an EEB, Energy Efficiency in Buildings study concludes that the net cost additions to achieve the IEA target will be 7 percent of total building costs worldwide. Such codes are best accomplished through collaboration between governments and the building sector, with governments providing regulatory oversight, enforcement and financial support for passive designs, active technologies and disciplines proposed by business (WBCSD, 2009). However, there are various barriers present in the building sector to reach such results.

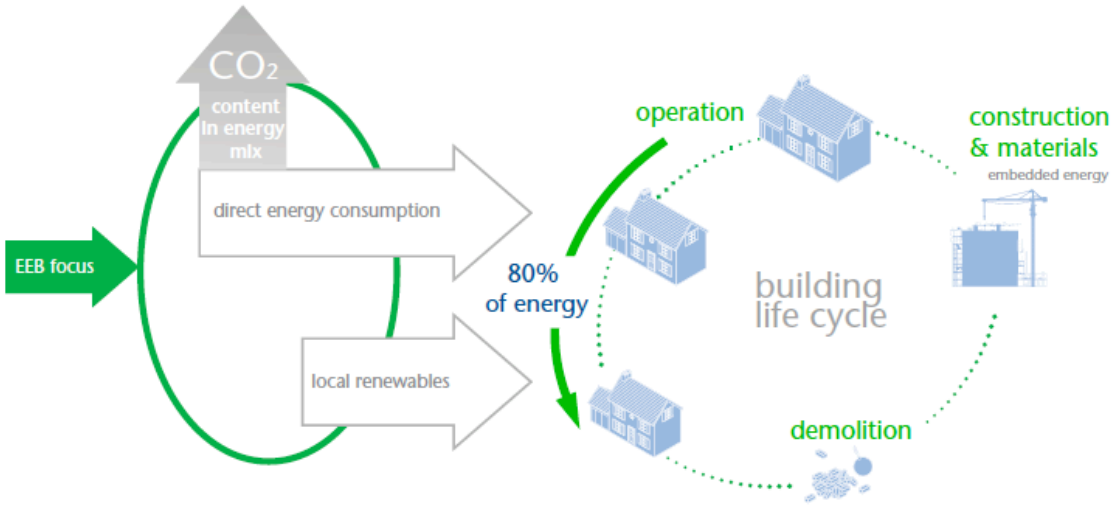


Figure 1.1 - Building Life Cycle (*WBCSD*, 2009)

Much of the buildings energy is wasted because of poor design, inadequate technology and inappropriate behaviors. Eighty percent of energy is used during the operation of a building during its life cycle (see Figure 1.1). It is necessary for businesses to gather and apply expertise and finance to develop and promote new approaches to energy efficiency. However, it is important to note that this transformation will not be achieved through the market alone. Often, various stakeholders including building professionals, owners and users do not grasp the urgency and remain unmotivated to act. All building sector stakeholders must adopt a new mindset in which building energy is a top priority and policy-makers advocate strong regulatory frameworks that support the market transformation (WBCSD, 2009).

The Case for Green Buildings

Green buildings involve a consideration of a wide array of factors such as indoor air quality, energy consumption, materials, water use, and location. The principal goal is

to improve the sustainability of buildings by reducing energy and resource consumption, waste, and inefficiency, while increasing levels of human comfort and productivity. Building users have begun to show that they are willing to pay for these features, particularly when claims of builders and developers are backed up with independent certification such as the US Green Building Council's LEED rating system. Green building factors have repeatedly proven sensible for individual buildings, allowing progressive firms to begin to see opportunities for entire green building real estate portfolios (CTG, 2007). According to data collected from CoStar, LEED- certified buildings are achieving higher rents and occupancy rates than new non-LEED buildings (see Figure 1.2). CoStar found that LEED-certified buildings command rents that are $3-7 per square foot higher than non-LEED buildings, based on 2010 and early 2011 data. In markets where rental recovery has wadded, both LEED and Energy Star[1] certified buildings have yielded high occupancy rates (Real Estate Finance & Investment, 2011).

[1] Energy Star Rating System and LEED Certification will be explained in detail in Chapter III.

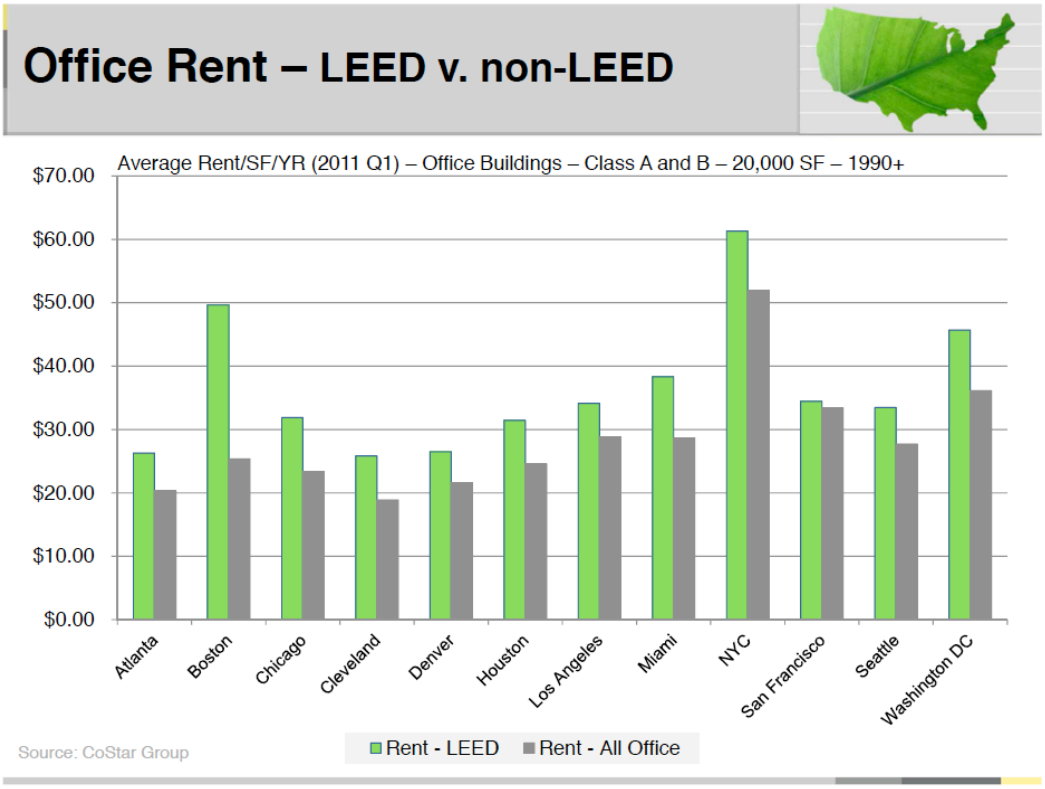


Figure 1.2 -Current Trends in Green Real Estate (CoStar, 2011)

> "Climate change has the potential to impact real estate with new risks and new opportunities. Besides physical risks such as floods, drought and hurricanes, non-physical real estate risks also include the evolution of sustainability related legislation, building codes, land use regulation and increasing utility costs. Monitoring and understanding changing regulation and performance standards helps identify options, and frequently new opportunities, to navigate the maze of new regulations with cost effective solutions for the built environment" (PREI).

For environmental "best practices" to have a chance of developing on a global scale, it is essential to understand what incentives drive the individual parties. In order to attain the overall goal of energy conservation and sustainable practices, multiple key players are involved in the process, including government regulation; tax incentives or rebates, corporate motivations, private enterprise motivation, and many other similar

influences. The question raised is what is the proper blend of the above areas for the success of a project and reaching the over arching goal that must be addressed worldwide. These motives reach across a multitude of industries and key players including local authorities, capital providers, developers, agents, owners, and users. The individual roles and ineffective coordination between participants in this value chain have two significant consequences. Incentives to reduce energy use are usually split between different layers and are not matched to those who can invest in energy-savings measures. Also, there is normally very little opportunity for users to provide feedback through the market to developers or designers (Hua, 2011).

Building Codes & Standards

It is estimated that around 30 percent of the baseline CO2 emissions in buildings projected for 2020 could be avoided in a cost-effective manner if technological advances were introduced to the building sector (UNEP, 2008). Such contributions would include updates in efficient heating, cooling and appliance related high energy consuming areas of buildings. In addition to the many benefits like increased air quality and increased productivity, the major accomplishment would greatly help assist the strategic goal to reduce Green House Gas emissions. However there are many obstacles presented which include the present market, technologies, and end-users which prevent the rational to opt for energy-saving choices in the purchase and use of appliances as well as during the life-cycle of a building. Thus, policies targeted to overcome these barriers for the application of energy efficiency technologies are crucial for Green House Gas mitigation in buildings.

There are three major ways to reduce Green House Gas emissions: reducing energy use, replacing fossil fuels with renewable energy options, and increasing energy efficiency. Currently, policy instruments are available for all of these opportunities to lower emissions. Some policy instruments are focused on the improvements of energy efficiency, reducing energy use, and hence reducing Green House Gas emissions. The reasoning of this emphasis is due to its' direct impact and because it is least expensive among the options.

Countries are slowly realizing the potential in savings described above and the necessity for policies to help achieve the boundaries presented in improving energy efficiency in buildings. Nations around the world have developed their own resources to help actively gauge the building sectors participation in these types of energy reduction tactics. In order to help the sector understand, adopt, and initiate changes, countries have instituted third party organizations that essentially construct guides or checklists to aid the process to reach energy efficient buildings. There are many different types of building evaluation systems in the different countries ranging (but not limited to) from the USA's LEED, Leadership in Energy and Environmental Design, certification process, to the UK's BREEAM, Building Research Establishment's Environmental Assessment Method, assessor for environmental performance of new or existing buildings, to Japan's CASBEE, Comprehensive Assessment System for Built Environment Efficiency, which has additional diverse categories such as temporary construction, heat island, district and region, and uses an assessment of areas to create a numerator and denominator equation. The similarities and differences, and pros and cons of these processes can be examined much further, however they are all steps in the right direction.

To assess the overall feasibility of a multitude of policies used in various countries, a study on policies was conducted comparing the most important policy instruments and the most effective and cost-effective ones in terms of energy savings and Green House Gas emission reductions. Once these were identified, the best-practice examples of implementation of such policy instruments were chosen for further study. Analysis of the success factors of these policy instruments was completed, followed by an investigation of which policies can most successfully overcome market barriers. Finally, an analysis of the special situations such as developing countries in regard to feasibility, implementation and success factors of such policies was studied.

There are more than 30 policy instruments used today, including for example appliance standards, public leadership programs, pricing schemes and many more. There were 20 frequently used policy instruments from this report that were further classified into the following categories. "*Regulatory and control mechanisms*: "laws and implementation regulations that require certain devices, practices or system designs to improve energy efficiency." Following the MURE (electronic database with descriptions/assessments of over 300 policy measures in EU stats) methodology, these tools were further subdivided into *regulatory- normative* for standards and *regulatory-informative* when the end-user is just informed, but not obliged to follow the energy efficiency advice (e.g. labeling). *Economic/ market-based instruments* are usually based on market mechanisms and contain elements of voluntary action or participation, although often initiated/promoted by regulatory incentives. F*iscal instruments and incentives* usually correct energy prices either by a Pigouvian tax aimed at reducing energy consumption or by financial support if first-cost related barriers are to be

addressed. S*upport, information and voluntary action.* These instruments aim at persuading consumers to change their behavior by providing information and examples of successful implementation" (UNEP, 2008). These mechanisms were further investigated, categorized, broken down and then studied to assess the effectives, country where it would work best, cost effectives, major strengths, and limitations for the particular policy. Since there were so many studied, please see Figure 1.3 for a detailed explanation of a few examples.

Policy instrument	Country/ regions exples	Effe ctive ness	Energy or emission reductions for selected best practices	Cost-effecti veness	Cost of GHG emis-sion reduction for se-lected best practices	Special conditions for success, major strengths and limitations, co-benefits	References
Fiscal instruments and incentives							
Taxation (on CO2 or household fuels)	Nor, De UK, NL, Dk, Sw	Low/ Me-dium	De: household consump-tion reduced by 0.9 % 2003: 1.5 MtCO2 in total Nor: 0.1-0.5% 1987-1991 NL:0.5-0.7 MtCO2 in 2000 Swe: 5% 1991-2005, 3MtCO2	Low		Effect depends on price elasticity. Revenues can be earmarked for further energy efficiency improvements. More effective when combined with other tools.	WEC 2001,Kohlhaas 2005, Larsen and Nesbakken 1997, MURE 2007, Brink and Erlandsson, 2004
Tax exemptions/ reductions	US, Fr, Nl, Kor	High	US: 88 $MtCO_2$ in 2006 FR: 1Mt CO2 in 2002	High	US: B/C ratio Com-mercial buildings: 5.4 New homes: 1.6	If properly structured, stimulate introduction of highly efficient equipment and new buildings.	Quinlan et al 2001, Geller and Attali 2005, MURE 2007
Public benefit charges	BE, Dk, Fr, Nl, US states	Me-dium	US: 0.1-0.8% of total el. sales saved /yr, 1.3 $ktCO_2$ savings in 12 states NL: 7.4TWh in 1996 = 2.5 Mt CO2 Br: 1954 GWh	High in report-ted cases	US: From -53$/$tCO_2$ to - 17$/$tCO_2$	Success factors: Independent administration of funds, invol-vement of all stakeholders, re-gular evaluation/ monitoring& feedback, simple and clear progr. design, multi-year progrs	Western Regional Air Partnership 2000, Kushler et al 2004, Lopes et al. 2000

Figure 1.3 – Fiscal Instruments & Incentives (UNEP,2008)

This type of detailed in-depth analyses of policies is a major step in the correct direction. The information that is established from this sort of research gives hard factual evidence and examples of what policies work where and why, and how they can become better. From this point forward, nations, states, and communities can effectively choose what mechanisms work best for them, towards the goal of lowering GHG emissions. The benefits of having a multitude of options, types, and levels of policies helps the goal to lower emissions become more feasible. Having a variety of options is beneficial, as these

options increase access and variability to reach the main goal. Additionally, amidst the range of policies available, the varieties of building evaluation systems help achieve the desired diverse resources that have been created all over the world. Thorough evaluations of the 'best' policies and systems accessible, assisting the progression and development of future systems, will be beneficial for reaching and advocating sustainable goals.

Investments in Green Buildings

Despite a weak U.S. economy, investments in the development, ownership and management of green buildings have increased. Sustainable construction accounted for about a third of all new nonresidential construction in 2010, according to a McGraw-Hill report. By 2015, green construction is expected to increase to $120-145 billion, and account for 40-48 percent of new nonresidential construction (Roth, 2011). The value of green retrofit and renovation projects is also increasing, and is expected to reach $14-18 billion by 2015. The USGBC reported in August 2011 that 10,000 commercial buildings are LEED certified and 1.3 billion square feet of commercial space worldwide is now LEED- compliant (Roth, 2011).

According to the USGBC, on average, an upfront investment of 2 percent in green building design, results in life-cycle savings of 20 percent of the total construction costs- more than 10 times the initial investment. Often, energy-efficient buildings sell for up to 10 percent higher per square foot than conventional buildings (USGBC). For owners of green real estate, there is an expanding range of measures that can be used to assess the performance of their buildings, which is an important concept particularly when reporting to investors. For example, San Francisco has mandated that private buildings must meet

the LEED Gold Standard as of 2012. The U.S. Environmental Protection Agency's Energy Star rating system has formed a Portfolio Manager tool to help investors, owners and property managers track building's consumptions. Other enticements for green investments include property tax, income tax, and other tax credits and deductions.

In February 2011, The Obama administration announced The Better Buildings Initiative, which aims to make commercial buildings 20 percent more energy efficient by 2020. The U.S. Department of Energy is working alongside Congress to re-evaluate the current tax deduction for commercial building upgrades, so it is more generous, and to encourage building owners and REITs to invest in retrofits. Some property owners contract with energy service companies (renewable energy equipment manufacturers and distributors) for energy-saving equipment, such as: efficient lighting, windows, HVAC systems, fuel cells, and turbines. The contract is structured in a way so the service companies finance the improvements, including the leasing of equipment to the building owner, usually for up to 15 years (after that time, the equipment belongs to the owner). The energy service companies then apply any tax deductions or credits viable to the project. The advantage of this financing method is that REITS and not-for-profit organizations can utilize federal, state and local tax credits and deductions through the use of the energy service companies' ownership of the equipment, while receiving rewards of instant reduced energy costs (Roth, 2011).

Property owners are focusing on energy management by developing policies that cover the purchase, use and management of energy, in order to manage energy, energy costs, and obey various government policies. For example, "a number of states have adopted renewable portfolio standards that require electricity providers to obtain a

minimum percentage of their power from renewable energy resources by a certain date" (Roth, 2011). As another incentive, energy companies have started time-of-day pricing, with prices usually two to three times higher at times of peak energy use. This encourages owners to be more aware of their energy use, and thus look for improvements to reduce costs.

The Focus on Retrofitting

According to the Intergovernmental Panel on Climate Chance (IPCC), retrofitting and replacing equipment in buildings has the largest potential within the building sector for reducing greenhouse gases by 2030. Retrofitting buildings plays a crucial role in reducing emissions because most of the structures that will be built in 2030 have already been created.

Despite the enormous importance and benefits of reducing energy use in buildings, many building owners continue to face significant barriers, including:

- **Contracting:** Lack of well-established, rigorous, standardized, and replicable contracting models for executing energy efficiency projects and, in some places, a lack of qualified contractors.
- **Finance:** Little availability of competitively priced, long-term financing solutions — limiting the owner's ability to pay for up-front costs.
- **Information:** Lack of information sharing within the sector, including details on successful projects.
- **Policy:** While some policies encouraging building owners to improve energy efficiency exist in various cities and countries around the world, they are far from

commonplace. Consistent policies (incentives and mandates) can spur the market and reinforce the importance of energy efficiency (Clinton Climate Initiative).

In 2007, The Clinton Climate Initiative launched its Energy Efficiency Building Retrofit Program, bringing together many of the world's largest cities, private building owners, energy service and technology firms, and financial institutions in a landmark effort to reduce energy consumption in existing buildings. The initiative included 16 of the world's largest cities: Bangkok, Berlin, Chicago, Houston, Johannesburg, Karachi, London, Melbourne, Mexico City, Mumbai, New York, Rome, São Paulo, Seoul, Tokyo, and Toronto.

The program assists building owners in identifying, designing, and implementing large-scale energy efficiency projects and uses these projects to catalyze more building owners to take action. CCI is creating standardized models, for procurement, contracting, project implementation, and financing, which can be replicated around the world. The program provides *pro bono* advisory support to building owners such as city and national governments, commercial portfolio owners, and schools and universities. The Clinton Climate Initiative's services include:

Project Development and Contracting Support: Support offers assistance to building owners throughout the project development process in order to design and implement best-in-class energy efficiency projects. These processes are designed to reduce project cost, development time, and business risk.

Access to CCI's Building Technology Partnerships: This helps building owners engage with suppliers to assess energy efficient options for building systems and technologies. Owners gain access to information and discounted pricing on a range of

best-in-class energy-efficient products, including heating, ventilation and cooling, building envelope, and lighting technologies.

Financial Advisory Assistance: The program can provide financial modeling support; solicit interest from capital providers, review proposals, and assist, where appropriate, in the negotiation process (Clinton Climate Initiative).

The Clinton Climate Initiative program also created the C40 Large Cities Climate Leadership Group to commend energy-efficiency programs in 40 megacities in both developing and developed countries. Other major retrofitting projects are emerging. For example, Chinese officials announced in 2005 that the country plans to transform all existing buildings into energy-saving buildings by 2020 and minimize energy consumption by up to 65 percent via the use of technology. PlaNYC (to be further discussed in Chapter II) has committed 10 percent of the city's energy budget, $81.2 million dollars in 2007, to retrofit municipal buildings—which amounts to 5,000 new jobs in the building sector (United Nations Environment Program, 2008).

Not only will retrofits benefit the environment and energy savings, the retrofitting industry will directly increase employment. Examples of jobs that are likely to be produced through this process are auditors, engineers, estimators, project managers and various jobs in the construction trades including pipe fitters, sheet metal works, HVAC technicians, electricians, and general construction workers (UNEP, 2008). These jobs are generally formed during the initial construction or investment period and are likely to stimulate the local economy because they are completed at the work site.

