**An Overview of the Benefits and Risk Factors of Going Green in Existing Buildings**

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**ABSTRACT**

The negative environmental effects caused by buildings - through energy consumption, carbon emission, raw material use and waste - are well known. A growing world population combined with the rapid growth in the economies of countries such as China and India will make so many more new buildings necessary in the near future that their collective negative effects could become catastrophic for the environment. In the United States non-residential green construction starts were at 10% of totals using 2008 numbers. This is not enough growth in green building to reach environmental targets, despite the fact that green building was introduced to the industry more than a decade ago. The world also faces the enormous issue of existing non-green buildings which outnumber new green construction starts by many times. The benefits of creating new green construction will fall far short of goals and could be negated entirely by the continued excess of existing buildings if they are not retrofitted using green building methods and practices. Despite growing environmental concerns on the one hand, and financial incentives and support offered by government and other institution to developers, investors and private owners on the other, these same individuals and corporations are hesitant to embrace the idea of green building.

This paper tries to emphasis one more time that green building benefits are real, and also shows the decision maker that even though there are risks factors involved of going green, these can be managed. The purpose of this paper is to develop a framework for benefits and risks of retrofitting existing buildings to green standards. Using the comprehensive literature review methodology, this paper tries to contribute to the new organization and framework of risk & benefits factors with number of risk strategy suggestions and tries to consolidate the information for subsequent research help.

**INTRODUCTION**

Green building is not a matter of choice or luxury but a necessity for the environmentally conscious industry professionals, owners, developers, government officials and the rest of the stakeholders. Growing awareness of environmental aspects and demand on green building worldwide shows that, the status quo as it exists in the construction industry simply cannot go on. The industry must, and is, changing. In the United States, buildings are responsible for 72% of electricity consumption, 39% of energy use, 35% of carbon dioxide emissions, 40% of raw material usage, 30% waste output and 14% potable water consumption. (USGBC, 2009) It is estimated that 73% of these buildings will stand for decades to satisfy demand with their negative environmental impact.

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Over the years green building principals became standards for many corporations, institutions, and government bodies as an indication of their ethical responsibility but the majority is still behind the curve.

Even though, any projects that involve multiple stakeholders typically require the evaluation and consideration of a wide variety of factors and not just the basic cost-based dimension, this was the path that many owners took when it came to green building decision. This is the area that facility managers can have the important role of offering objective opinion, and help their corporation commit to the environment and grasp the future value.

The added value of input from facility managers, along with the architects, engineers and green consultants, should be considered before starting a project. Facility managers are in a key position to identify candidate buildings, (either retrofit or new construction), or possible interventions in existing buildings, helping the decision maker about which and how much retrofit should be undertaken, which standard to be followed, leveraging their knowledge in regards to current and post-implementation building performance and convince the decision maker about the tangible benefits as well as the intangible benefits on going green. Facility managers are well aware of the possible effects of a building’s work environments on employees and their productivity as well as the life cycle effect on building operation and maintenance process. They are the only professionals in a position to work this angle in the green building process and make this process easier and more profitable for the corporation. Most of the time facility managers are familiar with the company and the building itself as well as the work and employee structure. Facility manager’s input in regards to the whole life cycle of operation and maintenance is of enormous benefit. This benefit could be calculated to hundreds of thousands, if not millions, of dollars throughout the life cycle of the building (Castro-Lacouture et.al. 2008) or not realized if facility managers are left out during this process.

Despite the many aspects of going green, most research focuses on cost, performance aspects, and the benefits of green buildings. There is seemingly a gap in knowledge about the risks related to going green. As long as these risks are not eliminated or managed, they will continue to become obstacles to green building movement.

The purpose of this paper is to fill a knowledge gap in identifying and managing the risks, develop a framework for benefits and risks of retrofitting existing buildings to green standards emphasizing green benefits one more time in detail, and show the decision maker that even though there are risks involved, these can be managed. This paper tries to contribute to the new organization and framework of risk/benefits factors with number of risk strategy suggestions and to help promoting green retrofits in existing buildings.

Background

“Over the last decade, green buildings have come to be known as buildings that are designed and constructed with an emphasis given to environmental, social and economic priorities. Most importantly, building green emphasizes long-term as well as short-term performance.” (Horman et. al. 2008) But is this what owners, investors and developers are thinking about green building? The answer is not all of them. As architects, engineers and facility managers, green building and sustainability have become part of our professional lives. On the other hand, stakeholders often do not reach a consensus about potential benefits; environmental and social priorities do not have the same weight as financial priorities and they have misconception about the green premium being much higher than it really is. (Turner, 2008)

The numbers below are enough to demonstrate that there is indeed a huge negative impact on the environment due to existing buildings. In the United States, buildings are responsible for:
72% of Electricity Consumption
39% of Energy Use
35% of Carbon Dioxide Emissions
40% of Raw Material Usage
30% Waste Output
14% Potable Water Consumption (USGBC, 2009)

Even though environmental consciousness started to spread in the US decades ago (The Air Pollution Control Act in 1955, The Federal Clean Air Act in 1970, Environmental Protection Agency (EPA) in 1971) it took very slow pace for this consciousness to spread to construction industry. (American Institute of Architects (AIA) formed Committee on the Environment (COTE) in 1990) Green building movement took another turn when the US Green Building Council (USGBC) was formed in 1993, and later Leadership in Energy and Environmental Design (LEED) standards introduced thorough USGBS in 1998. Since then, green building practices have been gaining acceptance in the US with the highest growth in the USGBC membership of 60% was reached between the years of 200-2007.(Wedding, Brown, 2007)

**Research Motivation**

As more and more research has been done over the years, the results confirm the positive impact from building with sustainability and green building standards in mind. But despite of all these facts, how much progress are we actually making in regards to “building green”? Unfortunately, even with the growing concerns over environmental, social and financial aspects, green building is not taking its place at the forefront as hoped for by the professionals within the design and construction industry. The green market share increased from 2% of (residential and non-residential) construction starts in 2005 (Nelson, 2007) to 10% in 2008, (USGBC 2009) But the ratio of existing buildings to green buildings is overwhelming. It is evident that in order to lower the environmental effects and bring energy usage, water consumption and CO₂ emissions 7% below 1990 levels- as stated in the United States Mayors climate protection agreement (www. usmayors.org, 2009) - the construction industry will need to take drastic actions.

According to EPA, between the years of 2000 and 2030, an estimated 27% of existing buildings will be replaced and 50% of the total building stock will be constructed. (www.epa.gov, 2009) Therefore, 73% of existing buildings will continue to see use, many for several decades.

The negative impact of existing non-green buildings is two-fold. First, if they are replaced, the demolition waste would fill and pollute landfills. (According to a research prepared for EPA-CA, 74% of the construction and demolition waste could be recycled. (www.calrecycle.ca.gov)) On the other hand, if these buildings are able to stand without retrofitting, their negative environmental effects would continue at percentages mentioned above. In this situation, retrofitting existing buildings using any viable standard would bring the benefit of green building to existing structures and help mitigate the negative environmental impact caused by them. This solution might seem a good one by industry professionals; however it is important to convince the decision maker in order to get approval to retrofit an existing building.

**Research Objectives**

When its benefits are measured against the status quo, green building should be the logical choice as one of the most effective solutions to many environmental concerns. The growing environmental issues will continue to create global problems which can only be eliminated with local effort.

While the efforts are continuing to spread green building, future targets are already set. The Architecture 2030 challenge calls for new buildings today to have a 50% reduced carbon footprint, compared to existing buildings with steady increases in efficiency and renewable energy until reaching carbon neutral new buildings by 2030. (Wedding et.al, 2008)
However, in spite of all the support and sympathy towards green building, the emissions and waste caused by buildings is continually on the rise. When the overall increase in greenhouse gas emissions from 2006 to 2007 is broken down, it shows a disproportionate rise in building generated emissions, a full 5 times the total average increase of 1%. (www.epa.gov, 2009) The growing support for green building practices and the current growth of new green building construction starts are not enough to reverse this cycle.

Since the ratio of existing buildings to new green construction is overwhelming, reusing existing buildings with green retrofits could be the logical solution to reduce the environmental effects sooner. Until recently green building movement was focused primarily on new green construction which allowed researchers to demonstrate to stakeholders of the positive outcomes of green building. Ideally these outcomes will help to influence the decisions around retrofitting existing buildings.

The purpose of this paper is twofold; first to illuminate the benefits of employing green building standards in existing buildings while evaluating the possible risk areas, second to recommend risk strategies in order to eliminate or manage these risks in order to promote green retrofits in existing buildings.