Green Building Index

The 2011 Green Building Opportunity Index is an office market assessment tool that compares the top U.S. office markets on the basis of real estate fundamentals and green investment considerations. The Index compares each market's relative position to its peers in six categories: Office Market Conditions, Investment Outlook, Green Adoption & Implementation, Mandates & Incentives, State Energy Initiatives and Green Culture. According to figure 2.1, Midtown Manhattan is ranked 2nd in the index.

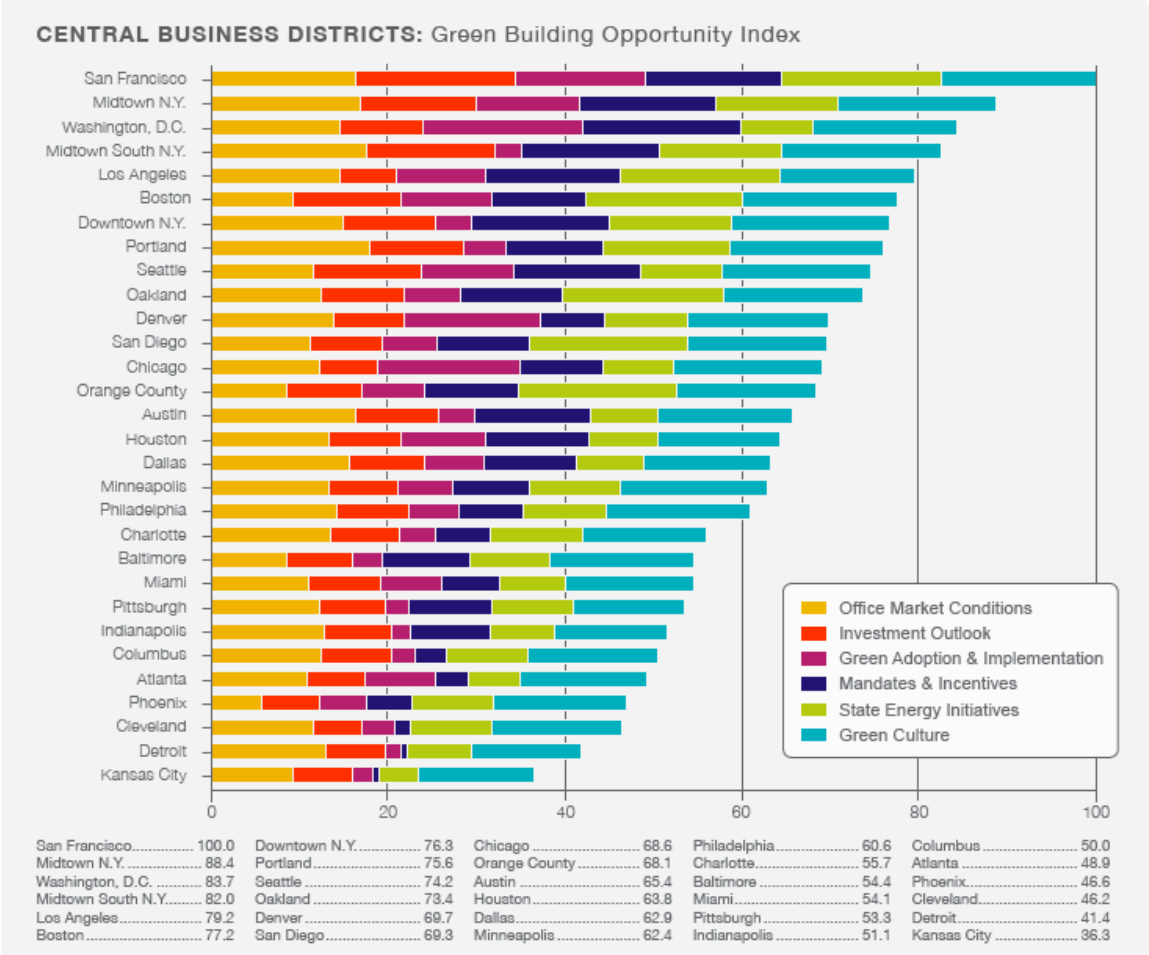


Figure 2.1 - 2011 Green Building Opportunity Index, National Overview: CBD (2011)

The overall Manhattan office market has an inventory of 393 million square feet, making it the largest in the country. The market is divided into three major submarkets: Midtown, Midtown South and Downtown. Manhattan's overall vacancy rate currently stands at 10 percent, representing its lowest level in two years (Cushman & Wakefield, 2011). Manhattan markets are all strong performers in the Green Building Opportunity Index in 2011. Midtown improved its 2011 Index ranking to #2 (up from #3 in 2010), followed by Midtown South at #4 (up from #15 in 2010) and Downtown at #7 (same ranking as 2010). The Manhattan office market is one of the healthiest in the country, with investor demand for prime assets in core CBD markets continuing to put upward pressure on property values. Transaction volume in Manhattan totaled $1.1 billion in the first quarter, up nearly threefold from the first quarter of 2010 and representing 24 percent of all CBD office investments sales in the U.S. for the quarter.

Midtown Manhattan qualifies as third in the Investment Potential category, behind San Francisco and Midtown South, see Figure 2.2. The ranking considers: two-year forecasted rent growth, three-year office-using employment and the incoming supply of new office inventory. All three Manhattan markets rank among the top five for forecast rent growth, with current forecasts calling for gains of 10.2 percent in Midtown South, 8.8 percent in Midtown and 7.3 percent in Downtown Manhattan by the end of 2012. Midtown possesses the highest overall average rent levels ($62.63 psf) among its survey peer group and in the country (Cushman & Wakefield, 2011).

Figure 2.2 – Top Ten Markets (Cushman & Wakefield, 2011)

As of 2011, Manhattan has a total of 28 LEED certified buildings, representing 24.1 msf of office space. Midtown accounted for the vast majority of these LEED certified buildings, with 22 properties and 20.3 msf of the Manhattan total. Certifications under the Existing Buildings (EB) ratings system predominated, with 18 of the 22 properties in the Midtown market achieving this certification. LEED Core & Shell (CS) certifications represented the second highest total among the three Manhattan markets, which was achieved by five properties (Cushman & Wakefield, 2011).

The number of buildings in a given city that have earned the Energy Star label is another indication of its commitment to improving economic and environmental condition. There were 99 buildings in Manhattan that achieved this goal in 2010. The distribution of buildings that have earned the Energy Star label remains quite similar to that of LEED certified buildings, and there are a number of buildings that share these two qualifications. Midtown is clearly the leading Manhattan market for the adoption and

implementation of LEED and Energy Star strategies, ranking fifth in the Green Adoption and Implementation category among its survey peers. By comparison, Downtown ranks 20th, while Midtown South ranks 25th (Cushman & Wakefield, 2011).

PlaNYC

Buildings account for 75 percent of New York City's total greenhouse gas emissions and 95 percent of the total electrical consumption (Real Estate Weekly, 2012). Some major steps have recently occurred within New York City. At a conference attended in September entitled "Global Lessons in Green Building, How NYC Stacks Up," sponsored by Bloomberg. A major program mentioned during the conference was "Greener Greater Buildings Plan." New York City's Office of Long-Term Planning and Sustainability (OLTPS) was created as part of the Mayor's Office by local law in 2006. The Office coordinates with all other City agencies to develop, implement, and track the progress of PlaNYC and other issues of infrastructure and the environment, which cut across multiple City departments. PlaNYC was released on Earth Day, April 22nd 2007 and updated in 2011 and is an effort undertaken by Mayor Bloomberg to prepare the city for one million more residents, to strengthen our economy, to enhance the quality of life for all New Yorkers, and to deal with climate change. The initial plan included ten goals and 127 initiatives to make NYC more sustainable, the update includes 132 new initiatives and 400 new milestones to meet by December 31, 2013. In addition to producing PlaNYC, the Office of Long-Term Planning and Sustainability promotes the integration of sustainability goals and practices into the work of City agencies and the lives of New Yorkers. According to a recent report, the adoption of 29 recommendations

will divert 100,000 tons of asphalt from landfills each year; reduce greenhouse gas emissions citywide by 5 percent; lower the costs of lighting energy by 10 percent; and provide $400 million in savings by 2030 (Real Estate Weekly, 2012).

Market Rankings Based on Regulatory Mandates and Available Incentives – Private Sector

Market	Score
Washington, D.C.	29
Midtown N.Y.	25
Midtown South N.Y.	25
Downtown N.Y.	25
Los Angeles	25
San Francisco	25
Seattle	23
Austin	21
Houston	19
Oakland	19
Portland	18
Boston	17
Dallas	17
Orange County	17
San Diego	17

Market	Score
Baltimore	16
Chicago	15
Indianapolis	15
Pittsburgh	15
Minneapolis	14
Denver	12
Philadelphia	12
Miami	11
Charlotte	10
Phoenix	8
Atlanta	6
Columbus	6
Cleveland	3
Detroit	1
Kansas City	1

SOURCE: C&W Research

Figure 2.3 – Markets & Available Incentives (Cushman & Wakefield, 2011)

In addition to this initiative, two major public organizations serving the area have created programs designed to facilitate the adoption of energy saving strategies through creative incentives and informed guidance for building owners. In March of 2011, Con Edison announced Lockheed Martin had been selected to run their Commercial and Industrial Energy Efficiency Programs. The program is designed to provide cash rebates and incentives to facilitate significant reductions in gas and electricity usage by the utility's commercial and industrial customers, thereby reducing their carbon footprint and saving money at the same time.

The program was initially launched in the fall of 2010 and according to Con Edison, more than 250 project applications have been received, which could effectively result in savings of approximately 23.5 million kilowatt hours and, in turn, generate almost $3 million in rebates and incentives for Con Edison's commercial and industrial clients (Cushman & Wakefield, 2011).

In addition to these initiatives, the signing of New York's most prominent "green lease" occurred in April 2011, when Wilmer Hale, a prestigious New York law firm, signed an agreement that was termed "transformational" by Mayor Michael Bloomberg. The lease involves a new energy conservation incentive model that allows building owners and tenants to share in sustainability benefits. Its terms require the law firm to contribute to the costs of green upgrades every month, just like they pay their rent. Once the investment is fully paid off, the firm will reap the full cost-savings (Cushman & Wakefield, 2011).

Under ordinary leases, building owners are responsible for the upfront cost of energy efficiency improvements. Yet the tenants are the immediate beneficiaries of those upgrades due to the reduced energy costs. This problem is called the Split Incentive Problem due to this "split" of responsibility for capital versus operating expenses leaves building owners with little incentive to undertake energy retrofits. Thus, because owners do not share in the benefit, they have little incentive to invest in energy upgrades. In a NYC Mayor's Office survey, 60% of NYC commercial property owners said it was an impediment to making energy retrofits (PlaNYC, 2011).[2]

Building on the insights developed by the Natural Resources Defense Council

[2] Please refer to Appendix A for a complete understanding of the Green Lease.

(NRDC) Green Lease Forum, the Mayor's Office of Long-Term Planning Sustainability summoned a group of real estate and energy efficiency experts and a lawyer to develop new commercial lease language that allows tenants and owners to share the costs, as well as the benefits, of energy efficiency improvements. Green lease agreements will give private owners an incentive to make their buildings more efficient while helping reach the PlaNYC goal of reducing City government's greenhouse gas emissions 30 percent by 2017 (Sklerov, 2011).

> "Perhaps the most important outcome of this agreement is that Mayor Bloomberg has declared that the same language will also now be incorporated into all new leases in which the City is a tenant. By continuing its aggressive and proactive approach in both the public and private sectors, New York has firmly established its position as a national leader in creative strategies for improving energy efficiency and reducing carbon emissions" (Cushman & Wakefield, 2011).

Another example that has rooted New York as a leading example is because per capita emissions are a third of those in the rest of the country due to public transit use, densely packed buildings and smaller homes. These were major factors in all areas of the city receiving high Index rankings in Green Culture, see figure 2.4 (Cushman & Wakefield, 2011).

Green Culture Rankings

Green Economy	City Innovation	Planning & Land Use
1. Portland	1. New York	1. New York
2. Seattle	1. Seattle	2. San Francisco
3. Sacramento	1. Chicago	3. Portland
4. San Francisco	1. Portland	4. Boston
5. Baltimore	1. San Francisco	5. Albuquerque
6. Albuquerque	6. Minneapolis	6. Austin
7. Minneapolis	6. Boston	7. New Orleans
8. Cleveland	6. Los Angeles	8. Denver
9. Boston	9. Baltimore	9. San Diego
10. Columbus	9. Sacramento	10. El Paso

SOURCE: SustainLane

Transit Ridership
1. Midtown N.Y.
1. Midtown South N.Y.
1. Downtown N.Y.
4. Washington, D.C.
5. Philadelphia
6. Boston
7. San Francisco
7. Oakland
9. Chicago
10. Seattle

SOURCE: ATPA, TTI, C&W Research

Walk Score®
1. San Francisco
2. Midtown N.Y.
2. Midtown South N.Y.
2. Downtown N.Y.
5. Boston
6. Chicago
6. Philadelphia
8. Seattle
8. Miami
10. Washington, D.C.

SOURCE: Walk Score®; ranking based on 30 CBD markets in Green Building Opportunity Index

Figure 2.4 – Green Culture Rankings (Cushman & Wakefield, 2011)

Susan Leeds, Chief Executive Officer at NYC ENERGY EFFICIENCY CORPORATION, mentioned another program at the conference. She is responsible for a source of 'innovation funds' that are focused on information technology used in buildings. With a base of $37 million, the money is intended to assist owners to undergo retrofits and commissioning, to compete against the barrier of upfront capital. She emphasized the fact that we are in urgent need of a business model for developers to implement sustainable practices relatively easily.

At the end of November 2011, Environmental Protection Commissioner Carter Strickland announced $4 million in grants as part of the 2012 Green Infrastructure Grant Program to build green roofs, rain gardens, rainwater harvesting, right-of-way bioswales, and similar methods for reducing and managing storm water on private property and public sidewalks in combined sewer areas. The new round of grants continues to support the PlaNYC goal of improving water quality by reducing the likelihood and intensity of combined sewer overflows. Private property owners, business, and not-for-profit organizations are eligible for funding for projects that use green infrastructure to resource or manage storm water on private property and public sidewalks. The Department of Environmental Protection manages the city's water supply, providing more than one billion gallons of water each day to more than nine million residents, including eight million in New York City (Loeser, 2011).

About 75 percent of New York City's carbon emissions result from energy used in buildings. Thus, the energy efficiency of the city's existing buildings is a PlaNYC focus. In December 2009, Mayor Bloomberg signed the four legislative components of the Greener, Greater Buildings Plan, the most comprehensive set of efficiency laws in the

nation. Together these laws remove a loophole in the energy code to ensure that it applies to all construction projects, require annual energy efficiency benchmarking that will be disclosed to the public, and mandate a set of cost-effective energy efficiency upgrades and evaluations of the city's largest buildings, both public and private. PlaNYC sets a goal of achieving a 30 percent reduction in NYC's annual greenhouse gas emissions below 2005 levels by 2030 (ICLEI, 2010). By focusing primarily on 16,000 of the city's largest properties, which constitute roughly half of citywide square footage and 45 percent of citywide greenhouse gas emissions, the Greener Greater Buildings Plan will result in an emissions reduction of about five percent. It will also reduce citywide energy costs by $700 million annually by 2030 and create roughly 17,800 construction-related jobs over ten years (PlaNYC, 2011).

By 2030, the City projects that 85 percent of its energy use will come from buildings that already exist today, as a result, we are unable to rely on new buildings to be more efficient. To ensure that existing buildings become more efficient over time, the Greener, Greater Buildings Plan comprises the following six components: New York City Energy Code, Lighting Upgrades, Benchmarking, Audits and Retrofits, Green Workforce Development Training, Green Building Financing.

The renovation of the Empire State Building provides a good example of how any number of technologies can be combined to maximize sustainability, and provide a huge payback. The project was a masterpiece of clever engineering, which included the upgrade of thousands of windows while preserving the original look and trademark red-colored frames. Design teams discovered ways to save 38 percent of the build's annual energy by spending $93 million that has been set aside for building upgrades, along with

an incremental investment of $13 million. The resulting energy savings will recoup the incremental investment in just over three years, while keeping 105,000 metric tons of carbon emissions out of the environment over the next 15 years (Miller, 2009).

Building Codes in NYC

Local Law 85 of 2009 (Local Law 1 of 2011 and Local Law 48 of 2010):

This Law is effective December 28, 2010, Local Law 1 supersedes Local Law 85 of 2009 and Local Law 48 of 2010. For the purposes of consistency, and to reduce confusion, the law will continue to be referenced as Local Law 85. All commercial and residential buildings must comply with the New York City Energy Code at the time of renovation, repair, or new construction. Exemptions include State or National Historic Buildings, and buildings with Landmarks Preservation Commission designation. It requires that all additions, alterations, renovations and repairs must comply with NYCECC even if work covers less than 50 percent of the building area. Areas not included in the renovation do not need to comply. This law was enforced as of July 1, 2010, and applies to all work for which DOB (Department of Buildings) construction document approval is required.

Local Law 84, Local Law 87 and Local Law 88:

The list of buildings required to comply with Benchmarking (Local Law 84), Audits and Retro-commissioning (Local Law 87) and Lighting Upgrades and Sub-metering (Local Law 88) has been determined by the Department of Finance's records. These laws apply to privately owned buildings over 50,000 square feet, two or more

buildings on the same lot with a total area over 100,000 square feet, condominiums owned by the same board with a total area over 100,000 square feet, and buildings over 10,000 square feet for which the City pays part or all of the electricity bill.

There are no exemptions to Local Law 84, Energy and Water Efficiency Benchmarks. Buildings are required to report Building Energy Star Score by collecting and inputting building operations data including all energy and water use into the EPA's online Portfolio Manager Tool or other eligible tool as determined by the Office of Long Term Sustainability. Benchmark Scores must have been reported annually by May 1st, 2010 for City Buildings and May 1st, 2011 for privately owned buildings.

Exemptions from Local Law 87 Energy Audit includes Energy Star label for 2 of the 3 preceding years, or LEED-EB certification within 4 years, or LEED equivalent energy efficiency more than 25 percent above average. Exemptions from Retro-Commissioning include LEED-EB certification within 2 years including LEED credits EA 2.1 and EA 2.2. Requirements include performing an energy audit. ASHRAE Level 2 Energy Audit of base building systems including HVAC, lighting, hot water, and building envelope showing cot and payback period of energy saving measures. Private buildings are not required to implement measures. Perform Retro Commissioning (RCx) through systematic tuning and adjustment of existing HVAC equipment to optimize building performance. File Energy Efficiency Report, covering Audit and RCx with DOB. Energy Efficiency Report will be due every 10 years starting in 2013. Due dates are determined by building block number. Buildings less than 10 years old or that have undergone major renovation and comply with the NYCECC can defer reporting by 10 years.

Exemptions for Local Law 88 Lighting Upgrades and Sub-metering include residential dwelling units and assembly spaces in houses of worship. Buildings are required to Upgrade Lighting Systems: all building common areas and commercial tenant areas must have upgraded lighting systems that comply with NYCECC. Install Submeters: submeters must be installed for every commercial tenant over 10,000 square feet or per floor, whichever is smaller. Issue Electrical Statements to Tenants: monthly statements must be issued to each tenant showing their electricity consumption and associated charges. File a report with the DOB: a registered design professional, a licensed master, or special electrician must file a report with the DOB certifying that submeters have been installed in all covered tenant spaces. Lighting upgrades, sub meter installations, and DOB report filing must be completed by January 1, 2025.

CHAPETER III - Measuring Building Performance

Third Party Involvement

The involvement of an objective third-party can provide an opportunity to assess and certify a building's performance, acting as a form of verification. Globally, there are many third-party rating systems, as mentioned previously, from which a building can benchmark its design, construction and operations. However this section focuses on two measurement systems used the most in the United States: Energy Star and the LEED Green Building rating system and, more specifically, LEED for Existing Buildings.

Energy Star:

Energy Star is a joint program of the U.S. Environmental Protection Agency and

the U.S. Department of Energy helping individuals and companies save money and protect the environment through energy efficient products and practices. In 1999, Energy Star for Office Buildings was released, allowing a building owner to measure the energy efficiency of a building and compare it to other buildings across the U.S. Under the program, the energy performance of a building is scored on a 1-100, scale and the buildings that achieve a score of 75 or above are eligible for the Energy Star. For example, a building that has a score of 80 means the building is in the top 20 percent of facilities in the country for energy performance. The score is calculated by estimating how much energy the building would use if it were the best- or worst-performing building of its type (and every level in between) in terms of its size, location, and number of occupants. The rating system compares the actual energy data entered to the estimate to determine where the building ranks relative to similar buildings. For existing buildings, applicants use the Portfolio Manager tool on the Energy Star website to organize, evaluate and track energy (and, more recently, water) consumption.

LEED:

The Leadership in Energy and Environmental Design (LEED) Green Building Rating System is another third-party certification program, overseen by a non-profit organization, the United States Green Building Council (USGBC). Following the formation of the U.S. Green Building Council (USGBC) in 1993, the organization's members began to research existing green building metrics and rating systems and formed a committee. Its' composition was diverse; it included architects, real estate agents, a building owner, a lawyer, an environmentalist, and industry representatives.

The first LEED Pilot Project Program, also referred to as LEED Version 1.0, was

launched August 1998. After extensive modifications, LEED Green Building Rating System Version 2.0 was released in March 2000, with LEED Version 2.1 following in 2002 and LEED Version 2.2 following in 2005. As LEED has evolved and matured, the program has undertaken new initiatives, including a rating system specifically devoted to building operational and maintenance issues, LEED for Existing Buildings: Operations & Maintenance- which is the focus of this thesis. Additionally, LEED addresses the multitude of different project development and delivery processes that exist in the U.S. building design and construction market, through rating systems for specific building typologies, sectors, and project scopes. (USGBC) LEED currently has 9 separate rating systems: LEED for New Construction and Major Renovations, Existing Buildings: Operations & Maintenance, Commercial Interiors, Core & Shell, Schools, Retail, Healthcare, Homes, and Neighborhood Development. Applicants can achieve 4 levels of certification; Certified, Silver, Gold and Platinum.

LEED promotes a whole-building approach to sustainability by recognizing performance in seven categories of human and environmental health: Sustainable Site Development, Water Efficiency, Energy Efficiency, Materials Selection, Indoor Environmental Quality, Innovation, and Regional Priority. In each of the categories, there are requirements and performance criteria. The USGBC calls these requirements prerequisites that specify the minimum requirements for achieving certification under a certain rating system. The performance criteria are called credits, of which there are numerous credits within the categories that have points assigned to them. The better the building is able to perform (and document) the more points it achieves. In order to achieve a point, the applicant must validate their compliance with the credit to the

USGBC.

LEED - Existing Buildings: Operations and Maintenance:

To better understand LEED 2009, the most current standard, for Existing Buildings: Operations & Maintenance and its intentions, it helps to examine the goals addressed in the seven LEED categories – Sustainable Sites (SS), Water Efficiency (WE), Energy & Atmosphere (EA), Materials & Resources (MR), Indoor Environmental Quality (IEQ), Innovation in Operations (IO), and Regional Priority (RP).

Sustainable Sites

Responsible, innovative, and proactive site management and maintenance techniques can lessen the negative consequences buildings have on their local and regional environment. The Sustainable Sites section identifies opportunities in improving exterior building management, encouraging alternate transportation, managing storm water, minimizing light pollution, and reducing the heat island effect. There are eight credits in this section with twenty-six possible points.

Water Efficiency

The US Geological Survey (USGS) web site states "estimates vary, but each person uses about 80-100 gallons of water per day." Only14 percent of withdrawn water is consumed; the remainder is used, treated, and discharged back to the nation's water bodies. This returned water often contains contaminates such as bacteria, nitrogen, and toxic metals. Building occupants use 13 percent of the total water consumed in the United

States per day. Of that total, 25 percent is used by commercial building occupants (EPA, 2009). The Water Efficiency section supports measures that limit water consumption within the building and on the exterior landscaping through efficiency and wastewater strategies. In this section of LEEDEB O&M there is one prerequisite and 4 credits on a scale that awards up to fourteen points.

Energy & Atmosphere

Producing electricity by burning fossil fuels emits around 21.3 billion tons of CO_2 per year, however the natural processes of Earth can only absorb about half of that amount, causing a net increase of 10.65 billion tons of atmospheric carbon dioxide per year (US Department of Energy). CO_2 contributes to global warming, as the average surface temperate of the Earth rises in response to the abundant amount of greenhouse gases emitted, which most scientists agree will cause harmful effects.

Utilities (electricity, water, natural gas, etc.) are the largest operational cost for commercial buildings, accounting for as much as 50 percent of overall operational costs on average. Additionally, it is the easiest area in buildings' budget to achieve savings, according to management experts. The Energy & Atmosphere (EA) section rewards building commissioning, the efficient design of Heating, Ventilating, and Air Conditioning (HVAC) systems and performance-based measurements of the building's systems, as well as on or off site use of renewable energy generation. There are three prerequisites and six credits for a total of thirty-five possible points, the most by far out of any of the sections.

Materials & Resources

Building-related construction and demolition (C&D) debris totals approximately 160 million tons per year, accounting for nearly 26 percent of total non-industrial waste generation in the U.S. Combining construction and demolition debris with municipal solid waste yields an estimate that building construction, renovation, use and demolition together constitute about two-thirds of all non-industrial solid waste generation in the US (Office of Solid Waste, 2003). In everyday use and operation, buildings generate a large amount of waste. The Material & Resource section aims to minimize waste, divert waste away from landfills and into recycling centers, and encourage the use of sustainable purchasing using locally available materials with reductions in environmental impacts whenever possible. The section rewards building policies that encompass responsible practices and effective waste management strategies. This section has two prerequisites and nine credits with a total of ten possible points.

Indoor Environmental Quality

While buildings have an impact on their environment, they also have environmental and health impacts on their occupants who inhabit them. On average, Americans spend 90 percent of their time indoors. Thus, the quality of a building's indoor environment is crucial. High Indoor Environmental Quality (IEQ) can yield better employee health and increased productivity. The IEQ section encourages the use of low emitting materials, the incorporation of day light and quality lighting, access to views, thermal comfort, the involvement of a green cleaning program and an Indoor Air Quality (IAQ) management plan, which addresses ventilation effectiveness, moisture

management, and control of contaminants. This section has three prerequisites and three credits for a total of fifteen possible points.

Innovation in Operations

Solutions in the sustainable operations and design industry are constantly developing and progressing. The Innovation in Operations portion provides an area for applicants to earn four additional points through the incorporation of innovative projects that are not recognized in any other category, awarding creative solutions to current issues. This section has three credits with a total of four possible points. The remaining two points are achievable by having a LEED Accredited Professional on the team (1 point) and documenting sustainable building cost impacts (1 point).

Regional Priority

This short section is implemented to provide an incentive for the achievement of credits that address geographically specific environmental priorities. For RP, the project can earn 1 of the 6 Regional Priority Credits (credits identified by the USGBC Regional Councils and Chapters as having additional regional environmental importance). A database of Regional Priority Credits and their geographic applicability is available on the USGBC website. One point is awarded for each Regional Priority credit achieved, although no more than 4 credits may be earned.

The Rating System:

LEED 2009 for Existing Buildings: Operations & Maintenance GBCI will recognize buildings that achieve 1 of these rating levels with a formal letter of certification. There

are 100 base points; 6 possible Innovation in Operations and 4 Regional Priority points, totaling a possible of 110 points. Please see Appendix B for a detailed breakdown and visual understanding of possible awarded points.

Rating Level	Number of Points
Certified	40-49
Silver	50-59
Gold	60-79
Platinum	80 and above

Table 3.1 – LEED EBOM Current Rating System Totals

Over the years LEED-EBOM has undergone changes to its point system, and will continue to update the LEED rating system in the future to include improvements and provisions. The three buildings studied for the following research and case studies happen to use three different LEED-EBOM models causing their point systems to differentiate. The following table compares the differences.

Categories	LEED EB 2.0	LEED EB 2008	LEED EB 2009
Energy & Atmosphere	23	30	35
Materials & Resources	16	14	10
Indoor Environmental Quality	22	19	15
Sustainable Sites	14	12	26
Water Efficiency	5	10	14
Innovation in Operations	5	7	6
Total	**85**	**92**	**110**

Table 3.2 – LEED EBOM Different Versions Point Breakdown

LEED as a tool:

Using LEED to benchmark building performance can yield clear managerial benefits. Using LEED as a resource in gaining the power to measure the efficiency of

building systems or have a working knowledge of indoor air quality presents the managers and owners with better tools in the effort to monitor and control costs and ensure tenant comfort. The crucial role that buildings and real estate stakeholders hold in the movement to reduce greenhouse gasses is evident. This rating system provides owners and managers with the tools and guidance to manage their environmental footprint and compare it to others in the industry.

CHAPTER IV – Research Questions & Methodology

Objectives

Identifying the Gap:

Due to the fact that buildings account for 75 percent of New York City's total greenhouse gas emissions and 95 percent of the total electrical consumption, it is evident that NYC presents a major amount of opportunity and investment for the retrofit of existing buildings (Real Estate Weekly, 2012). New York City already has many tools and programs available, not to mention energy code mandates that will soon be required.

Today there is extensive research on sustainable ways to build new construction, either by using passive design methods or technologically advanced methods. Sustainable standards can be incorporated into the early designs of buildings without added cost to the overall project. However, a major challenge within the industry is within the existing building sector. The data collected and research performed is in order to expand upon the green business case for stakeholders involved in the retrofit of existing buildings.

A majority of buildings will eventually need to undergo a retrofit at some point in their life cycle in order to avoid obsolescence. A major component to achieving substantial progress in sustainability, however, is reducing existing building energy consumption and the associated carbon footprint. Based on the past few chapters, it is clear that Midtown Manhattan offers a tremendous amount of opportunity and is leading the way for energy efficiency in existing buildings. Through the course of this thesis, the aims have been to investigate the process and define the motivations of the parties involved in the retrofitting of a building, and identify the enabling and hindering factors within the relationships of key stakeholders.

This thesis presents an opportunity to learn what works or doesn't work within the industry. Though the study will present a lot of data, the information collected will be focused on 3 case studies/buildings in New York City. Data will yield useful information of successful factors and inhibiting factors that may facilitate and improve retrofit projects for the future. After thorough analysis is completed, the study will assess if there are commonalities, uniqueness, or new findings within the stakeholders, compared to the established theories.

The objective of the research is to further investigate the process and the players involved in the retrofitting of an existing building to identify the enabling factors and hindering barriers within the relationships of key stakeholders.

- *Who are the key stakeholders?*
- *What are the key motivators for stakeholders?*
- *Why did the case study buildings chosen pursue LEED certification?*
- *How was the process challenging?*
- *What steps must be taken to further increase the stakeholders' incentive?*

The research will aim to establish reasoning about the slow rate of achieving positive and measureable results in sustainable practices within the real estate industry, and assess what must occur for the system to adapt accordingly to become more applicable to the complexities of the built environment sector. Often we are subject to only learning about success stories; this research attempts to uncover a series of 'lessons learned.' The intention is to understand which practices serve as incentives versus those that serve as disincentives in creating sustainable design practices and the associated policies. A key

objective is to discern what works within each stakeholder sector, and what does not, in an effort to comprehend what may be effectively enhanced or disregarded.

Method

Research on the measures, policies, and available tools, and analysis of the LEED certification processes that are shaping the Green Building industry and specifically New York City buildings, prepared a solid foundation for the study. This is a comparative study through the case study method that utilizes multiple sources of evidence through qualitative research methods such as interviewing stakeholders, surveys, literature reviews, and interpretation of quantitative data. Three buildings were compared using their LEED Existing Building, or Existing Building Operations and Maintenance certification as the baseline commonality using the information to build off of and study their similarities and differences. Using the LEED documents as a common platform between the buildings being analyzed, the thesis studies the different motivators and decision processes for the stakeholders. The research activities were defined through the questionnaires and interviews of key stakeholders involved in the selected case studies that are from three different time periods, affording possible diverse lessons learned.

Process

Initially, I researched many LEED buildings in NYC using data collected from various websites, magazine publications and the USGBC website listings of buildings that have attained certification. The three buildings in midtown Manhattan where chosen for specific reasons. The buildings are all multi-tenant commercial office buildings

located within midtown. The focus on 3 buildings for the case study was a manageable amount of data to compare and contrast. I then limited the building selections to LEED-EB, or EBOM Silver and higher, omitting all other LEED buildings specifically excluding Core and Shell listings and "Certified" EBOM buildings. Next, I collected and compared locations of buildings, LEED certification level, managers, owners, original architects, GBA (Gross Buildings Area), and number of floors.

The building selection was further narrowed down, as the 3 buildings were from 3 different time periods (compared to studying 3 buildings from the same time period), which were owned and managed by 3 different companies. These differences would present a significant but manageable level of variation and challenges, in which I could appropriately identify distinctive lessons learned. Next, I contacted numerous building owners or managers in an effort to secure access to LEED documentation in order to make sure I had the necessary data to conduct the study. If the building owners and/or managers were open to their involvement in the proposed case study, they were viable and selected.

Checklist of Case Study Criteria:

- Located in NYC Midtown Manhattan
- Commercial building, multi-tenant
- Existing building
- LEED EB 2.0, EB 2008, or EBOM Silver and higher
- 3 Buildings from 3 different time periods with 3 different owners/managers
- Consent to study and sufficient access to LEED documentation

Procedure of Case Study

Early in the study, appropriate phone calls occurred to explain the goals of the study and to gain access to the information necessary. Over time, access to LEED documentation was provided by sharing the large files online, or collecting the hard copies in binders by meeting with the appropriate project manager. Various modes of transportation were utilized dependent on the situation and destination, including foot, bus, train, and personal automobile.

Candidates for inclusion in the study were selected based upon their participation in the building's process to obtain LEED certification. The intent was to obtain a sample of participants involved in the projects representative of the key stakeholder populations that collaborate to achieve LEED certification. Potential participants were contacted largely via email, along with a consent form, and a link to the questionnaire. Often, multiple rounds of emails were sent to those who did not reply. Additionally, phone calls were placed to those who did not reply to either round of emails.

The questionnaires ask key respondents for the facts of a matter as well as for the respondent's opinions about events and insights, from which I utilized such propositions as the basis for further inquiry through interviews. The questionnaire format was organized in the appropriate matter placing sensitive questions at the end, avoiding bias language and jargon. Each question was comprised of honest inquiry and the length was kept short, taking approximately twenty minutes. Questionnaire data was administered to and collected from eleven respondents. Questionnaire data included four respondents from Building 1, three respondents from Building 2 and four respondents from Building 3. Topics in the questionnaire include background information of the stakeholders, goals

and successes, process, synergies, outcomes, and lessons learned. Questionnaires and responses in full can be viewed in Appendix B.

Based on the information gathered; analysis was completed through the review of repetitive themes and words to formulate additional questions. From these questions geared towards one stakeholder from each Building, three phone interviews were conducted. The purpose of the phone interviews was to enable a more in-depth discussion only attainable through conversation. The interviews were semi-structured, where questions were used to guide, but not dictate, the discussion. An audio recorder was used to record the 3 phone interviews. Pen and paper were used to record key discussion points and also to record follow-up questions. A copy of the interview questions is included in Appendix C. The interviews lasted between approximately 15 and 20 minutes. Based on the data collected, observations of the policymaking process, and document research collected, the enabling and hindering factors were analyzed.

CHAPTER V – Three Case Studies

Building 1:

Building 1 is the first Pre-War office building in NYC that achieved LEED-EBOM Gold certification in August 2009. Constructed in 1928, the building totals 1,300,000 square feet and reaches 34 floors. This building is an example of an extensively restored historic property that had undergone a modernization to stay in tune with today's standards. The certification is considered a milestone that followed $100 million in upgrades to the building's infrastructure and operating systems.

Some of the restoration tasks included refinishing the exterior limestone and brick, restoring the cupola, upgrading pedestrian arcades, restoration of a bronze finish and approved renovations to the landmark lobby and common corridors. Modernization projects provided the building with technological and security upgrades, new elevators, backup electrical generators, and new operable thermo-pane windows throughout the building. Additionally, the building's chiller plant utilizes absorbers and turbine chillers, connected to six new cooling towers.

The building reached an Energy Star Score of 85 and included the installation of energy-efficient lights, extensive load shedding, multiple equipment upgrades and an upgraded building management system (BMS). The renovations were expected to reduce energy consumption by 200k Btu/sf, while reducing carbon emissions by 7,000 tons per year.

Some key features of the building included a waste stream audit demonstrating that 76 percent (by weight) of all waste generated by the building is diverted from landfill. The reduction of water usage by about 26 percent, compared to standard building code, was attained through the installation of water efficient fixtures and aerators. Increased comfort of tenants through adequate airflow design in occupied areas have been achieved through humidity and outdoor air monitoring. High efficiency air filters were installed yielding an efficiency rating of approximately 90 percent, providing a healthier and more productive environment for tenants. Additionally, due to its location in midtown Manhattan, over 90 percent of tenants take some mode of alternative transportation to and from work each day. Overall tenant interest and involvement in environmental aspects of building operation have increased. Building 1 attained 61 points

total, falling within the Gold range, out of a maximum of 110 points. Please refer to Appendix D for the additional breakdown of LEED points.

Gold on 08/25/2010	
LEED EB 2009	**61/110**
Energy and Atmosphere	20/35
Materials and Resources	3/10
Indoor Environmental Quality	9/15
Sustainable Sites	17/26
Water Efficiency	7/14
Innovation in Operations	5/6

Table 5.1 – Building 3, LEED for Existing Buildings Operations & Maintenance– Gold Certification

Building 2:

Building 2 was built in 1960 and achieved LEED-EB 2.0 Silver in April of 2009. It reaches 35 floors and totals 730,000 square feet. Building 2 is a multitenant office building, with retail tenants on the first floor. The exterior of the building is in Sardinian Gray granite from street level to the first setback, beyond that the façade is comprised of painted aluminum panels. Floor plates were designed to offer full-floor identity to tenants of varying sizes ranging from 32,000 square feet to 8,000 square feet. The ground floor currently has six retail tenants.

Building 2 was reconstructed in 1995. The first major initiative was a complete building redevelopment including new infrastructure, building systems, common areas and building exterior. The building reopened 65 percent leased, and was 97 percent occupied within 15 months. The renovation included instituting green building exterior management practices; reducing indoor potable water by 10 percent over EPA 1992 standards; purchasing green office materials, including cleaning paper products and light

bulbs; conducting an energy study to help increase energy efficiency and reduce energy costs; and devising a thorough preventative maintenance program. In 2002, an energy management program was put into effect, resulting in cost savings of $327,000 per year.

Building 2 has received the Energy Star Building designation by the U.S Department of Environmental Protection every year since efficiency improvements were made in 2002. Building 2 provided a strong example of the Energy and Atmosphere Prerequisite credit 1. Its Preventative Maintenance activities include: Weekly, monthly, quarterly and annual inspections of all building equipment; AHU's, cooling towers, pumps, heat exchangers, HVAC controls and sensor calibrations, steam system, electrical components and controls, and operator training four times per year. Additionally, the controls contractor is contracted to monitor and review the building's energy consumption and the operation of the building automation system on a monthly basis. Deficiency reports are provided to the operating staff for corrective actions. Through the utilization of the Portfolio Manager tool for Energy and Atmosphere credits 1.1-1.10, building 2 received an Energy Star rating of 79 yielding an average of 8,588 tons of CO2 emissions per year compared to the industry average of 11,525 tons of CO2 emissions per year. Building 2 attained 41 points total, falling within the Silver range of 43-50 points, out of a possible 85 points. Please refer to Appendix D for the additional breakdown of LEED points.

Silver on 04/10/2009	
LEED EB 2.0	**41/85**
Energy and Atmosphere	9/23
Materials and Resources	14/16
Indoor Environmental Quality	9/22
Sustainable Sites	4/14
Water Efficiency	1/5
Innovation in Operations	4/5

Table 5.2 – Building 2, LEED for Existing Buildings– Silver Certification

Building 3:

Building 3 was built in 1976 totaling 1,850,000 square feet and reaching 44 floors. In mid-2009, it earned LEED-EB 2008 Silver qualifying the tower to be the largest commercial office building that has been certified to date under the LEED for Existing Buildings rating system (either Version 2.0 or Operations and Maintenance). Building 3 attained 43 points total, falling within the Silver range of 43-50 points, out of a maximum of 92 points (Platinum).