OVERVIEW OF GREEN BUILDING RATING SYSTEMS

After the launch of Building Research Establishment Environmental Assessment Method (BREEAM) in the UK in 1990. US Green Building Council’s Leadership in Energy and Environmental Design (LEED) followed BREEAM in 1998. Many other green building standards started around the world such as Green Star by Green Building Council Australia (GBCA), Green Globes by Green Building Initiative (Canada-US), and Comprehensive Assessment System for Building Environment Efficiency (CASBEE-Japan). Another rating system in the US is Energy Star, established by the U.S. EPA in 1992 started with energy-efficient product focus. Energy Star transformed its energy rating to the buildings and over 83,000 buildings in the US have been rated by Energy Star in 2008. (www.energystar.gov) Energy Star focuses solely on energy efficiency and related greenhouse gas emission and does not take the other sustainability issues under consideration.

Apart from many localized standards in the world, UK based BREEAM and US based LEED are leading the green building standards in the world. The localization seems necessary in order to implement these standards with resource, legislative, energy consumption, cultural structure, climate and geological differences but the concerns and motivation related to the green buildings are similar.

Some of the most important standards are briefly addressed below.

BREEAM
BREEAM is the earliest building rating system for environmental performance assessment and it is applicable to different situations such as: industrial, multi-residential, office and retail. Design stage and post construction stage could undergo BREEAM standards with several criteria areas such as; management, health and wellbeing, energy, transport, water, material, land use and pollution. The process requires the building to obtain performance credit for an overall score on a scale of 1-5 (pass, good, very good, excellent and outstanding.) Around the world, BREEAM certified and registered building numbers are over 100,000 and 500,000, respectively. (www. climatechangecorp.com)
Different than LEED, BREEAM follows the UK building code standards and it is embedded into the local legislation. Additionally, BREEAM mandates to hire an assessor during the process, while this is optional in LEED.

LEED
LEED is a voluntary green building rating system, however, in certain US states, LEED certification is mandatory. Currently 35,000 projects are participating in the LEED system, comprising over 4.5 billion square
feet of construction space in all 50 United States and 91 countries, with over 100,000 Accredited Professionals (LEED-AP) providing management. (USGBC-2009a) LEED certification has four levels (Certified, Silver, Gold and Platinum) depend on the credits obtained. Applicants must earn credits across six categories (sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation and operations). The new version of LEED (LEED v3), launched in April 2009, emphasized more on CO₂ emissions and energy performance by making these criterias mandatory. New version of LEED requires certified buildings to collect building performance data for five years. If a building does not perform within the limits of its designated level, the building may lose LEED certification.

LEED has application categories of new construction (LEED-NC), existing buildings operation & maintenance (LEED-EB), core and shell (LEED-CS) commercial interiors (LEED-CI) homes, schools, healthcare and retail.

THE GREEN GLOBES
Originated in Canada by the green building initiative, The Green Globes rating system was brought to the US in 2004 in order to promote green building standards for New Construction and Continual Improvement of Existing Buildings. (Green globes-NC, and Green Globes CEIB, respectively.) Green Globes certification could be obtained starting 350 of 1000 total points with rating of one to four globes. (www.thegbi.org)

Green Globes Environmental Assessment Areas are project management (policies and practices), site, energy, water, resource, building materials and solid wastes, emission and other impacts, indoor environment, emphasizing energy and indoor environment and Some of the US legislative bodies are mandating the buildings to obtain either LEED or Green Globes standards.

SUMMARY OF BENEFITS
If a benefit is described as “something that aids or promotes well-being” (www.wordnetweb.princeton.edu), green building is all about promoting well being, usually as it relates to environment, health and community. There are also direct economical benefits through the reduction of energy and water use. Green building also produces many less obvious benefits, such as market and industry benefits. The biggest obstacle in front of green buildings is, misconception overwhelming.

A recent GSA study of green buildings indicated that, they had 33% less carbon emissions, 27% higher occupant satisfaction, used up to 45% less energy, experienced 13% lower aggregate maintenance costs and used up to 54% less water when compared to national averages. (GSA White Paper, 2009) Even though the benefits are categorized as environmental, health and community, financial, market, and industry, most of the categories have secondary financial benefits as well.