Silver on 06/12/2009	
LEED EB 2008	**43/92**
Energy and Atmosphere	10/30
Materials and Resources	4/14
Indoor Environmental Quality	13/19
Sustainable Sites	6/12
Water Efficiency	3/10
Innovation in Operations	7/7

Table 5.3 – Building 3, LEED for Existing Buildings– Silver Certification

Specific notable green features that Building 3 incorporated into its retrofit effort include efficient and reduced-content mercury lighting, low-flow plumbing fixtures, and

new glazing that boosts the amount of daylight that reaches the tower's interiors. For LEEDs Indoor Environmental Air Quality, Credit 3.1 Green Cleaning - High Performance Cleaning Program, building 3 implemented a cleaning program that addresses an appropriate staffing plan, implementation of training, use of chemical concentrates, use of sustainable cleaning materials, sustainable cleaning and hard floor carpet care products, and use of cleaning equipment.

An innovative credit 1.1 achieved under Innovation in Operations was a total facility infrared scan conducted to determine where energy loss locations were. Another innovative credit 1.4 included the implementation of an education program that was developed to present the project's sustainable design practices to occupants or visitors to the facility. The program included multiple educational components; an educational display highlighting the build's sustainable design features, a published brochure describing the projects features and LEED program, guided tours and posted website information. Additionally, building 3 earned BOMA's "Best Operating Office Building" award in 2008 for buildings larger than one million square feet. Please refer to Appendix D for the additional breakdown of LEED points.

Building	Year Built	Square ft.	# of Floors	LEED Cert.
1	1928	1,300,000	34	Gold
2	1960	730,000	35	Silver
3	1976	1,850,000	44	Silver

Table 5.4 – Summary of Three Case Study Buildings

Data Collection

The following is a summary of questionnaires responses.

I. Background

1. *Role in the retrofit process:*

-3 Engineers
-4 Project Managers
-3 Property Managers
-1 Owner

2. *Background by training:*

Engineers:
-MS in Engineering
-Operational Engineer
-Mechanical Engineer

Project Managers:
-Finance Degree with 20 years of experience
-Urban Studies, Architecture and Construction
-Engineering/Construction Management
-Engineering

Property Managers:
-Attorney handling brownfield redevelopment
-Operating Engineer, 24 years in commercial NYC RE
-PM for 15 years

Owner:
-Previously ran an energy and water conservation company

3. *Age group:*

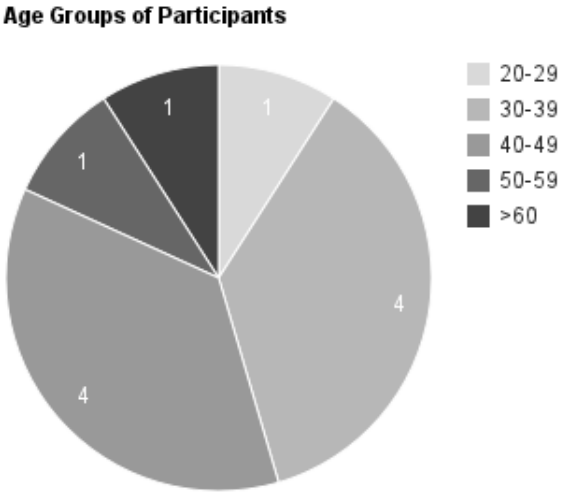


Figure 5.1 – Age Groups of Participants

4. *Professional certificates held (e.g. LEED Associate, LEED AP, SFP…):*

   Engineers:
   -PE (Professional Engineer) and LEED AP (Leadership in Energy and Environmental Design Accredited Professional)
   -BOMA (Building Owners and Management Association), RPA (Real Property Administrator), SMA (Systems Maintenance Administrator)
   -LEED AP, PE, CEM (Certified Energy Manager), CEA (Certified Energy Auditor), DCEP (Data Center Engineer Practitioner)

   Project Managers:
   -All LEED AP, one RPA (Real Property Administrator),

   Property Managers:
   -JD (Juris Doctorate)
   -BOMA, RPA, FMA (Facilities Management Administrator), SMA, LEED AP
   -MBA (Masters in Business Administration)

   Owner:
   -MS and PhD in Environmental Engineering and PE

5. *The importance sustainability plays in one's company's mission: (Rank)*

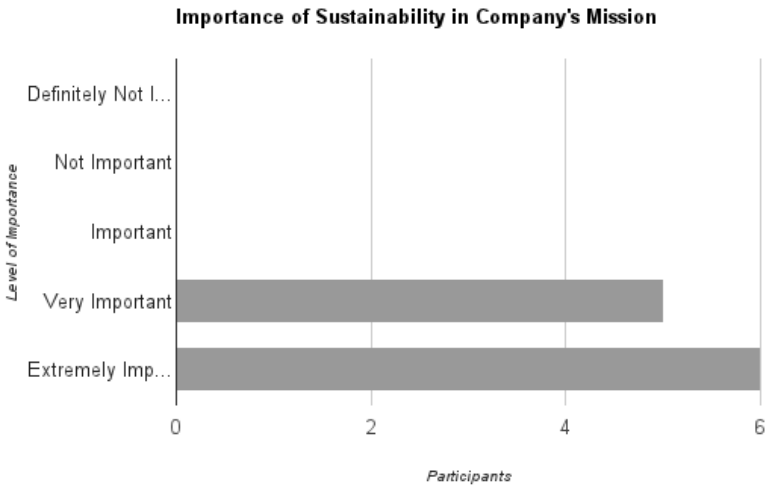


Figure 5.2 – Importance of Sustainability in Company's Mission

6. *Definition of Sustainability:*

   -Acting with awareness and initiative for the environment, economic and social current and future conditions.

- Efficiency across all business platforms by reducing our dependence on fossil fuels and lowering our carbon footprint.
- Operating my building at its peak efficiency while maintaining cost controls and environmental quality.
- Operational best practices not difficult to maintain on an ongoing basis.
- Enhance building desirability to tenants and prospective owners and contribute to tenant productivity, comfort and well-being through the implementation of energy and environmental practices that improve indoor climate conditions.

II. Goals & Successes:

7. The importance of each of the following outcomes of the project:

a) Attaining LEED certification.

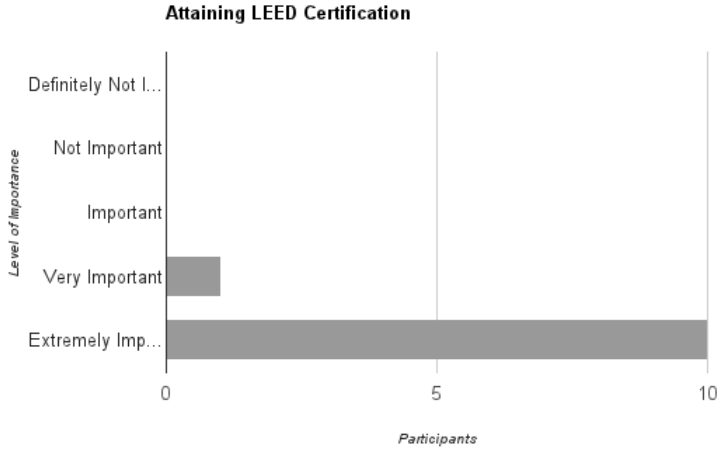


Figure 5.3 – The Importance of Attaining LEED Certification

b) Recognition and potential market impact.

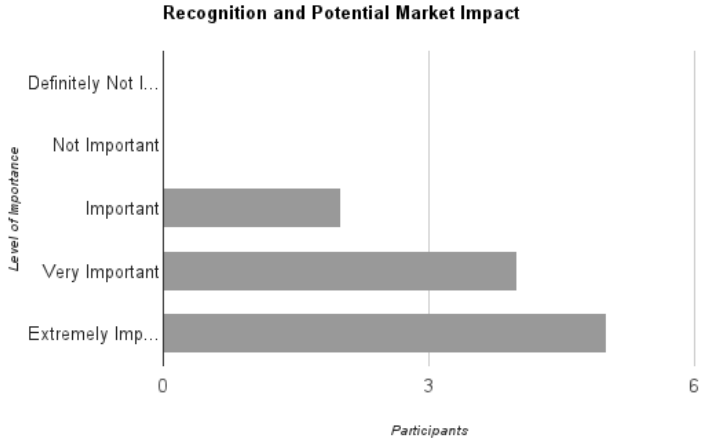


Figure 5.4 – The Importance of Recognition and Potential Market Impact

c) The experience as a learning process and knowledge accumulation in order to repeat it in the future.

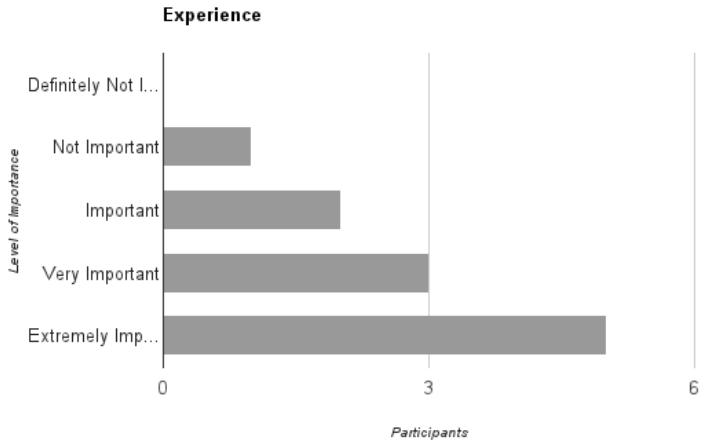


Figure 5.5 – The Importance of the Experience

d) Cost savings (e.g. Energy, Utility, Water…).

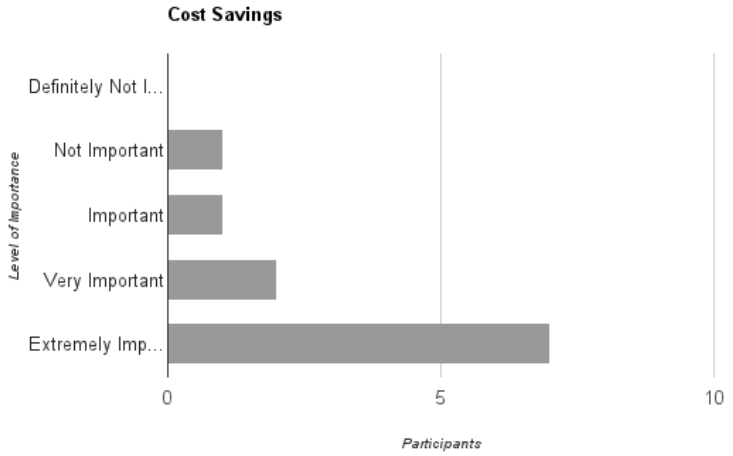


Figure 5.6 – The Importance of Cost Savings (Energy, Utility, Water)

e) Monetary gains in rent.

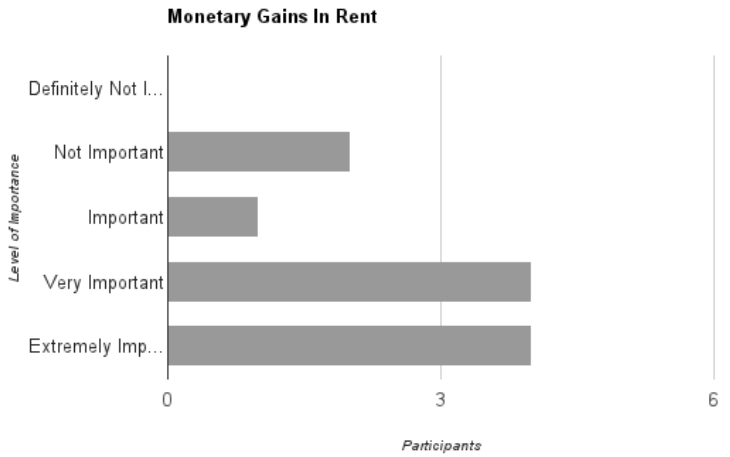


Figure 5.7 – The Importance of Monetary Gains in Rent

f) Capital investment savings.

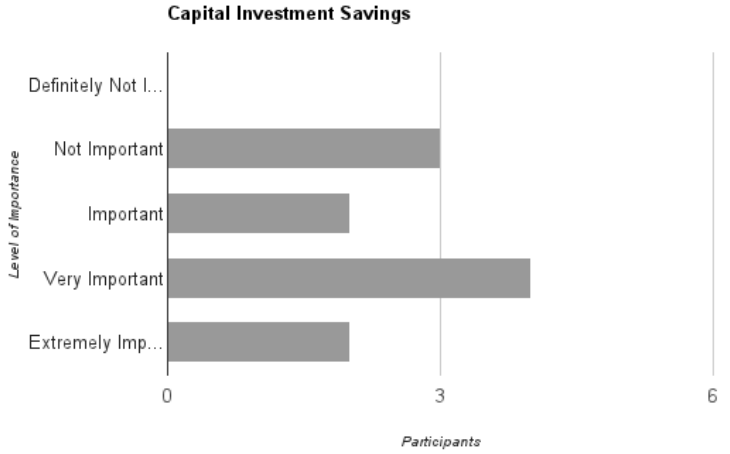


Figure 5.8 – The Importance of Capital Investment Savings

g) Monetary and labor savings for operation and maintenance.

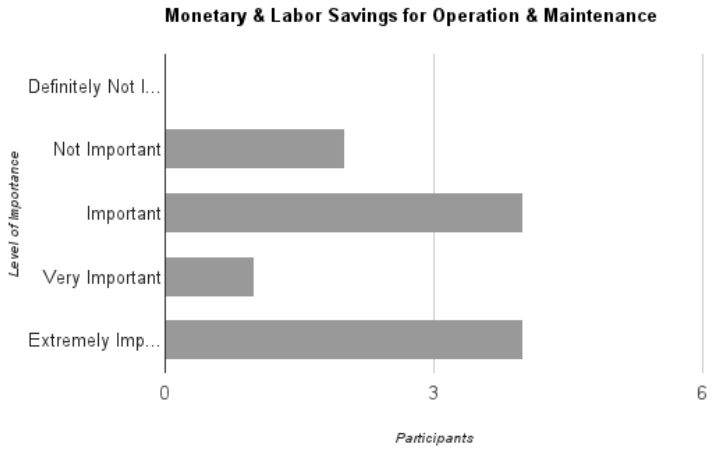


Figure 5.9 – The Importance of Monetary & Labor Savings for Operations & Maintenance

h) Longer lifespan predicted.

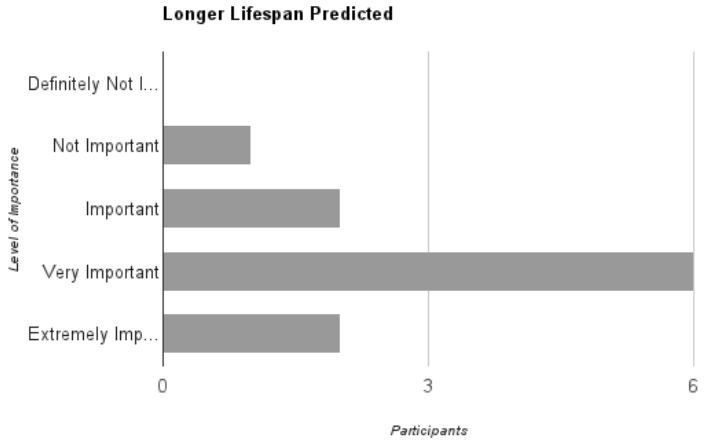


Figure 5.10 – The Importance of a Predicted Longer Building Life Span

i) Tenant attraction and retention.

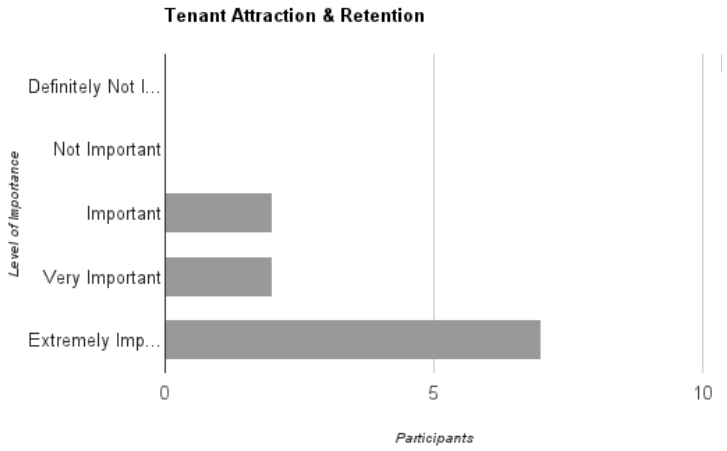


Figure 5.11 – The Importance of Tenant Attraction & Retention

j) Emissions reduction and climate change mitigation achieved.

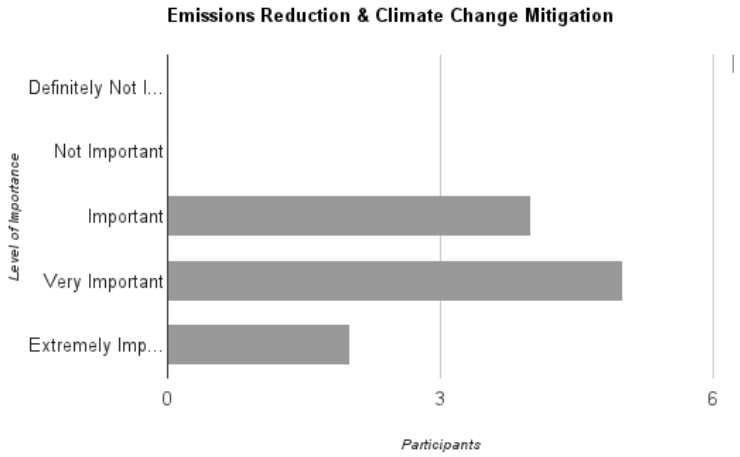


Figure 5.12 – The Importance of Emissions Reduction & Climate Change Mitigation

8. Project's top overarching goals and objectives:

-To lead NY real estate market in LEED certificate effort and create tenant's awareness of management's commitment to sustainable operation.
-To obtain LEED Certification and an Energy Star Rating.
-To develop a Sustainability Plan and create baseline of energy usage and measure future performance to baseline.

9. Motivations to pursue LEED certification and how they influenced the project:

-To become competitive in the market place with newer buildings, add building value, retain existing tenants and attract new tenants, achieve higher rents.
-To operate the building to its peak capabilities while lowering operating costs.
-The main tenant / owner wanted to achieve LEED for their headquarters.
-Wanted to be one of the first large commercial office buildings in New York City to obtain LEED Certification.

10. The key driver:

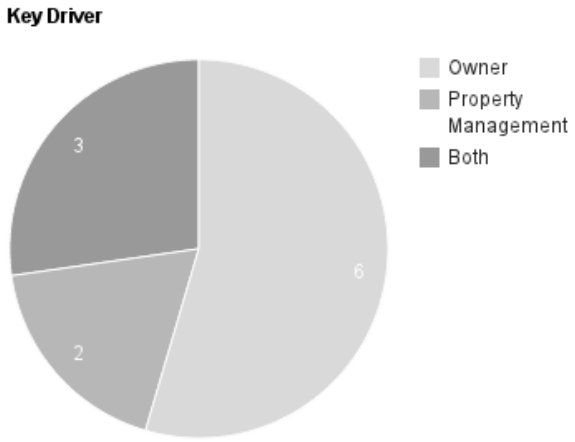


Figure 5.13 – The Key Driving Stakeholder

III. Process:

11. Building codes, zoning, or regulatory requirements that influenced decisions while pursing LEED, and how:

-NYC Building Codes and Local Laws, PLANYC 2030 ASHRAE, LEED Manuals, the building's Landmark Designation.
-None at the time of certification because building was ahead.

12. Value added to the project by pursuing LEED:

-Ahead of local building rules and regulations instead of passive compliance.
-Well viewed in the market place as green advocates, added competitiveness.
-LEED was the main goal.
-Appeal to perspective tenants and extended pride of existing tenants.

IV. Synergies: (Interactions between stakeholders and organizations)

13. Synergies that impacted the project and how:

-The measurements and calculations performed required the owner's direct involvement to dedicate personal for the effort.
-Cooperation with the LEED consultants in a timely fashion.

-More tenant interaction – tenants were involved and educated on the building.

V. Outcomes:

14. The most important long-term and short-term value-add strategies adopted in this project:

-Short Term: Attain LEED Certification, energy conservation, reduce water use, better recycling.
-Long Term: Address areas that we can further improve, reduce operational costs and increase tenant retention, maintain certification and Energy Star Labels.

15. Returns on investment (ROI) achieved or anticipated:

-Low cost energy conservation measures (ECMs) were implemented that had no large up front cost so paid off immediately.
-Reduced operating costs with energy rebates of up to 20,000 dollars per year and building marketability.
-The retro commissioning and energy auditing paid for it-self in less than 2 years.