Other research came to the same conclusion in detail. In a paper published by Leonardo Academy, operational cost savings in buildings that had LEED-EB certification were significant. Specifically, when compared to information gathered from Buildings Owners Managers Association International (BOMA) Experience Exchange Report, LEED-EB compliant buildings had on average a $6.68 per square foot savings over the operating costs of traditional buildings, yet had only an average of $2.43 per square foot cost disadvantage to come into compliance with LEED-EB standards. (www.leonardoacademy.org) (www.mybuildingsuccess.com)

When life cycle costs are analyzed, studies have suggested that an initial up-front investment of an extra 2% of construction cost (New green construction) will yield over ten times that investment over the life cycle of the building through energy and other operational cost savings. (Wolff, 2006) With green retrofit, the life cycle benefits are there (among with the other benefits) with only investing the proportional cost of green retrofits, eliminating the rest of the cost related to new construction.
There is every expectation that implementation costs will be reduced through the use of technology and standardization which can only make implementation that much less expensive and the savings that much greater. (www.mybuildingsuccess.com)

It is worth mentioning that some of the benefits we list here, especially the financial gains, are only a means to an end in that they are truly secondary to the overarching need to address global environmental issues. Traditional metrics are being applied to a very non-traditional process which has its roots in social good.

Environmental Benefits
   - Enhance and protect eco-system and biodiversity,
   - Improve water and air quality,
   - Reduce solid waste,
   - Conserve natural resources. (USGBC, 2007)

As previously stated, buildings have a substantial energy impact on the environment. Population growth and the resultant demand on the built environment is always on the increase, creating obvious resource consumption issues; however the knock-on effects are less obvious but just as significant. For example, energy consumption grows proportionately to increased building quantity and use. Less obvious is the water used to generate this power. In 2000, the United States geological service estimated that 52% of all surface water withdrawals and 39% of total fresh water withdrawals were used for thermoelectric power generation. Water consumption resulting from energy use is estimated at over six billion gallons of water per day. Estimates now project that 40 states are expected to experience water shortages by 2050. (Wedding, 2007)

When we consider the life span of green and non-green buildings, green buildings outlive the non-green buildings with twice of useful life span. This means that a single green-building would create substantial savings on many fronts; carbon emissions would be considerably lower as would energy and water consumption and reduced landfill waste. Non-green buildings experience energy use that is 50% greater than green buildings, outdoor water use at 100% greater and indoor water use at 30% greater (Wedding et.al, 2008) and retrofitting an existing building to green building standards holds just as much promise of environmental benefits as building a new green building.

Health and Community Benefits
   - Improve air, thermal, daylight and acoustic environments,
   - Enhance occupant comfort and health,
   - Minimize strain on local infrastructure,
   - Contribute the overall quality of life,
   - Set example in the community. (USGBC, 2007)

It is shown that improving employee health is not just an ethical act; these health improvements will also have a direct monetary value, along with an indirect affect on productivity and profit.

Employees in buildings with interiors that are compliant with green building standards experience less absenteeism and fewer turnovers. Recent study conducted with the participation of a well known insurance company showed a 16% productivity gain and 15% reduced worker absenteeism following a move to a new green building. Apart from this, employees in a healthy indoor environment are less likely to file lawsuits or file insurance claims. (Roper, Beard, 2006) This leads to substantial financial benefits for a company, and also benefits for the overall economy in the form of saved health related expenses.
Financial Benefits
- Reduce operating costs,
- Reduce life cycle energy costs,
- Enhance asset value and profit
- Improve employee productivity and satisfaction,
- Optimize life cycle economic performance,
- Lower absenteeism / Increased productivity,
- Lower health related costs such as insurance premiums,
- Lower litigation risks because of improved indoor air quality,
- Staying ahead of regulations,
- Lower employee turnover,
- Longer economic life of the facility,
- Tax abatements at the federal, state and local level,
- Federal grants used as enticements to promote green building. (e.g. $32 Billion of American Recovery and Reinvestment Act Stimulus spending (ARRA 09) goes to energy related spending) (McKinsey and Company, 2009)

According to a recent research conducted in the US, upgrading an existing building to a green building would increase its capital value by 16%. (Eichhlotz et.al 2009)

Additionally, green buildings function more efficiently by design and produce financial benefits of:
- Operating cost reduction of 8-9%
- Building value increase of 7.5%
- Return on investment improvement 6.6%
- Occupancy ratio increase of 3.5%
- Rent ratio increase of 3% (USGBC, 2009a)