16. Tenant involvement and contribution:

-Tenants participated transportation survey, reported to management if any air ventilation issue in their spaces and were given seminars asking to reduce energy and water consumption, continue to adhere to the building's recycling policy.
-Tenant involvement was very difficult.
-The owner of the project in question was also the main anchor tenant, they contributed much information on purchases, and office arrangements to help achieve LEED credits for purchases and lighting control and day lighting.
-All Tenants participate by providing energy usage documentation and implementing improved recycling practices. Main Tenant is partnering with Owner on Fuel Cell technology and purchase of clean energy (no emissions).

17. Occupant behavior impact:

-Tenants have installed occupancy sensors in office, adapted to waterless urinals/ aerators/ low flush toilets/ air hand dryers in the bathrooms.
-Yes, tenants typically make up between 40% - 60% of a building's energy usage. If behavior isn't changed, then the building can make an impact only up to a certain point.
-No. All corporations were on board and all were very interested in being able to say they were being corporately responsible for being in such a building.

VI. Lessons Learned:

18. Challenging aspects:

-The technical aspects of the renovation
-The initiation
-The finances
-Timeline - completing project before others + USGBC delays
-The extensive documentation requirements

19. The main differences between the buildings before versus after the retrofit:

-Higher tenant's satisfaction rating and more attractive to future tenants.
-Sustainable practices in place and vendors being held accountable for their practices at the building.
-A more energy efficient building that is more marketable.

20. Key moments that significantly influenced the project, and the main difficulties encountered:

-Achieving a high-energy star score, potential to become certified.
-Challenges included tenant participation in the transportation and occupancy survey.
-Obtaining financing for the project. In these difficult economic times money is always an issue.
-The entire process was difficult and became a full time job.
-Staying within budget to achieve LEED points and meeting timeline to achieve Owner's goals.

21. Key moments that adjusted the project's direction or outcomes:

-Obtaining the points that could be earned from the transportation survey and the Energy Star rating, yielding the potential to achieve Gold.
-Making sacrifices to water and energy usage in tenant occupied spaces without defaulting on our obligations under the lease, in a subtle way so as to not draw too much attention and without comprising our high level of service for our Class A building tenants.
-Monetary issues influenced the pursuit or non-pursuit of many credits.
-Timing of completing LEED certification. Decided to use consultant to expedite the process.

22. Influence on ones approach to other projects, and collaborative relationships formed:

-Collaborative relationships were formed and mutual respect, reinforcing that LEED certification requires total buy-in by all stakeholders if it wants to achieve certification and in a timely manner.

KEY WORDS found based on Questionnaire data:

- Competitiveness
- Leading
- The first
- Tenant cooperation and involvement
- Attaining LEED
- Attract tenants
- Timeline

Based on the information gathered; analysis was completed through the review of repetitive themes and words to formulate additional questions. From these questions geared towards one stakeholder from each Building, three phone interviews were conducted. Interview questions and summary of feedback collected follows.

Interview Questions:

1. When you compare your building's rent to a non-LEED building, is there a difference?

-No difference to buildings in Midtown Manhattan area.
-Right now no, though as time goes on and as more buildings become LEED certified there will be more a difference between rents.
-Yes there is a difference, though it is hard to quantify that difference. However some tenants will not even look at a building unless it is certified, may be considered a pre-requisite. About a 5-20% higher asking rent.

2. Are there commissioning programs for future tenant involvement, like the seminars given in the past?

-Yes, recertification is scheduled for the summer; seminars will be for both new and old tenants
-Yes, reapplying for gold instead of silver. Do have tenant meetings to encourage policies.
-Yes will re-apply and are considering increasing certification from silver to gold.

3. Since tenant cooperation and use is a main challenge, is there a better incentive for tenant involvement?

-Tried to hand out metro cards, raffles to give out an iPad due to difficulty of participation, will find out this year if this system works.

-Found that tenants are receptive but are reluctant to spend additional money. However in day-to-day tasks they are eager to participate.

4. In order to maintain a competitive edge alongside the idea that 'sustainability sells,' how do you market the LEED aspect of the building?

-All pictures of the building, website, leasing documents, marketing, using the USGBC logo. It is also in the lobby of the building.
-Market through tours of the building, however brokers tell potential tenants they are the first EB Silver Certified building in NYC. However -this is also because there hasn't been any vacancy in the building, so they haven't had to sell as a green building, though that will probably change in the future. Going for Gold instead of Silver will make us competitive 5 years from now.

5. *According to data collected, the Owner if the building is often regarded as the decision-making stakeholder. Additionally, cost savings were polled as very important. Who do you believe should lead the sustainability industry, the carrot or the stick? What is more effective? Such as;*

-Having mandates and codes of NYC that guide the industry
-Having some sort of disclosure requirement, for example when signing a lease, the building must provide historical utility information
-Using a green lease, solving the split incentive issue, due to shared benefits between the tenant and the owner

-The carrot- in order for a tenant to come into a building, they want to make sure as owner you are exercising your ability to decrease costs, which is passed on to tenants through operating costs. Saving on a bottom line, in addition to providing a safe and clean building.
-The carrot should lead the market for sustainability because at the end of the day, you want to be competitive and that means being 'green' right now. Against government mandates because at the end of the day, because the competitiveness will strive for landlords to update and being able to attract A tenants for your building.
-The owner is leading the way, benchmarking is required by local law 84, and that is easy to comply with now that we have received certification. However sustainability for the most part is lead by the owner.

6. What was the reasoning of hiring a 3rd party organization?

-Experts in the area and had a tight time frame to achieve certification. Were able to shorten the time frame by probably a year. If there is a company that can help guide you along, and are willing to spend $30,000 to help, it is worth it.

7. How are you planning to maintain building performance? Do you plan on using a third party organization again?

-Getting recertified and planning on using third party again for Local Law 84 and recertification.
-Although a little hesitant at first, will use an in house team for recertification.

Analysis

In analyzing the data comprised of answers from the 3 Engineers, 3 Property Managers, 4 Project Managers, and 1 Owner, and comparing the ranking of the importance of various outcomes, some interesting inferences and relationships became apparent. When comparing the responses to the question about The Importance of Sustainability in Company's Mission (Figure 5.2), and those to the question about The Importance of Attaining LEED Certification (Figure 5.3), it was very clear that stakeholders surveyed unanimously agreed on the importance of certain topics.

When comparing the responses to the question about The Importance of Monetary Gains in Rent (Figure 5.7) and those to the question about The Importance of Capital Investment Savings (Figure 5.8), they challenge the assumption that cost is the main barrier against green investments. If, according to the previous comparison, the bottom line goal is to attain LEED certification, is the cost irrelevant? Though answers are mixed, rather than increasing rent and thus increasing gains, it appears the driving factor is to stay competitive in order to maintain a differentiation. However, there are other sides to this relationship. One stakeholder responded, "Monetary issues influenced the pursuit or non-pursuit of many credits. Additionally, one of the interview questions asked was "When you compare your building's rent to a non-LEED building, is there a difference?" Two out of three stakeholders interviewed said no, there was no difference to buildings in the surrounding Midtown Manhattan area. However, one noted that as

time goes on and as more buildings become LEED certified, he believed there would be more of a difference between rents. This raises another question; once more buildings become certified, what will the next move be to maintain and edge?

When comparing the responses to the question about The Importance of Recognition and Potential Market Impact (Figure 5.4), The Importance of a Predicted Longer Building Life Span (Figure 5.10) and those to the question about The Importance of Emissions Reduction & Climate Change Mitigation (Figure 5.12), responses exemplify the mixed opinions of the long term goal to mitigate climate change and have a longer building life span. When compared to the short-term goal of achieving recognition (from tenants), it is evident short-term goals may be more important when compared to the overall long-term goals.

CHAPTER VI - Conclusion and Discussion

Discussion of Results:

Commonalities and uniquenesses were found based on the data collected from the three buildings studied. To reiterate, the objectives of the research was to further investigate the process and the people involved in the retrofitting of an existing building to identify the enabling factors and hindering barriers within the relationships of key stakeholders.

- Who are the key stakeholders?
- What are the key motivators for stakeholders?
- Why did the case study buildings chosen pursue LEED certification?

- How was the process challenging?
- What steps must be taken to further increase the stakeholders' incentive?

Commonalities:

One commonality found was "*The Competitive Edge*." Research questions that were addressed included: What are the key motivators for stakeholders? Why did the case study buildings chosen pursue LEED?

With attitudes expressing that buildings that do no stay current with the market will find themselves obsolete. The incorporation of maintaining or achieving value in the building adds to the market value, a very business oriented statement. The following are examples of supporting data:

- "To lead NY Real Estate market in LEED certificate effort."
- "...this is also because there hasn't been any vacancy in the building, so they haven't had to sell as a green building, though that will probably change in the future. Going for Gold instead of Silver will make us competitive 5 years from now."
- "We wanted to be one of the first large commercial office buildings in New York City to obtain LEED Certification."

Stakeholders viewed LEED as a means to maintain a competitive edge. At the end of the day, Real Estate is a business. Many companies have already realized it is inherent in their values, and thus necessary for their headquarters, for example, to be located in a 'green' building. Since in most cases this means occupying a LEED certified building, those buildings are recognized as more appealing.

Another commonality found was "*Tenant Involvement and Awareness*." The research question addressed was: Who are the key stakeholders? Tenant involvement and engagement is a large driver. User/tenant awareness and prioritization of goals is key to

the success for future initiatives. People must recognize the importance and the positive impacts. They hold a lot of power in the stakeholder relationship, as they are the ones that demand the product of a sustainable building.

- "The main tenant / owner wanted to achieve LEED for their headquarters."
- "To become competitive in the market place with newer buildings, add building value, retain existing tenants and attract new tenants, achieve higher rents."
- "Tenants typically make up between 40% - 60% of a building's energy usage. If behavior isn't changed, then the building can make an impact only up to a certain point."
- "Higher tenant's satisfaction rating and more attractive to future tenants."

Another commonality found was the consensus of "*The new player and stakeholder: The 3rd Party Organization.*" This also addressed the research question of "Who are the key stakeholders?"

- "Experts in the area and we had a tight time frame to achieve certification. Were able to shorten the time frame by probably a year. If there is a company that can help guide you along, and you are willing to spend $30,000 to help, it is worth it."
- "Collaborative relationships were formed and mutual respect, reinforcing that LEED certification requires total buy-in by all stakeholders if you want to achieve certification in a timely manner."
- "We are getting recertified and planning on using a third party again for Local Law 85 and recertification."

All three buildings utilized a third party organization to manage their LEED certification processes. Additionally, all three buildings happened to use the same consultant company. This company is a Sustainable Building Solutions company that supports many facets of Green Real Estate. The company, and many like them, offers sustainability services to improve environmental and energy performance. The service offerings assist building owners in order to maximize sustainability and energy performance to; attain LEED or Energy Star certification, attract and retain tenants, reduce operating expenses, comply with new NYC Energy Laws, align with corporate environmental policies, and to reduce carbon footprints. This company in particular has

managed the certification of about 75 percent of New York City's LEED-EB office space, and about 60 million square feet of property nationwide. These sustainability consultants are able to support clients in meeting the new energy mandates implemented by NYC, which is an important facet because a third party organization must be used for certain mandates.

An additional common link was the overall agreement that "*'The Carrot' versus 'The Stick' is more effective."* The research question addressed was "What steps must be taken to further increase the stakeholders' incentive?" In order to achieve recognition by setting their building apart from the other available options, a cost worthy approach was to invest in LEED certification to retain current tenants, attract new interested tenants and possibly increase asking rents.

- "The carrot is more effective- in order for a tenant to come into a building, they want to make sure as owner you are exercising your ability to decrease costs, which is passed on to tenants through operating costs. Saving on a bottom line, in addition to providing a safe and clean building."
- "The carrot should lead the market for sustainability because at the end of the day, you want to be competitive and that means being 'green' right now. This competitiveness will strive for landlords to update and thus attract A tenants for your building."

However, the combination of local laws with natural competitiveness of industry is realistic. NYC Building Codes, Local Laws, PlaNYC, ASHRAE, and Landmark Designation were listed as regulatory requirements that influenced decisions. The use of mandates and codes is also a driver and an effective means for compliance and progress.

NYC is on the cusp of potentially taking huge leaps due to the new requirements currently being implemented.

Another common issue raised from the data was that it was frequently a challenge to successfully engage tenants to complete the surveys necessary to submit for LEED certification. Building 1 mentioned that for their recertification they would try to use incentives to gain tenant interest, such as raffling an iPad or awarding metro cards. However, alternatively, client participation in the actual green initiatives was high.

Uniquenesses:

A uniqueness found within the data collected was the debate of who is "*The Leading Stakeholder*," which addressed the question of: Who are the key stakeholders? The Owner, Building Manager, or Tenant as the leading stakeholder? Dependent on the situation, all three players can act as the initiator, please refer to Figure 5.13.

Another uniqueness found were the variety of "*Challenges*" mentioned between the three case studies. This finding addressed the question of "How was the process challenging?"

- "The technical aspects of the renovation"
- "The initiation"
- "The finances, in these difficult economic times, money is always an issue."
- "The timeline - completing project before others & USGBC delays."
- "The extensive documentation requirements"
- "Tenant participation in the transportation and occupancy survey."
- "The entire process was difficult and became a full time job."
- "Staying within budget"

It is apparent that there are many commonalities and some unique elements that the stakeholders from the three chosen case study buildings face. The following provides the summarization of the above discussion recapping the answers of the proposed

research questions:

- Who are the key stakeholders?

  -Tenants play a major role in the success of green initiatives. Tenants hold a lot of power in the stakeholder relationship, as they are the ones that demand the product of a sustainable building.

  -The 3rd Party Organization, a Sustainable Building Solutions consultant company held a major role within the organization and management of retrofits for all three case buildings.

  -Dependent on the situation, all three key players (the owner, the building manager, or tenant) can act as the initiator in the project.

- What are the key motivators for stakeholders?

  -To maintain or create a competitive edge. Real Estate is a business, and if LEED allows the company to set itself or its' buildings apart, it is a strategic means to stay ahead of the curve.

- Why did the case study buildings chosen pursue LEED certification?

  -To maintain a competitive edge. Additionally, achieving LEED and the values associated with LEED, are parallel with the company's mission.

- How was the process challenging?

  -There were a variety of challenging aspects for each project. Such as; the technical aspects, the finances, and the timeline.

- What steps must be taken to further increase the stakeholders' incentive?

  -"The Carrot" over "The Stick" is more effective. Natural

competitiveness will effectively lead the market, however the reality of the industry combines the use of local laws.

The findings present prospective lessons learned and suggest areas to further investigate. It is clear that LEED EB and EBOM have significantly changed the landscape of existing buildings. The apparent mandates and codes forming requirements for New York City to adhere to, in combination with attaining recognition for updating a building are excellent incentives for molding a better city. The purpose of this study has been to provide some preliminary insight into the nature of these changes, stakeholder decisions to attain LEED recognition and their relationships, as well as their direction for the future. With regard to the preliminary insight, the above results are promising. The overall attitude of the stakeholders was positive about LEED initiatives, collectively exhibiting confidence in the programs success, and even aiming for higher LEED ratings in achieving recertification.

CHAPTER VII - Limitations and Outlook

Limitations

The inferential quality of this study is partially limited by its qualitative research design. The research approach uses data collection and observation to develop findings about the current trends in stakeholder relationships. Appropriately, then, hypotheses were purposefully omitted, yielding a study of the exploratory nature.

Some forms of bias may have been an influential factor in the research. Response

bias is when the subject consciously or subconsciously gives the response that they think the interviewer wants to hear. The subject may also believe that they understand the experiment and are aware of the expected findings, so they adapt their responses to suit. Mono-method bias occurs when only a single method of measurement is used. Although questionnaire and interviews were performed, perhaps additional varieties of methods could have been incorporated, minimizing the chances of this particular threat.

Additional aspects of the study that would have been helpful include the integration of users and occupants into the study. Involving the tenants and researching their motivations for wanting to occupy a LEED certified Class A office building instead of just a regular Class A office, would provide even more insight. Based on this exploratory study, moreover, it is important to realize the crucial role that users hold in a building. Yes, a LEED building can be achieved and various certification levels awarded, but if the building isn't used correctly, then its label becomes worthless. Another way to further expand this study would be to include more buildings. Due to the time limitations, studying more than 3 buildings was not feasible. However, using a large-scale data collection would yield greater comparisons and approaches towards the stakeholder relationships. Greater exploration of rewards and rebate programs, and the threats of taxation penalties, is another area that could be further explored. Additionally, the residential industry is an entire different sector that is another very large consumer of energy and has its own issues to investigate.

Outlook

Sustainability is a trend that is here to stay**.** Federal and state governments are

supportive by providing incentives for sustainable development and renovation. Tenants are demanding green buildings, and owners want to save money on energy costs. These behaviors are resulting in a new industry that is continuing to expand and develop to meet the increasing demand; energy service companies. Building owners and developers that are apprehensive of the 'trend' will surely be left behind. Competition will increase between LEED certified buildings and non-green properties, and those behind the curve will face reduced tenant demand for the space, and higher long-term energy costs due to inefficient systems, policies and procedures.

There are many available tools that should be utilized in the incorporation of sustainable practices. One recent develop in particular, as discussed earlier, is the incorporation of a green lease. Technology energy efficiency solutions are another force pressuring building owners and managers to provide sustainable buildings. One example is a Brooklyn-based company, EnergyHub, sells smart, cost-effective energy management tools that allow consumers to monitor and control energy consumption of individual appliances. With such technologies available, building users are becoming increasingly more aware of how not only individual appliances - but also building design and structure- affect their energy bills. Consequently, owners may be pressured to pay closer attentions in ensuring buildings are sustainably designed throughout the rest of the building construction supply chain. With consumers increasingly becoming cognizant of their energy bills and potential savings and the origins of where those costs are coming from, owners have the opportunity to think ahead with more long-term goals.

There is a rich array of technological tools that help building professionals adopt sustainable standards and achieve high efficiency and optimization of design. While

owners and managers may not be the primary user of most technological devices, they should certainly ensure that the architects and engineers hired use the technology in the development of sustainable buildings. Building Information Modeling (BIM) is defined as the process of creating and suing digital models for design, construction and/or operations of projects. The rapid emergence of BIM is changing the way project teams work together to communicate, solve problems and build better projects faster and at less cost. This modeling program encompasses building geometry, spatial relationships, geographic information, and quantities and properties of building components (Hua, 2011).

Some benefits BIM offer users are easier coordination of different software and project personnel, improved productivity, improved communication and improved quality control. BIM is seen to be closely related to Integrated Project Delivery (IPD) where the primary motive is to bring the teams together early on in the project. A full implementation of BIM also requires the project teams to collaborate from the inception stage and formulate model sharing and ownership contract documents. In investing in BIM adoption, developers must be prepared for ensuring adequate training and the cost of software and required hardware upgrades. By using BIM, owners and managers will better understand the process of generating and managing building data during its lifecycle as well as force its team of engineers, designers and architects to share information continuously.

In NYC, this is the second year of benchmarking reporting, but unlike last year, the scores submitted this year will be made public in September 2012 for all to see, including prospective tenants, competitors, investors and others. This may incentivize

building owners to become more energy conscious and pursue LEED certification. These kinds of technological devices, in congruence with local laws, help to raise awareness of energy waste and reduce the level of waste, especially in commercial buildings and in residential buildings in developed countries (WBCSD, 2009). Simple feedback has been found to cut energy use by up to 15% (ECI, 2006). Future technological advances will help automate building operation to provide further energy reductions. In understanding the role these kind of technological solutions have in the building sector, owners and managers should be equipped with the right strategies in their approach to the engineers and architects they hire.

Another example of a service offered by green consultants, is a software called ProAct. ProAct is a software solution for tracking operations, energy and sustainability of complex buildings for building owners, building managers and portfolio managers. It allows users to set and track initiatives for each building, such as recycling, purchasing, and energy use, while allowing custom goals and LEED requirements, and account managers to provide user viewing regulations. The tracking system exhibits a building dashboard which shows real-time status of all initiatives and if goals are being met. Portfolio tools are used to graph and compare historical results for buildings and portfolios. Alerts are emailed to users to ensure sustainable initiatives are on time and on target, and other tools. This program integrates the EPA Energy Star Portfolio Manager and is able to streamline LEED certification.