It is safe to say that 30% of the operating cost of a building comes from the energy cost which is the most easily realized and measured impact of the use of green building standards. To put a monetary value on the benefit, the energy savings created by LEED specific spending between the years of 2000-2008 amounts to $281 million dollars, with projected savings between the years of 2009-2013 at $10.7 billion. (USGBC, 2009a) This is the potential that can be reached by employing green building practices. These savings are both immediate and long term; money that stays in our pocket now, and money saved later through tax avoidance since states, cities and local municipalities would not need to build new infrastructure to accommodate twice as many resource-intensive traditional buildings.

Since 78% of total business expense for companies during their operational life is salaries and benefits, (www.facilitylink.net) improving employee productivity, or lowering turnover rate, or even reducing absenteeism by providing a healthy environment becomes extremely important. Improvements in indoor environments are estimated to save $17-48 Billion in total health gains and $20-160 Billion in worker performance. (USGBC, 2009a) According to the Commission for Environmental Cooperation (CEC) the cost to corporations for building-related sickness in the United States alone is $58 billion dollars per year. They go on to say that green building has the potential to create some $200 Billion in measurable worker productivity in offices with noticeable improvements to air quality. (www.cec.org)

Market Benefits
- Create value within the compatible market,
- Higher occupancy rates,
- Less vacancy period,
Meet growing demands by tenants,
Company recognition,
Lower advertising costs.

Retrofitted or new green building tends to bring its own demand to the marketplace. It is believed that as the number of workers occupying green buildings increases their greater level of satisfaction with their work environment will prompt demand for similar surroundings from industry peers. This will create a positive feedback loop within the marketplace that will only compliment the environmental and health benefits.

Since the green market is still small when compared to total construction starts, availability will remain a factor as early adopters are able to see significant profits for certified buildings; even if a building is retrofitted for a specific company’s use the market benefit will still be there if the building is sold. In commercial real estate, CoStar Reports show that buildings that carry LEED certification exhibit higher lease and occupancy rates than their conventional peers. (Loban, Jones 2008)

Industry Benefits
- Positive impact on the Construction Industry, (integrated, non-traditional processes, new materials)
- Allow technology to become part of the green building process improving the outcome of projects,
- Allow professionals to become more qualified, educated, integrated,
- Allow opening other countries and selling green building know-how,
- Help other industries to benefit from new opportunities,
- Help to increase job opportunities,
- Eligible for grant money.

Green building enjoys very vocal support not just from government agencies, but also from many professional and trade organizations. This is indicative of an industry that is ready to accept the challenges and changes that green building presents.

Many organizations within the industry are supporting green building by publishing educational materials, developing guidelines and resources, creating training programs and hosting green building conferences, creating a new level of awareness. (Ahn, Pearce, 2007) Growing support and educational work will help the industry to staff these positions with experienced and passionate team members. A committed construction industry will also stir up other related industries such as manufacturing, finance, insurance and education, adding value to the overall economy.

The market opportunity -overall, the green building market in the United States is likely to more than double from today’s $36-$49 Billion to $96-$140 Billion by the year 2013. (USGBC-2009) A national commitment to green building has the potential to generate 7.9 million jobs in America over the next 5 years, according to studies conducted by the USGBC. (USGBC, 2009a) But the hesitation around the stakeholders is costing us as lost benefits, environmental chaos and economical downturn.

SUMMARY OF RISKS
As described above, building to green standards produces many benefits. But risks are involved. At the forefront of risk are the inconsistencies associated with inexperienced team members, establishing implementation cost benchmarks, post-implementation performance numbers, government incentives and so forth; all of which contribute to a level of risk when deciding whether or not to execute a green building project. There are different categories of risks related to green buildings which are listed below.

Financial Risks
o Due to the common belief of “green cost much higher” lending amounts can be disproportionate to need resulting in needless debt,  
o Return on Investment needs more of a historical perspective to become more predictable,  
o Inexperienced teams might lack the skills to properly implement green oriented technology which could hinder its effectiveness,  
o Company budgets are not usually structured to track Life Cycle Cost (LCC) for a project making longer term gains harder to record,  
o Costs associated with litigation between the architect/engineers and the owner if certification is not reached,  
o Loss of tax incentives if certification is not reached,  
o New green building materials might result in issues never encountered previously and be a source of litigation,  
o Loss of possible financial gain if the building doesn’t perform as it was intended to,  
o Possible unforeseen conditions of retrofitting existing buildings.

With green building, financial risks are there, but this is a risk factor to consider in any project and this situation is not unique to the green building.

Market Risks
- Lack of consensus in the market about leading green standards,  
- Lack of knowledge in financial institutions in regards to green buildings, results lending based on the status quo,  
- Real estate agents are unable to articulate the benefits of green building and will focus on easier sales which require no learning curve,  
- Misconceptions about green buildings’ energy efficiency,  
- Possibility of not reaching the anticipated results for green buildings in the market.

Market risks are primarily caused by the lack of knowledge towards green building benefits in the real estate market. Lenders and real estate firms especially have yet to embrace the changes and promote them openly. Additionally, previous version of LEED did not focus on energy savings; therefore the negative feedback of the energy performance of these buildings affected green building’s market position. As a result of this, recent report findings indicate that Energy Star buildings bring higher lease and higher sale value than LEED certified buildings. (Eichholtz et.al, 2009)

Industry Risks
- Education within the construction industry is not sufficient to create a consensus,  
- Owners and investors do not have access to enough information to easily convince them that green building is the best avenue to pursue,  
- Not engaging green building practices may cause architects, engineers, construction companies etc. become obsolete in the future,  
- The green building demand may not be satisfied by the supply chain e.g. recycled materials etc.  
- Continuous improvement is needed to keep pace with changes to standards

Since early discipline integration is crucial for green buildings, it is as much important to have educated team members in the process. Unfortunately, green building knowledge is not equally spread among the project participants within the industry. The risks categorized as industry related are, again, apt to diminish with time, but are considerable today. They are focused around the pace of change, the dynamic nature of standards, the availability of information and the ability of the industry to reinvent itself.
Performance Risks

Building Performance Risks
- Some LEED certified buildings are documented to perform worse than non-green buildings
- New materials-performance is not tested over the years
- If the building does not perform, the certification will be revoked
- There is not many performance data about retrofitted existing building.

Team Performance Risks
- Some owners start green projects with inexperienced team
- Lack of support from the team members
- Owners might not be ready to leave their comfort zone, e.g. new team, unfamiliar environment, new process, new technology etc.

The possibility of not having the building performing as it was intended is a huge impact on decision maker. The GSA research mentioned above indicated that green buildings perform better than non-green buildings, but the same research also found that a few of the buildings perform worse than the national average. (GSA, White Paper, 2008) Even though the reason is not clear and needs further investigation, this information might be enough to confuse decision makers about green building performance.

Legislative Risks
- Tax and regulatory incentives are not uniform and tend to change from state to state, and over time
- Tax and regulatory incentives may be complicated and difficult to obtain
- As legislation changes risks are introduced that are not yet known and cannot be controlled by decision maker
- Uncertain expiration dates on incentives

Uncertain expiration dates can affect decision makers’ future investment plans therefore their budget, and cause them to postpone or, even worse, cancel a green project.

RISK MANAGEMENT STRATEGIES
Deciding to build green is not just a business decision for some companies. Whether an owner (owner-occupied, owner-developer), speculative developer or an investor, there are many factors that affect this decision. A company’s finances, budget structure, interest and belief in green buildings, support from upper management and even employee support all influence the eventual decision.

For owner-occupied buildings, the decision can be less complicated. When comparing the negative and positive factors, the scale favors the owner-occupied buildings in terms life cycle cost benefits, most of which go to tenants - in this situation to the owner.

Additionally, building a new green building or retrofitting an existing building for owner-occupied use will bring future benefits in the form of a higher sales price tag if the building is eventually sold. Owner-occupied building owners also benefit from tax reductions and incentives.

Even though decision parameters can be different for owners, developer and investors, the risks and benefits are usually similar. After identifying and categorizing the risks, the next step is offering some strategies of how to manage these risks.