This type of system is another example of a user interface to help maintain and track the initial changes made to increase energy efficiency. It is important to realize the role a type of system may serve in the maintenance and involvement of users and

companies. Supporting a smooth transition of buildings' updates to then be placed into a project manager's responsibilities should be as effortless as possible. This user friendly interface is a step in the right direction to encourage user involvement and to make sure the building continues to run correctly after the initial investments.

Based on this exploratory study, a variety of additional hypotheses could be formed and tested. One future study could test the input and output of investments towards green buildings, exploring what companies actually save in monetary values. Another study could focus on the tenant relationship; comparing the true role of occupants versus the predicted role of computer-generated models, evaluating the difference between real life savings with tenants to those that computer programs predict.

A Model Energy Aligned Lease Provision

Detailing language that solves the Split Incentive Problem
in typical modified gross commercial leases for base buildings

The Split Incentive Problem

- The "Split Incentive" problem occurs because building owners pay the capital expenses for energy retrofits to the base building, but tenants receive the financial benefits of energy savings through a reduction in their proportionate share of base building operating expenses.
- This "split" of responsibility for capital versus operating expenses leaves building owners with little incentive to undertake energy retrofits.
- This is not just a problem in theory. In a NYC Mayor's Office survey, 60% of NYC commercial property owners said it was an impediment to making energy retrofits.

Current Leases do not Solve the Split Incentive Problem

- Many modified gross commercial leases have a clause which allows owners to recover costs of capital expenses that result in operational savings. But this recovery is typically based on the useful life of the retrofit; this is too long to encourage owner investments.

Solving the Problem

- The NYC Mayor's Office of Long Term Planning and Sustainability (OLTPS) convened a Working Group of major building owners, tenants, property managers, lawyers, and engineers, to address the split incentive issue.
- Owners expressed a strong preference to recoup the capital costs of efficiency retrofit measures based on a prediction of energy savings; a measured savings standard, from the owners' point of view, was too complex, expensive and unpredictable.
- Tenants, on the other hand, were concerned that predicted savings would not be realized and wanted cost recovery to be based on measured savings.

The Solution to the Split Incentive Problem

- The Working Group concurred that industry experience showed that actual commercial energy retrofit savings are generally within +/- 20% of predicted savings.
- Tenants agreed to base the owners' recovery on predicted savings as long as tenants could be protected against underperformance.
- **Solution: The building owner's cost recovery is based on a prediction of savings as determined by an energy specialist agreed upon by both parties, but the owner's capital expense pass-through is limited to 80% of such predicted savings in any given year.** This provides the tenant with a cushion to protect against underperformance; accordingly, the owner's payback (recovery) period is extended by 25%.
- OLTPS developed a financial model which shows that, under this arrangement, both parties benefit financially in the situations that cause concern: when energy savings are lower than expected, when retrofits occur late in the lease, or when the retrofits have a long payback. Even when all three occur, the downside risk to the tenant is minimal.

Why this Works

- **A key conclusion of the Working Group was that energy efficiency retrofits in multi-tenant commercial buildings are not a zero sum game.**
- The energy-aligned lease language simply unlocks the potential for energy savings that result from retrofits.
- In almost all cases, the use of this pass-through structure will make energy retrofits net present value (NPV) positive to both owners and tenants – a true win-win situation. Even in cases where the retrofit substantially underperforms predictions, the downside risk to the parties is nominal compared to the overall costs of owning, operating and occupying a commercial building.

Key Features of Lease Language

Standardized Lease Language is Easy to Use.
The model lease language can be easily inserted into a typical modified gross commercial lease. This reduces transaction costs between owners and tenants who do not have to negotiate a new "green lease" simply to position themselves to accomplish energy retrofits.

Both Parties Benefit from Energy Savings.
If the energy retrofit performs as predicted, tenants keep 20% of their share of energy savings *immediately*, and enjoy the full amount of savings after the retrofit is paid off. The owner accrues the energy savings when the lease turns over because of the lower base building costs.

The Buffer Protects Tenants from Underperformance.
The tenant pays only 80% of predicted savings, which extends payback period to 125%. Keeping 20% of savings creates a performance buffer, which protects tenants in case of less-than-expected results from underperforming retrofits.

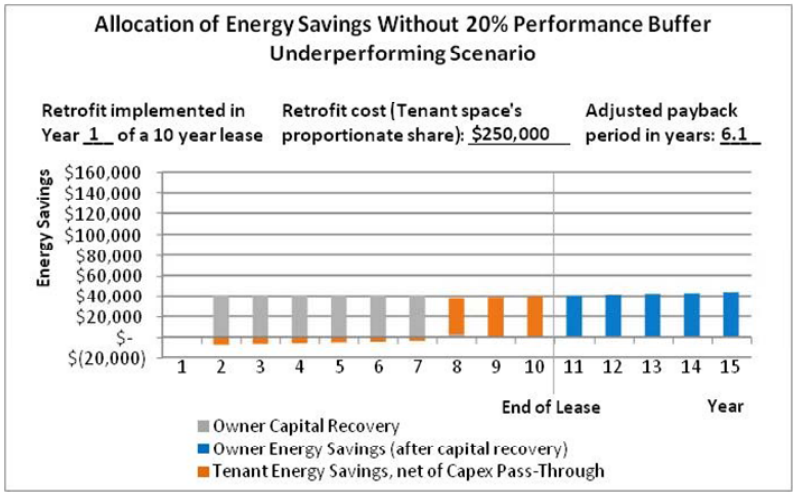
The Owners Recover Their Capital Costs.
The building owner can start recovering the cost of the retrofit from the tenant as soon as it is in place, with full recovery well before the end of the useful life of the equipment.

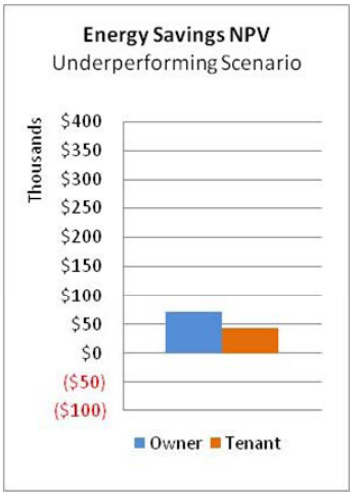
Predicted Payback Simplifies the Accounting.
Monthly payback amount is calculated upfront using predicted energy savings, as determined by a professional energy specialist, which is considerably simpler and less controversial than determining actual savings.

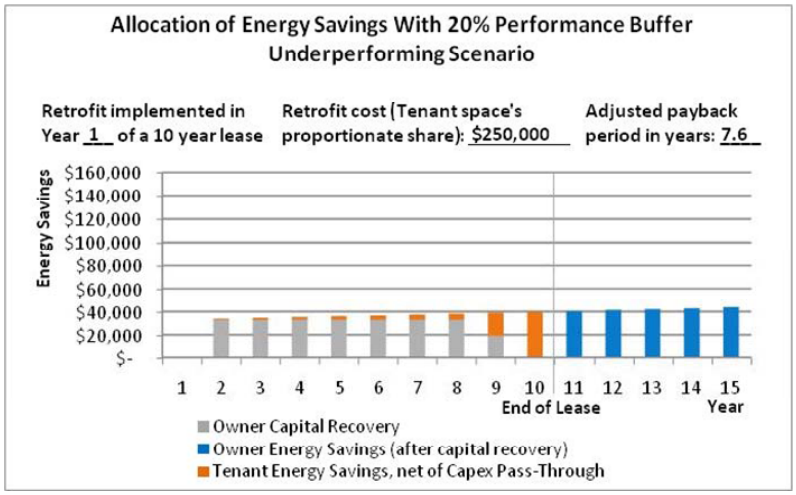
What this Lease Language Does Not Do.
This model lease language solves the split incentive problem for energy used in the base building systems for typical modified gross commercial leases. It does not solve the split incentive problem for electricity used *within* tenant spaces when such spaces are not individually metered or sub-metered. To solve this issue, tenants must be individually metered or sub-metered, and pay for their metered electrical consumption. Note: In Dec. 2010, NYC adopted LL. 88. This requires the installation of meters or sub-meters for all large commercial tenant spaces by 2025. For more information, see:
http://www.nyc.gov/html/planyc2030/downloads/pdf/ll88of2009_lighting_upgrades_and_sub-meters.pdf

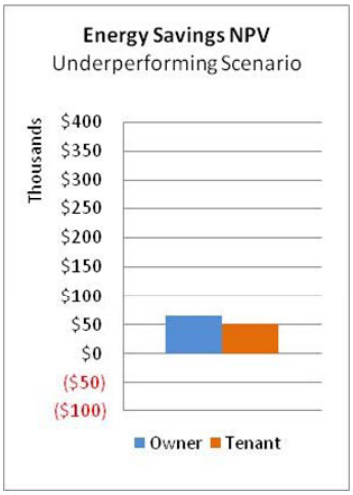
The financial model below shows how the energy-aligned lease language protects the tenant from an underperforming retrofit.

Example of a tenant space:	**100,000 sf.**
Lease rent psf:	**$60.00**
Operational expenses for energy in base year:	**$2.00**
Year of retrofit implementation in 10 year lease:	**Year 1**
Retrofit cost psf.:	**$2.50**
Predicted energy savings psf:	**20% or $0.41**
Predicted simple payback period:	**6.1 years**
Performance Buffer:	**20%**
Adjusted payback period with Performance Buffer:	**7.6 years**









Mayor Bloomberg oversees the signing agreement between Silverstein Properties and WilmerHale, the first lease to use the energy-aligned lease language.

Support for the Model Lease Language

- On April 5, 2011, Silverstein Properties and WilmerHale signed the first lease based on this language, for a floor of 7 World Trade Center. A second lease was signed by MSCI Inc. in the 7 WTC on September 19, 2011.
- The City of New York will use this language in new leases where the City is a tenant.
- Language has been endorsed by: Real Estate Board of New York, US Green Building Council, Natural Resources Defense Council, Environmental Defense Fund, and HR&A Advisors
- The following lawyers, owners, tenants, property managers, and engineers helped develop the language: Marc Rauch, Esq., Forest City Ratner Companies, First New York Partners, Cushman & Wakefield, Ernst & Young, Deutsche Bank, Goldman Copeland Associates, JB&B

Re: Capital Improvements to Improve Energy Efficiency
(Amends typical commercial modified gross lease)

1.1 Operating Expenses

(a) Definitions

(i) "Base Year" means _____.

(ii) "Capital Improvement" means any alteration, addition, change, repair or replacement (whether structural or nonstructural) made by Landlord in or to the Building or the common areas or equipment or systems thereof, which under generally accepted accounting principles, consistently applied, is properly classified as a capital expenditure. The aggregate costs of any Capital Improvement shall be deemed to include, without limitation, architectural, engineering and expediting fees, legal, consulting, inspection and commissioning fees actually incurred in connection therewith, but shall be deemed to exclude actual or imputed financing costs in connection therewith.

(iii) "Comparison Year" means each period of twelve (12) consecutive months subsequent to the Base Year.

(iv) "Independent Engineer" means an engineer selected by Landlord from the list annexed hereto as Exhibit ____. From time to time, but not more than once during any period of twelve (12) consecutive months, Landlord and Tenant may each recommend one or more independent professional engineers licensed by the State of New York or energy management specialists, in each case with at least six (6) years' experience in performing energy audits on commercial property similar in size and use to the Property, for inclusion on the list annexed hereto as Exhibit ____. Any such recommendation(s) by Landlord or Tenant shall be subject to the written approval of the other party, which approval shall not be unreasonably withheld.

(v) "Operating Expenses" means all costs, expenses, disbursements and expenditures (and taxes, if any, thereon) incurred by or on behalf of Landlord (and whether paid or incurred directly or through independent contractors or outside vendors) with respect to operating, maintaining, repairing, replacing, lighting, insuring, staffing, cleaning, safeguarding and managing the Building and all common areas and equipment or systems thereof, including, without limitation…(16) the cost of any Capital Improvement (as hereinafter defined) if and to the extent includable in Operating Expenses pursuant to Section 1.1(b) below, which cost shall be amortized on a straight line basis over the useful life of such Capital Improvement (such useful life to be determined in accordance with generally accepted accounting principles, consistently applied), except with respect to Capital Improvements described in Section 1.1(b)(i) below (which shall be amortized as provided in that subsection), with the annual amortization amount included in Operating Expenses for the Comparison Year in question…

(vi) "Projected Annual Savings" means the average annual base building utility cost savings anticipated to be generated by a Capital Improvement, determined using commonly applied engineering methods and an estimate provided in writing by the Independent Engineer.

(b) Capital Improvements.

Landlord may include the costs of certain Capital Improvements in Operating Expenses pursuant to Section 1.1(a)(v)(16) in accordance with the following:

(i) Capital Improvements Intended to Improve Energy Efficiency. In the case of any Capital Improvement that the Independent Engineer certifies in writing will, subject to reasonable assumptions and qualifications, reduce the Building's consumption of electricity, oil, natural gas, steam, water or other utilities, and notwithstanding anything to the contrary in Section 1.1(a)(v):

A. The costs of such Capital Improvement shall be deemed reduced by the amount of any NYSERDA or similar government or other incentives for energy efficiency improvements actually received by Landlord to defray the costs of such Capital Improvement, and shall further be reduced by any energy efficiency tax credits or similar energy-efficiency-based tax incentives actually accruing to Landlord as a result of such Capital Improvement.

B. For the purposes of this Section 1.1(b)(i), "simple payback period" means the length of time (expressed in months) obtained by dividing (x) the aggregate costs of any such Capital Improvement, by (y) the Projected Annual Savings. By way of example: If the aggregate costs of such Capital Improvement are $2,000,000 and the Projected Annual Savings are $500,000, then the simple payback period for such Capital Improvement is forty-eight (48) months.

C. Commencing with the first Comparison Year following the year in which such Capital Improvement is completed and placed in service, and continuing for the duration of the Adjusted Payback Period (as hereinafter defined), Landlord may include in Operating Expenses a portion of the aggregate costs of such Capital Improvement equivalent to eighty percent (80%)[1] of the Projected Annual Savings, so that the aggregate costs of such Capital Improvement will be fully amortized over one hundred twenty-five percent (125%)[2] of the simple payback period (such period of time, the "Adjusted Payback Period"). By way of example: If the aggregate costs of such Capital Improvement are $2,000,000, the Projected Annual Savings are $500,000 and the simple payback period for such Capital Improvement is forty-eight (48) months, then Landlord may include $400,000 of the aggregate costs of such Capital Improvement (i.e., an amount equivalent to 80% of the Projected Annual Savings) in Operating Expenses for five consecutive Comparison Years (i.e. sixty (60) months or 125% of the simple payback period).

[1] Actual cost savings from energy efficiency improvements may equal, exceed or fall short of projected savings. The discount of Projected Annual Savings (and the concomitant extension of the payback period) is intended to provide a margin of error in case actual savings fall short of Projected Annual Savings.
[2] See Footnote 1.

APPENDIX B
LEED 2009 for Existing Buildings: Operations & Maintenance Project

Checklist Sustainable Sites	**26 Possible Points**
Credit 1 LEED Certified Design and Construction	4
Credit 2 Building Exterior and Hardscape Management Plan	1
Credit 3 Integrated Pest Management, Erosion Control, and Landscape Management Plan	1
Credit 4 Alternative Commuting Transportation	3-15
Credit 5 Site Development—Protect or Restore Open Habitat	1
Credit 6 Stormwater Quantity Control	1
Credit 7.1 H eat Island Reduction—Nonroof	1
Credit 7.2 H eat Island Reduction—Roof	1
Credit 8 Light Pollution Reduction	1

Water Efficiency	**14 Possible Points**
Prerequisite 1 Minimum Indoor Plumbing Fixture and Fitting Efficiency	Required
Credit 1 Water Performance Measurement	1-2
Credit 2 Additional Indoor Plumbing Fixture and Fitting Efficiency	1-5
Credit 3 Water Efficient Landscaping	1-5
Credit 4.1 Cooling Tower Water Management—Chemical Management	1
Credit 4.2 Cooling Tower Water Management—Nonpotable Water Source Use	1

Energy and Atmosphere	**35 Possible Points**
Prerequisite 1 Energy Efficiency Best Management Practices—Planning, Documentation, and Opportunity Assessment	Required
Prerequisite 2 Minimum Energy Efficiency Performance	Required
Prerequisite 3 Fundamental Refrigerant Management	Required
Credit 1 Optimize Energy Efficiency Performance	1-18
Credit 2.1 Existing Building Commissioning—Investigation and Analysis	2
Credit 2.2 Existing Building Commissioning—Implementation	2
Credit 2.3 Existing Building Commissioning—Ongoing Commissioning	2
Credit 3.1 Performance Measurement—Building Automation System	1
Credit 3.2 Performance Measurement—System Level Metering	1-2
Credit 4 On-site and Off-site Renewable Energy	1-6
Credit 5 Enhanced Refrigerant Management	1
Credit 6 Emissions Reduction Reporting	1

Materials and Resources	**10 Possible Points**
Prerequisite 1 Sustainable Purchasing Policy	Required
Prerequisite 2 Solid Waste Management Policy	Required

Credit 1 Sustainable Purchasing—Ongoing Consumables	1
Credit 2.1 Sustainable Purchasing—Electric-Powered Equipment	1
Credit 2.2 Sustainable Purchasing—Furniture	1
Credit 3 Sustainable Purchasing—Facility Alterations and Additions	1
Credit 4 Sustainable Purchasing—Reduced Mercury in Lamps	1
Credit 5 Sustainable Purchasing—Food	1
Credit 6 Solid Waste Management—Waste Stream Audit	1
Credit 7 Solid Waste Management—Ongoing Consumables	1
Credit 8 Solid Waste Management—Durable Goods	1
Credit 9 Solid Waste Management—Facility Alterations and Additions	1

Indoor Environmental Quality **15 Possible Points**

Prerequisite 1 Minimum Indoor Air Quality Performance	Required
Prerequisite 2 Environmental Tobacco Smoke (ETS) Control	Required
Prerequisite 3 Green Cleaning Policy	Required
Credit 1.1 Indoor Air Quality Best Management Practices—Indoor Air Quality Management Program	1
Credit 1.2 Indoor Air Quality Best Management Practices—Outdoor Air Delivery Monitoring	1
Credit 1.3 Indoor Air Quality Best Management Practices—Increased Ventilation	1
Credit 1.4 Indoor Air Quality Best Management Practices—Reduce Particulates in Air Distribution	1
Credit 1.5 Indoor Air Quality Best Management Practices—Indoor Air Quality Management for Facility Alterations and Additions	1
Credit 2.1 Occupant Comfort—Occupant Survey	1
Credit 2.2 Controllability of Systems—Lighting	1
Credit 2.3 Occupant Comfort—Thermal Comfort Monitoring	1
Credit 2.4 Daylight and Views	1
Credit 3.1 Green Cleaning—High Performance Cleaning Program	1
Credit 3.2 Green Cleaning—Custodial Effectiveness Assessment	1
Credit 3.3 Green Cleaning—Purchase of Sustainable Cleaning Products and Materials	1
Credit 3.4 Green Cleaning—Sustainable Cleaning Equipment	1
Credit 3.5 Green Cleaning—Indoor Chemical and Pollutant Source Control	1
Credit 3.6 Green Cleaning—Indoor Integrated Pest Management	1

Innovation in Operations **6 Possible Points**

Credit 1 Innovation in Operations	1-4
Credit 2 LEED Accredited Professional	1
Credit 3 Documenting Sustainable Building Cost Impacts	1

Regional Priority **4 Possible Points**

Credit 1 Regional Priority	1-4

APPENDIX C - Questionnaire Responses

Building 1

1. What was your role in the retrofit process?	2. What's your background by training:	3. Please indicate your age group:	4. Please list any professional certificates you may hold (e.g. LEED Associate, LEED AP, SFP, etc.):	5. Please rank the importance sustainability plays in your company's mission:	6. What is your definition of Sustainability:
Engineer	University BS in ELEC 1989 Resselaer Polytech Instintute MS in ELEC 1993	40-49	PE & LEED AP	4	To perserve the natural resouces by all means to benefit future generations.
Project Manager	Finance Degree with 20 years of experience	40-49	LEED AP, RPA	4	environment and its natural recsource
Project Manager	Urban Studies & Architecture as well as Construction.	20-29	LEED AP	5	and adopting practices considering long term impacts, who and what they impact, and overall health of those practices to minimize negative long term affects to ensure continued health and stability.

a) Attaining the LEED certification.	b) Recognition and potential market impact.	c) The experience as a learning process and knowledge accumulation in order to repeat it in the future.	d) Cost savings (e. g. Energy, Utility, Water…).	e) Monetary gains in rent.	f) Capital investment savings.	g) Monetary and labor savings for operation and maintenance.	h) Longer lifespan predicted.	i) Tenant attraction and retention.	j) Emissions reduction and climate change mitigation achieved.
4	4	4	5	4	3	3	4	4	4
5	5	5	5	3	3	5	4	5	3
5	5	5	4	5	4	4	4	5	4

8. What were the project's top overarching goals and objectives?	9. What were the motivations to pursue LEED certification and how did they influence the project?	10. Who (which stakeholder) was the key driver?	11. Which building codes, zoning, or regulatory requirements influenced decisions while pursing LEED, and how?	12. What was the value added to the project by pursuing LEED?	13. What synergies impacted the project and how?	14. What were the most important long-term and short-term value-add strategies adopted in this project?	15. What returns on investment (ROI) have been achieved or anticipated?
To lead NY real estate market in LEED certificate effort and create tenant's awareness of management's commitment to sustainable operation. The project initiate goal was LEED Silver and it is awarded Gold.	[redacted] to address.	[redacted] the part owner and building management.	NYC Building Codes and Local Laws ASHRAE LEED Manuals	Ahead of local building rules and regulations instead of passive compliance.	The measurements and calculations performed required [redacted] -owner's direct involvement to dedicate personal for the effort. Cooporate with [redacted] the lead consultants in timely fashion. For example, we set up a meeting at moment notice.	Take immediate action to meet LEED certificate goal. Have a long term plan to address areas that we can improve.	[redacted] to address.
To obtain Leed Gold for a building that is almost 80 years old	To become competive in the market place with newer buildings	The building ownership [redacted] and the managing agent [redacted]	The building's Landmark Designation and New York City Code	Building and its ownership/ managing became well viewed in the market place as "green" advocates.	Cleaning /Energy Atmosphere Water Consumption/ Regional Credit	Energy and Water Conservation	No infrastruce changes were made there was no real ROI.
Attain LEED Certification as well as optimize energy performance at the building to reduce energy costs and increase the Energy Star score.	I believe the motivation was to distinguish the building within the real estate market as a well run and sustainable building.	Ownership.	The new energy efficiency local laws in NYC.	It was the main goal.	More tenant interaction - getting the tenants involved and educated on the buildings initiatives.	Continues approaches to keep up the high bar set within the LEED performance period with regards to sustainable operations and energy performance.	low cost energy conservation measures (ECMs) were implemented that had no large up front cost so paid off immediately.

16. Is there any tenant involvement and contribution in this project? If any, at what level is the involvement?	17. Do you see occupant behavior impacting the project's sustainability? If yes, in what way?	18. What was the most challenging aspect of the project?	19. What are the main differences between the buildings before versus after the retrofit?	20. What were the key moments that significantly influenced the project? What were the main difficulties that you encountered during that time?	21. Were there any key moments that adjusted the project's direction or outcomes? In what ways did they enable or hinder the project?	22. How has this project influenced your approach to other projects? Were collaborative relationships formed during this project that may be used in the future?
Tenants participated transportation survey. Tenants reported to management if any air ventilation issue in their spaces.	Tenants' willing participation encourage the team to reach a higher goal than initial Silver.	The technical aspects of the renovation	Higher tenant's satisfication rating. More attactive to future tenants.	Certain formats of technical calculations are changed as LEED improves the standards. We have to do the same work multiple times.	To pursue Gold instead of Silver. It makes the project more challenging and rewarding.	More willing to bring up sustainable aspect at initial project planning stages. [redacted] services whenever possible.
Tenants were given seminars asking to reduce energy and water consumption, continue to adhere to teh building's recycling policy.	Tenants have installed occupancy sensors in office, adapted to waterless unrinals/ aerators/ low flush toilets/ air hand dryers in the bathroms.	The initiation	No were no major retrofits more policy changes were made.	Once we received such a high energy star scorce, we need we had the potential to become certified. Challenges include tenant participation in the transportation and occupancy survey.	Once we obtain the points that could be earned from the transportation survey and the energy star rating, we knew we had the potential to become LEED GOLD EB Certified.	Collaborative relationships were formed with the in-house staff - management/engine and well as with the outside consultants.

Yes, they participated in education seminars as well as lobby events explaining the process the building was going through and what they can do to help and begin to adopt sustainable practices in their own homes.	Yes, tenants typically make up between 40% - 60% of a building's energy usage. If they don't change their behavior then the building can make an impact only up to a certain point.	meeting requirements as requested by the LEED review team	sustainable practices in place and vendors being held accountable for their practices at the building.	Getting tenant response to surveys such as alternative transportation and comfort surveys.	The high Energy Star score allowed them to pursue a higher level of LEED certification.	Yes, you always learn something with each project team. We are already working with the building to pursue re-certification at the building.

Building 2

1. What was your role in the retrofit process?	2. What's your background by training:	3. Please indicate your age group:	4. Please list any professional certificates you may hold (e.g. LEED Associate, LEED AP, SFP, etc.):	5. Please rank the importance sustainability plays in your company's mission:	6. What is your definition of Sustainability:
Property Manager	I was an attorney handling urban re-use and brownfields redevelopment.	30-39	JD	5	A policy goal of improving the environmetal health for future generations through improving efficiency across all business platforms by reducing our dependence on fossil fuels and lowering our carbon footprint.
Engineer	OPERATING ENGINEER	50-59	BOMA ,RPA ,SMA	4	Operating my building at it's peak efficiency while maintaing cost controls and environmental quality.
Engineer	Professional Engineer. I am a mechanical engineer by trade. I am also LEED certified.	30-39	LEED AP PE CEM CEA DCEP	4	Operational best practicies that are not difficult to maintain on an ongoing basis.
Project manager	Engineering/Constru Project management	30-39	LEED AP since 2007	5	See response in [redacted] survey

a) Attaining the LEED certification.	b) Recognition and potential market impact.	c) The experience as a learning process and knowledge accumulation in order to repeat it in the future.	d) Cost savings (e. g. Energy, Utility, Water…).	e) Monetary gains in rent.	f) Capital investment savings.	g) Monetary and labor savings for operation and maintenance.	h) Longer lifespan predicted.	i) Tenant attraction and retention.	j) Emissions reduction and climate change mitigation achieved.
5	4	3	5	4	4	5	4	5	4
5	5	5	5	4	4	3	5	5	5
5	3	4	4	5	2	3	3	5	3
5	3	2	3	2	2	2	4	3	3

8. What were the project's top overarching goals and objectives?	9. What were the motivations to pursue LEED certification and how did they influence the project?	10. Who (which stakeholder) was the key driver?	11. Which building codes, zoning, or regulatory requirements influenced decisions while pursing LEED, and how?	12. What was the value added to the project by pursuing LEED?	13. What synergies impacted the project and how?	13. What synergies impacted the project and how?	14. What were the most important long-term and short-term value-add strategies adopted in this project?	15. What returns on investment (ROI) have been achieved or anticipated?
Reduction of utility costs and increased operational efficiencies.	Make the building more marketable for future tenants.	[redacted] the property manager.	NYC 2030 initiative	I believe we are now more competitive in retaining existing and attracting new tenants.	Not really sure	Not really sure	Short-term strategy was to become the first EB LEED Certified office building in NYC. Long-term strategy was to reduce operational costs and increase tenant retention. This has clearly worked as we have reduced our expenses while having a current 100% occupancy rate when the vacany for this market is 11%.	I do not have this info
Raising building standards to meet LEED objectives, while educating building operators in sustainability.	Operating our building to its peak capablities and lowering operating costs.	Property management company and building owner.	NYC Building 2030	Sustainabilty sells. All companies when renting new space like to announce thye fact that they are being "Green" in their operations.	Owners wish to update the building to bring it to LEED standards and property managements desire to operate at a lower cost for the owner.	Owners wish to update the building to bring it to LEED standards and property managements desire to operate at a lower cost for the owner.	Improvements in building lighting, reduction in energy usage, and reduction in water usage.	Reduced operating costs, enrollment in energy rapid response with energy rebates of up to 20,000 dollars a year and building marketability.
LEED certification	Prove the site was best in class to retain and attract tenants	Owner	This building was certified before	This was a LEED EB project... this was the sole purpose of the project not a value add	This building already had great energy star score and very efficient operation. This helped us get alot of points easily.	Many of the best practices and tools used to run the building allowed the management company to easily provide required documentation.	Short term energy conservation opportunties were implemented at low or no cost. Long term documentation protocols will help us feep track of our sustainable practices and easily recertify the building in the future.	The retrocommissioning and enegy auditing paid for itself in less than 2 years.

Achieve LEED certification and be one of the first buildings in New York City to do so. This project occurred in 2007-2008	[redacted] wanted to achieve LEED for their headquarters	Ownership - [redacted]	None at the time of certification	Corporate sustainability awareness, tenant attractiveness	Unaware for this project	See above	Long-term - maintain certification and Energy Star Labels	Unsure

16. Is there any tenant involvement and contribution in this project? If any, at what level is the involvement?	17. Do you see occupant behavior impacting the project's sustainability? If yes, in what way?	18. What was the most challenging aspect of the project?	19. What are the main differences between the buildings before versus after the retrofit?	20. What were the key moments that significantly influenced the project? What were the main difficulties that you encountered during that time?	21. Were there any key moments that adjusted the project's direction or outcomes? In what ways did they enable or hinder the project?	22. How has this project influenced your approach to other projects? Were collaborative relationships formed during this project that may be used in the future?
Recycling, providing receipts for sustainable goods purchased during the performance period.	New tenants to the building have more intense energy usage due to trading operations which require more computers and electronic equipment. We are seeing this across the board. So while we are becoming more efficient we are finding the tenants in our building have higher energy requirements due to their operations.	The management	A higher tech, more efficient building that make us more marketable.	I cannot recall	Making sacrifices to water and energy usage in tenant occcupied spaces without defaulting on our obligations under the lease. Also, we had to make these changes in a subtle way so as to not draw too much attention and not comprise our high level of service for our Class A building tenants.	I am now much more familiar with the process and all of the parties involved. There is a lot to coordinate.
Tenants have participated in recycling programs, load shedding programs, and water reduction strategy meetings.	Yes occupants must be involved for project to be successful. Tenants were very cooperative in sustainability efforts.	The finances	A more efficent building and a better educated staff, and occupants.	Obtaining financing for the project. In these difficult economic times money is always an issue.	Monetary issues influenced the pursuit or non pursuit of many credits.	This project helped me in forming a team mentality to my approach in handling projects.

Tenant involvement was very difficult.	No, since this is a multi tenant building, we had to work with tenants to get as much participation as possible. We could not rely on tenant involvement to get the entire certification done.	The finances	Documenting sustainable activities and recycling.	I cannot identify one specific moment.	No	Will reach out to tenants more early on to help them be a larger part of the certification process.
The owner of the project in question was also the main anchor tenant, they contributed much information on purchases, and office arrangements to help achieve LEED credits for purchases and lighting control and daylighting.	Yes - see 1211 response for both energy usage and indoor environmental quality	Timeline - completing project before others + USGBC delays	None - no major changes, as most actions were already in place	None that I am aware of?	Unsure on this question	Reinforced the notion that collaboration is required in order for these projects to both achieve LEED and maintain it long-term

Building 3

1. What was your role in the retrofit process?	2. What is your background by training?	3. Please indicate your age group:	4. Please list any professional certificates you may hold (e.g. LEED Associate, LEED AP, SFP…):	5. Please rank the importance sustainability plays in your company's mission:	6. What is your definition of Sustainability?
Owner	Previously ran an energy and water conservation company that worked mostly in hospitals throughout the US.	>60	No LEED related certification. Have BS, MS and Ph.D. in Environmental Engineering and licensed Professional Engineer.	5	Enhance building desirability to tenants and prospective owners and contribute to tenant productivity, comfort and well-being through the implementation of energy and environmental practices that improve indoor climate conditions, reduce utilities and other operating costs, and address deferred maintenance to increase the quality of the property.
Property Manager	24 years in commercial real estate in NYC. Hands on training as an operating engineer. Holder of all BOMA designations RPA FMA SMA. I am a Certified Property Manager and a LEED AP. I maintained continous training throughout my career.	40-49	Holder of all BOMA designations RPA FMA SMA. I am a Certified Property Manager and a LEED AP O + M.	5	To me, it is the responsible management of resources.

Agent for Owner	Property Manager - 15 years	40-49	MBA	4	Sustainability is an ongoing plan to continually improve sustainability efforts to reduce energy usage, operate more efficiently and improve recycling efforts. Sustainability starts with creating a baseline and continually measuring energy usage and recycling performance to see if we are meeting our sustainablity goals and see where we need to make continued improvements.
Project Manager	Engineering	30-39	LEED AP since 2007	5	Acting with awareness and initiative for the environment, economic and social current and future conditions.

a) Attaining LEED certification.	b) Recognition and potential market impact.	c) The experience as a learning process and knowledge accumulation in order to repeat it in the future.	d) Cost savings (e. g. Energy, Utility, Water…).	e) Monetary gains in rent.	f) Capital investment savings.	g) Monetary and labor savings for operation and maintenance.	h) Longer lifespan predicted.	i) Tenant attraction and retention.	j) Emissions reduction and climate change mitigation achieved.
5	4	3	2	2	2	2	2	3	3
5	5	5	5	5	5	5	5	5	5

5	5	4	5	5	5	5	4	5	4
5	4	5	5	4	4	3	3	4	4

8. What were the project's top overarching goals and objectives?	9. What were the motivations to pursue LEED certification and how did they influence the project?	11. Which building codes, zoning, or regulatory requirements influenced decisions while pursing LEED and how?	12. What was the value added to the project by pursuing LEED?	13. What synergies impacted the project and how?	14. What were the most important long-term and short-term value-add strategies adopted in this project??	15. What returns on investment (ROI) have been achieved or anticipated?
Obtain LEED Silver Certification.	Wanted to be one of the first large commercial office buildings in New York City to obtain LEED Certification.	n/a	n/a	n/a	n/a	n/a

Become Energy Star rated and LEED Certified (inextricably related in many ways). Make the building an award winning trophy asset during their holding period. This was achieved via other awards for Building of the Year at the local and regional level and getting The Sixth Avenue Association Green Streets Award.	The motivations were market driven. [redacted] had a vision of how they wanted to reposition the property and set it apart from the other buildings that comprise Rockefeller Center. It was a mission with a specific time frame to achieve the desired result. As the person primarily responsible, I took pride in making that happen.	We were ahead of NYC Local Law 84 and Plan NYC 2030 so nothing to my knowledge.	More interest in the property by perspective tenants AND pride of existing tenants. Making the building more efficient and adding potential value when market conditions improve.	Unknown at my level as I was in the trenches.	Retrofits to reduce water use, we were the first building to add electronic steam trap monitoring and receive the first Innovation Credit for it (saves wasted steam by identifying failed steam traps), operational decisions changed / improved in order to maintain an admirable Energy Star score.	Unfortunately, I cannot answer this question. I dont have figures for energy savings and rent increases or property values have not increased due to other economic factors. I left the property last year and I am on a new assignment.

I.) Achieve LEED-EB Silver certification II.) Develop a Sustainability Plan III.) Create baseline of energy usage and measure future performance to baseline. IV.) Educate the Tenants and promote their sustainability efforts. V.) Determine cost/plan for LEED Gold certification	I.) Corporate Mission II.) Corporate responsibilty III.) Add Building Value IV) Attract Tenants V.) Retain existing Tenants VI.) Achieve higher rents	Fresh Air requirements	All marketing material now promotes [redacted] LEED achievement and sustainability mandate. Building is recognized as a peer leader in its submarket. Tenants confirm value that this achievment has in deciding on leasing space at [redacted]	Owner, Agent and Tenants became more educated about sustainability process and the value of working together to acheive these goals.	I.) Immediate energy savings II.) Recommissioning of existing equipment and knowledge imparted to engineers in running the building more efficiently. III.) Improved green cleaning practices IV.) Better recycling results and education with the Tenants V.) Commitment by everyone to strive for discovering new ways to reduce energy	n/a
Attain LEED certification in condensed time frame and achieve an Energy Star Label	Ownership's overall goals for their portfolio of buildings	None at the time of this certification	Improved operations in cleaning, waste removal and greater awareness of energy usage	Ownership was involved with both the management company and consultants, providing oversight and input on all levels. It was a collaborative effort by all	Long-term strategies were to maintain certification and energy star data Short-term value-add was green tenant events	Unsure

16. Is there any tenant involvement and contribution in this project? If any, at what level is the involvement?	18. What was the most challenging aspect of the project?	19. What are the main differences between the building before versus after the retrofit?	20. What were the key moments that significantly influenced the project? What were the main difficulties that you encountered during that time?	21. Were there any key moments that adjusted the project's direction or outcomes? In what ways did they enable or hinder the project?	10. Who (which stakeholder) was the key driver?	17. Do you see occupant behavior impacting the project's sustainability? If yes, in what way?	22. How has this project influenced your approach to other projects? Were collaborative relationships formed during this project that may be used in the future?
Tenants were told about the LEED Certification process and responded to the Commuter Survey.	I was not involved in the project	n/a	n/a	n/a	Building Owner.	n/a	[redacted] has LEED certified over 25 million sqft of its office properties in several US cities using different LEED consultants. In some locations, the LEED consultant and mechanical engineering consultant were used on multiple projects which provided a cost economy.

In our case, a tenat with one million square foot of space (the building is 2 million sf) had a seperate cleaning contractor who needed to provide us with a great detail of green cleaning logs and requirements. Tenants had to allow assesments of their space for many credits.	The extensive documentation requirements	[redacted] was one of 22 properties made of limestone that comprised Rock Center. After the retrofits and LEED process, we had interest from local press and Real Estate publications, the building was truly set apart and distinct and it demonstrated that the vision of [redacted] was unwavering. A property that was one in a group now stood tall above the others.	The entire process was difficult and became a full time job for me and a major component of what other staff did at the building during that 18 months. I must say that the project progressed unhindered.	No	The ownership entity wanted to pursue it anywhere it was feasible portfolio wide.	No. All corporations were on board and all were very interested in being able to say they were being corporately responsible for being in such a building.	This project was THE SINGLE most important resume builder for me as an individual and a LEED AP. The knowledge gained makes me want to make all subsequent buildings operate as efficiently as [redacted] Many collaborative relationships were formed and mutual respect. It was a highlight in my career.

All Tenants participate by providing energy usage documentation and impementing improved recycling practices. Main Tenant is partnering with Owner on Fuel Cell technology and purchase of clean energy (no emmissions).	Time needed to document energy usage (electricity, water, steam), daylight effects and green practices	Operates more efficiently and reduced energy usage	Difficulty in achieving LEED points and overcoming the obstacles to achieve require LEED points. Staying within budget to achieve LEED points. Meeting timeline to achieve Owner's goals. Getting Tenants full cooperation.	Timing of completing LEED certification. Decided to use consultant to expedite the process.	The Owner	Yes, Tenants are more conscious of reducing energy usage and improving recycling practices.	Yes, great contacts were made with Tenant representatives and consultants which will help in completing future projects and identifying additional energy savings initiatives.
Tenant involvement at this project was kept to a minimum	Time - Limited Schedule	No major retrofits occured to achieve LEED at this property	The timeline for this project was short, so all team members needed to work together and efficiently to meet deadlines.	No	Ownership and management	Yes - an occupants behaviour can affect energy, indoor air quality, and other factors greatly. For example if occupants decide to leave lighting, computers, monitors, etc ON all the time, this will affect the buildings overall energy use per square foot, this lowering their score.	Reinforced that LEED certification requires total buy-in by all stakeholders if it wants to achieve certification and in a timely manner.

APPENDIX D - Interview Questions

1. When you compare your building's rent to a non-LEED building, is there a difference?

2. Are there commissioning programs for future tenant involvement, like the seminars given in the past?

3. Since tenant cooperation and use is a main challenge, is there a better incentive for tenant involvement?

4. In order to maintain a competitive edge alongside the idea that 'sustainability sells,' how do you market the LEED aspect of the building?

5. According to data collected, the Owner if the building is often regarded as the decision-making stakeholder. Additionally, cost savings were polled as very important. Who do you believe should lead the sustainability industry, the carrot or the stick? What is more effective?

-Having mandates and codes of NYC that guide the industry
-Having some sort of disclosure requirement, for example when signing a lease, the building must provide historical utility information
-Using a green lease, solving the split incentive issue, due to shared benefits between the tenant and the owner

6. What was the reasoning of hiring a 3rd party organization?

7. How are you planning to maintain building performance? Do you plan on using a third party organization again?

APPENDIX E

LEED 2009 for Existing Buildings: Operations & Maintenance
Project Scorecard

		SUSTAINABLE SITES	**17 Points**
1		Credit 2	Building Exterior and Hardscape Management Plan
1		Credit 3	Integrated Pest Management, Erosion Control, and Landscape Management Plan
15		Credit 4	Alternative Commuting Transportation
		WATER EFFICIENCY	**7 Points**
Y		Prereq 1	Minimum Indoor Plumbing Fixture and Fitting Efficiency
2		Credit 1	Water Performance Measurement
4		Credit 2	Additional Indoor Plumbing Fixture and Fitting Efficiency
1		Credit 4	Cooling Tower Water Management
		ENERGY & ATMOSPHERE	**20 Points**
Y		Prereq 1	Energy Efficiency Best Management Practices
Y		Prereq 2	Minimum Energy Efficiency Performance
Y		Prereq 3	Fundamental Refrigerant Management
13		Credit 1	Optimize Energy Efficiency Performance
2		Credit 2.1	Existing Building Commissioning - Investigation and Analysis
2		Credit 2.2	Existing Building Commissioning - Implementation
1		Credit 3.1	Performance Measurement - Building Automation System
1		Credit 5	Enhanced Refrigerant Management
1		Credit 6	Emissions Reduction Reporting
		MATERIALS & RESOURCES	**3 Points**
Y		Prereq 1	Sustainable Purchasing Policy
Y		Prereq 2	Solid Waste Management Policy
1		Credit 4	Sustainable Purchasing - Reduced Mercury in Lamps
1		Credit 7	Solid Waste Management - Ongoing Consumables
1		Credit 8	Solid Waste Management - Durable Goods
		INDOOR ENVIRONMENTAL QUALITY	**9 Points**
Y		Prereq 1	Minimum Indoor Air Quality Performance
Y		Prereq 2	Environmental Tobacco Smoke (ETS) Control
Y		Prereq 3	Green Cleaning Policy
1		Credit 1.1	Indoor Air Quality Best Management Practices - Indoor Air Quality Management Program
1		Credit 1.4	Indoor Air Quality Best Management Practices - Reduce Particulates in Air Distribution
1		Credit 1.5	Indoor Air Quality Best Management Practices - Indoor Air Quality Management for Facility Alterations and Additions
1		Credit 3.1	Green Cleaning - High-Performance Cleaning Program
1		Credit 3.2	Green Cleaning - Custodial Effectiveness Assessment
1		Credit 3.3	Green Cleaning - Purchase of Sustainable Cleaning Products and Materials
1		Credit 3.4	Green Cleaning - Sustainable Cleaning Equipment
1		Credit 3.5	Green Cleaning - Indoor Chemical and Pollutant Source Control
1		Credit 3.6	Green Cleaning - Indoor Integrated Pest Management
		INNOVATION IN DESIGN	**5 Points**
3		Credit 1	Innovation in Operations
1		Credit 2	LEED® Accredited Professional
1		Credit 3	Documenting Sustainable Building Cost Impacts

Earned	Denied		
43	3	**PROJECT TOTALS Gold Certification**	**61 Points**

Certified: 40-49 points Silver: 50-59 points Gold: 60-79 points Platinum: 80+ points

LEED for Existing Buildings

New York, NY, US

Certification Level: Silver

Certification Date: 2009.04.10

41	**Points Achieved**	**Possible Points:** 85

Certified 32 to 39 points **Silver** 40 to 47 points **Gold** 48 to 63 points **Platinum** 64 or more points

4 Sustainable Sites — Possible Points: 14

Y	Prereq 1	Erosion & Sedimentation Control	
Y	Prereq 2	Age of Building	
1	Credit 1.1	Plan for Green Site and Building Exterior Management, 4 items	1
1	Credit 1.2	Plan for Green Site and Building Exterior Management, 4 additional items	1
1	Credit 2	High Development Density Building and Area	1
1	Credit 3.1	Alternative Transportation, Public Transportation Access	1
	Credit 3.2	Alternative Transportation, Bicycle Storage & Changing Rooms	1
	Credit 3.3	Alternative Transportation, Alternative Fuel Vehicles	1
	Credit 3.4	Alternative Transportation, Car Pooling & Telecommuting	1
	Credit 4.1	Reduced Site Disturbance, Protect or Restore Open Space: 50% of Site Area	1
	Credit 4.2	Reduced Site Disturbance, Protect or Restore Open Space: 75% of Site Area	1
	Credit 5.1	Stormwater Management, Rate and Quantity Reduction: 25% Reduction	1
	Credit 5.2	Stormwater Management, Rate and Quantity Reduction: 50% Reduction	1
	Credit 6.1	Heat Island Reduction, Non-Roof	1
	Credit 6.2	Heat Island Reduction, Roof	1
	Credit 7	Light Pollution Reduction	1

1 Water Efficiency — Possible Points: 5

Y	Prereq 1	Minimum Water Efficiency	
Y	Prereq 2	Discharge Water Compliance	
	Credit 1.1	Water Efficient Landscaping, Reduce Water Use: 50% Reduction	1
	Credit 1.2	Water Efficient Landscaping, Reduce Water Use: 95% Reduction	1
	Credit 2	Innovative Wastewater Technologies	1
1	Credit 3.1	Water Use Reduction, 10% Reduction	1
	Credit 3.2	Water Use Reduction, 20% Reduction	1

9 Energy & Atmosphere — Possible Points: 23

Y	Prereq 1	Existing Building Commissioning	
Y	Prereq 2	Minimum Energy Performance	
Y	Prereq 3	Ozone Protection	
1	Credit 1.1	Optimize Energy Performance, Energy Star Rating of 63	1
1	Credit 1.2	Optimize Energy Performance, Energy Star Rating of 67	1
1	Credit 1.3	Optimize Energy Performance, Energy Star Rating of 71	1
1	Credit 1.4	Optimize Energy Performance, Energy Star Rating of 75	1
1	Credit 1.5	Optimize Energy Performance, Energy Star Rating of 79	1
	Credit 1.6	Optimize Energy Performance, Energy Star Rating of 83	1
	Credit 1.7	Optimize Energy Performance, Energy Star Rating of 87	1
	Credit 1.8	Optimize Energy Performance, Energy Star Rating of 91	1
	Credit 1.9	Optimize Energy Performance, Energy Star Rating of 95	1
	Credit 1.10	Optimize Energy Performance, Energy Star Rating of 99	1
	Credit 2.1	On-site and Off-site Renewable Energy, 3% On-site or 15% Off-site	1
	Credit 2.2	On-site and Off-site Renewable Energy, 6% On-site or 30% Off-site	1
	Credit 2.3	On-site and Off-site Renewable Energy, 9% On-site or 45% Off-site	1
	Credit 2.4	On-site and Off-site Renewable Energy, 12% On-site or 60% Off-site	1
1	Credit 3.1	Building Operation & Maintenance: Staff Education	1
1	Credit 3.2	Building Operation & Maintenance: Building Systems Maintenance	1
	Credit 3.3	Building Operation & Maintenance: Building Systems Monitoring	1
1	Credit 4	Additional Ozone Protection	1
	Credit 5.1	Performance Measurement - Enhanced Metering, 4 Actions	1
	Credit 5.2	Performance Measurement - Enhanced Metering, 4 Additional Actions	1
	Credit 5.3	Performance Measurement - Enhanced Metering, 4 Additional Actions	1
	Credit 5.4	Performance Measurement - Emission Reduction Reporting	1
1	Credit 6	Documenting Sustainable Building Cost Impacts	1

14 Materials & Resources — Possible Points: 16

Y	Prereq 1.1	Source Reduction and Waste Management, Waste Stream Audit	
Y	Prereq 1.2	Source Reduction and Waste Management, Storage & Collection	
Y	Prereq 2	Toxic Material Source Reduction, Reduced Mercury in Light Bulbs	
1	Credit 1.1	Construction, Demolition and Renovation, Waste Management: 50% Diversion	1
1	Credit 1.2	Construction, Demolition and Renovation, Waste Management: 75% Diversion	1
1	Credit 2.1	Optimize Use of Alternative Materials, 10% of Purchases	1
1	Credit 2.2	Optimize Use of Alternative Materials, 20% of Purchases	1
1	Credit 2.3	Optimize Use of Alternative Materials, 30% of Purchases	1
1	Credit 2.4	Optimize Use of Alternative Materials, 40% of Purchases	1
1	Credit 2.5	Optimize Use of Alternative Materials, 50% of Purchases	1
	Credit 3.1	Optimize Use of IAQ Compliant Products, 45% of Purchases	1
	Credit 3.2	Optimize Use of IAQ Compliant Products, 90% of Purchases	1
1	Credit 4.1	Sustainable Cleaning Products and Materials, 30% of Purchases	1
1	Credit 4.2	Sustainable Cleaning Products and Materials, 60% of Purchases	1
1	Credit 4.3	Sustainable Cleaning Products and Materials, 90% of Purchases	1
1	Credit 5.1	Occupant Recycling, 30% Diversion	1
1	Credit 5.2	Occupant Recycling, 40% Diversion	1
1	Credit 5.3	Occupant Recycling, 50% Diversion	1
1	Credit 6	Additional Toxic Materials Source Reduction: Reduced Mercury in Light Bulbs	1

9 Indoor Environmental Quality — Possible Points: 22

Y	Prereq 1	Outside Air Introduction and Exhaust Systems	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y	Prereq 3	Asbestos Removal or Encapsulation	
Y	Prereq 4	PCB Removal	
	Credit 1	Outdoor Air Delivery Monitoring	1
	Credit 2	Increased Ventilation	1
	Credit 3	Construction IAQ Management Plan	1
	Credit 4.1	Documenting Productivity Impacts: Absenteeism and Healthcare Cost Impacts	1
	Credit 4.2	Documenting Productivity Impacts: Other Impacts	1
1	Credit 5.1	Indoor Chemical and Pollutant Source Control: Reduce Particulates in Air Distribution	1
	Credit 5.2	Indoor Chemical and Pollutant Source Control: Isolate High Volume Copying/Print Rooms/Fax Stations	1
1	Credit 6.1	Controllability of Systems: Lighting	1
	Credit 6.2	Controllability of Systems: Temperature & Ventilation	1
1	Credit 7.1	Thermal Comfort: Compliance	1
	Credit 7.2	Thermal Comfort: Monitoring	1
1	Credit 8.1	Daylight & Views: Daylight for 50% of Spaces	1
	Credit 8.2	Daylight & Views: Daylight for 75% of Spaces	1
	Credit 8.3	Daylight & Views: Views for 45% of Spaces	1
	Credit 8.4	Daylight & Views: Views for 90% of Spaces	1
1	Credit 9	Contemporary IAQ Practice	1
	Credit 10.1	Green Cleaning: Entryway Systems	1
	Credit 10.2	Green Cleaning: Isolation of Janitorial Closets	1
1	Credit 10.3	Green Cleaning: Low Environmental Impact Cleaning Policy	1
2	Credit 10.4-5	Green Cleaning: Low Environmental Impact Pest Management Policy	2
1	Credit 10.6	Green Cleaning: Low Environmental Impact Cleaning Equipment Policy	1

4 Innovation in Upgrades, Operations & Maintenance — Possible Points: 5

	Credit 1.1	Innovation in Operation & Upgrades	1
1	Credit 1.2	Innovation in Operation & Upgrades	1
1	Credit 1.3	Innovation in Operation & Upgrades	1
1	Credit 1.4	Innovation in Operation & Upgrades	1
1	Credit 2	LEED® Accredited Professional	1

LEED for Existing Buildings

New York, NY, US

Certification Level: Silver

Certification Date: 2009.06.12

43	**Points Achieved**	**Possible Points:**	92

Certified 34 to 42 points Silver 43 to 50 points Gold 51 to 67 points Platinum 68 or more points

	General Submittals	**Possible Points:**	0

Y	Prereq 1	General Submittals	

6	**Sustainable Sites**	**Possible Points:**	12

	Credit 1	LEED Certified Design and Construction	1
1	Credit 2	Building Exterior and Hardscape Management Plan	1
1	Credit 3	Integrated Pest Mgmt, Erosion Control, and Landscape Mgmt Plan	1
1	Credit 4.1	Alternative Commuting Transportation, 10% Reduction	1
1	Credit 4.2	Alternative Commuting Transportation, 25% Reduction	1
1	Credit 4.3	Alternative Commuting Transportation, 50% Reduction	1
1	Credit 4.4	Alternative Commuting Transportation, 75% Reduction	1
	Credit 5	Reduced Site Disturbance, Protect or Restore Open Space	1
	Credit 6	Stormwater Management	1
	Credit 7.1	Heat Island Reduction, Non-Roof	1
	Credit 7.2	Heat Island Reduction, Roof	1
	Credit 8	Light Pollution Reduction	1

3	**Water Efficiency**	**Possible Points:**	10

Y	Prereq 1	Minimum Indoor Plumbing Fixture & Fitting Efficiency	
1	Credit 1.1	Water Performance Measurement, Whole Building Metering	1
1	Credit 1.2	Water Performance Measurement, Submetering	1
	Credit 2.1	Additional Indoor Plumbing Fixture and Fitting Efficiency, 10% Reduction	1
	Credit 2.2	Additional Indoor Plumbing Fixture and Fitting Efficiency, 20% Reduction	1
	Credit 2.3	Additional Indoor Plumbing Fixture and Fitting Efficiency, 30% Reduction	1
	Credit 3.1	Water Efficient Landscaping, 50% Reduction	1
	Credit 3.2	Water Efficient Landscaping, 75% Reduction	1
	Credit 3.3	Water Efficient Landscaping, 100% Reduction	1
1	Credit 4.1	Cooling Tower Water Mgmt, Chemical Management	1
	Credit 4.2	Cooling Tower Water Mgmt, Non-Potable Water Source Use	1

10	**Energy & Atmosphere**	**Possible Points:**	30

Y	Prereq 1	Energy Efficiency Best Management Practices	
Y	Prereq 2	Minimum Energy Efficiency Performance	
Y	Prereq 3	Refrigerant Management, Ozone Protection	
1	Credit 1.1	Optimize Energy Performance, Energy Star Rating of 67 or 17% Above National Average	1
1	Credit 1.2	Optimize Energy Performance, Energy Star Rating of 69 or 19% Above National Average	1
1	Credit 1.3	Optimize Energy Performance, Energy Star Rating of 71 or 21% Above National Average	1
1	Credit 1.4	Optimize Energy Performance, Energy Star Rating of 73 or 23% Above National Average	1
1	Credit 1.5	Optimize Energy Performance, Energy Star Rating of 75 or 25% Above National Average	1
	Credit 1.6	Optimize Energy Performance, Energy Star Rating of 77 or 27% Above National Average	1
	Credit 1.7	Optimize Energy Performance, Energy Star Rating of 79 or 29% Above National Average	1
	Credit 1.8	Optimize Energy Performance, Energy Star Rating of 81 or 31% Above National Average	1
	Credit 1.9	Optimize Energy Performance, Energy Star Rating of 83 or 33% Above National Average	1
	Credit 1.10	Optimize Energy Performance, Energy Star Rating of 85 or 35% Above National Average	1
	Credit 1.11	Optimize Energy Performance, Energy Star Rating of 87 or 37% Above National Average	1
	Credit 1.12	Optimize Energy Performance, Energy Star Rating of 89 or 39% Above National Average	1
	Credit 1.13	Optimize Energy Performance, Energy Star Rating of 91 or 41% Above National Average	1
	Credit 1.14	Optimize Energy Performance, Energy Star Rating of 93 or 43% Above National Average	1
	Credit 1.15	Optimize Energy Performance, Energy Star Rating of 95+ or 45% Above National Average	1
2	Credit 2.1	Existing Building Commissioning, Investigation and Analysis	2
2	Credit 2.2	Existing Building Commissioning, Implementation	2
	Credit 2.3	Existing Building Commissioning, Ongoing Commissioning	2
	Credit 3.1	Performance Measurement, Building Automation System	1
1	Credit 3.2	Performance Measurement, System Level Metering (40% Metered)	1
	Credit 3.3	Performance Measurement, System Level Metering (80% Metered)	1
	Credit 4.1	Renewable Energy, On-site 3% / Off-site 25%	1
	Credit 4.2	Renewable Energy, On-site 6% / Off-site 50%	1
	Credit 4.3	Renewable Energy, On-site 9% / Off-site 75%	1
	Credit 4.4	Renewable Energy, On-site 12% / Off-site 100%	1
	Credit 5	Refrigerant Management	1
	Credit 6	Emissions Reduction Reporting	1

4	**Materials & Resources**	**Possible Points:**	14

Y	Prereq 1	Sustainable Purchasing Policy	
Y	Prereq 2	Solid Waste Management Policy	
	Credit 1.1	Sustainable Purchasing, Ongoing Consumables: 40% of Purchases	1
	Credit 1.2	Sustainable Purchasing, Ongoing Consumables: 60% of Purchases	1
	Credit 1.3	Sustainable Purchasing, Ongoing Consumables: 80% of Purchases	1
	Credit 2.1	Sustainable Purchasing, Durable Goods: Electric	1
	Credit 2.2	Sustainable Purchasing, Durable Goods: Furniture	1
	Credit 3	Sustainable Purchasing, Facility Alterations and Additions	1
1	Credit 4.1	Sustainable Purchasing, Reduced Mercury in Lamps: 90 pg/lum-hr	1
1	Credit 4.2	Sustainable Purchasing, Reduced Mercury in Lamps: 70 pg/lum-hr	1
	Credit 5	Sustainable Purchasing, Food	1
	Credit 6	Solid Waste Management, Waste Stream Audit	1
1	Credit 7.1	Solid Waste Management, Ongoing Consumables: 50% Waste Diversion	1
1	Credit 7.2	Solid Waste Management, Ongoing Consumables: 70% Waste Diversion	1
	Credit 8	Solid Waste Management, Durable Goods	1
	Credit 9	Solid Waste Management, Facility Alterations and Additions	1

13	**Indoor Environmental Quality**	**Possible Points:**	19

Y	Prereq 1	Outside Air Introduction and Exhaust Systems	
Y	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
Y	Prereq 3	Green Cleaning Policy	
1	Credit 1.1	IAQ Best Management Practices, IAQ Management Program	1
	Credit 1.2	IAQ Best Management Practices, Outdoor Air Delivery Monitoring	1
	Credit 1.3	IAQ Best Management Practices, Increased Ventilation	1
1	Credit 1.4	IAQ Best Management Practices, Reduce Particulates in Air Distribution	1
1	Credit 1.5	IAQ Best Management Practices, Facility Alterations and Additions	1
	Credit 2.1	Occupant Comfort, Occupant Survey	1
1	Credit 2.2	Occupant Comfort, Occupant Controlled Lighting	1
	Credit 2.3	Occupant Comfort, Thermal Comfort Monitoring	1
1	Credit 2.4	Occupant Comfort, Daylight and Views: 50% Daylight / 45% Views	1
	Credit 2.5	Occupant Comfort, Daylight and Views: 75% Daylight / 90% Views	1
1	Credit 3.1	Green Cleaning, High Performance Cleaning Program	1
1	Credit 3.2	Green Cleaning, Custodial Effectiveness Assessment: Score of ≤ 3	1
1	Credit 3.3	Green Cleaning, Custodial Effectiveness Assessment: Score of ≤ 2	1
1	Credit 3.4	Green Cleaning, Sustainable Cleaning Products and Materials: 30% Purchases	1
1	Credit 3.5	Green Cleaning, Sustainable Cleaning Products and Materials: 60% Purchases	1
	Credit 3.6	Green Cleaning, Sustainable Cleaning Products and Materials: 90% Purchases	1
1	Credit 3.7	Green Cleaning, Sustainable Cleaning Equipment	1
1	Credit 3.8	Green Cleaning, Entryway Systems	1
1	Credit 3.9	Green Cleaning, Indoor Integrated Pest Management	1

7	**Innovation in Operations**	**Possible Points:**	7

1	Credit 1.1	Innovation in Operation and Upgrades	1
1	Credit 1.2	Innovation in Operation and Upgrades	1
1	Credit 1.3	Innovation in Operation and Upgrades	1
1	Credit 1.4	Innovation in Operation and Upgrades	1
1	Credit 2	LEED® Accredited Professional	1
2	Credit 3	Documenting Sustainable Building Cost Impacts	2

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