STRATEGIES FOR FINANCIAL RISKS
- Sharing some of the financial risks with other parties by contractual agreement
- Shifting the risk with insurance policies
• Using tested green materials to avoid future litigation
• Re-structuring the financial structure of the company to obtain life cycle costs in order to acknowledge the savings over the years.
• Seeking counseling for possible litigation areas e.g. performance, new materials,
• Commissioning and periodic re-commissioning in order to reach the best performance during the life cycle of the building. (www.allenmatkins.com)
• Enhancing technologies early on, such as Building Information Modeling (BIM), Integrated Workplace Management System (IWMS), Computer Aided Facilities Management (CAFM) etc.,
• Retaining green building experienced team members and consultants
• Engaging integrated project delivery methods.

Some of the financial strategies overlap with the performance strategies since the team performance, project delivery methods, use of technology affects the financial outcome. Technologies mentioned above would allow decision maker to determine the cost and environmental impact as well as the building performance of green standards during design phase, allow tracking and reducing operation and maintenance cost during the occupancy phase. BIM is proven to be preventive tool of problematic parts of design and construction which is another way of eliminating cost increase, therefore financial risk.

Financial risks that might be faced are seemingly able to be eliminated by time, a history of success and documentation. The newness of the practice, lack of information, inexperienced professionals, untested materials, lack of technology interaction; all these contribute to risk that can eventually be reduced. Once there is a knowledge base to fall back on it will be easier to predict the outcome of green building efforts.

STRATEGIES FOR MARKET RISKS
• Avoiding performance problems using the related strategies in order to obtain higher rent, sale price.
• Documenting performance & savings data in order to establish proof of higher performance and savings of green buildings
• Using technologies such as IWMS/Geographic Information Systems (GIS) to be able to analyze the market conditions before deciding on retrofitting a specific building and the building sites.

Industry stakeholders are not holding the same level of knowledge in green building practices. This may result in market risks of not positioning the green buildings correctly in the real estate market if the retrofitted or new building would be rented or sold. Lack of knowledge brings confusion to the market for green buildings and this can only be addressed by educating the industry and market professionals which would be addressed below.

STRATEGIES FOR INDUSTRY RISKS
• Retaining experienced team members.
• Using technologies such as IWMS, BIM to collect timely data for the building management and the historical data for research purposes,
• Establishing and/or sponsoring education programs for the industry professionals
• Preparing a knowledge portal for historical data of performance and lessons learned in order to reach best practices.
• Preparing database for green materials e.g. for their performance and test results,
• Establishing easy access education programs for the real estate, finance, insurance and related professionals,
• Requiring insurance companies to prepare green building risk- specific policies,
• Sponsoring for more research in order to reach the consensus about green building performance, cost, savings and green materials,
Using media to improve awareness of green building.

Green building research within the industry is not enough and not consistent to convince the decision maker that green building is indeed not riskier than any conventional construction project. Even though the last changes in LEED v3 are possibly going to help the green building has a better reputation in the future for energy savings and environmental concerns, changes in LEED might be confusing for professionals and decision makers. On the other hand, retaining a LEED Accredited Professional (LEED-AP) is still optional during green building process, and this may cause unwanted outcomes which may continuously create a risk for the industry.

STRATEGIES FOR PERFORMANCE RISKS
Performance risks can be eliminated starting very early on during the project and work through the life cycle of the project by:

- Having clear objectives of pursuing a sustainable project,
- Engaging the end user,
- Having 100% support by team members on green building process,
- Obtaining collaborative approach as a team early on,
- Using integrated project delivery methods,
- Retaining green consultants, e.g. LEED-AP
- Educating project team members,
- Teaming up with green building experienced professionals,
- Enhancing technologies early on, such as Building Information Modeling (BIM), Integrated Workplace Management System (IWMS), Computer Aided Facilities Management (CAFM),

It has been established by other research that to be able to successfully build a green building all the stakeholders and professionals involved – the owner, architects, engineers, constructor, developer, subcontractors and facility manager - must work in an integrated manner from the very beginning of the project, (Horman et.al, 2006) with a clear objective and hundred percent support of green building. Another research that can be mentioned reached the same conclusion not just for green buildings, but for the overall success of any construction project in order to reach budget, schedule and quality goals. (Molenaar, et.al. 2009)

Integrated delivery with technology enhancement would also add value to the project as well as being an invincible tool for green building. BIM is proven to be preventive tool of problematic parts of design and construction which is another way of eliminating performance and also financial risk. Technologies such as BIM, IWMS would allow determining the cost and environmental impact of green standards during the design phase, allow tracking and reducing operation and maintenance cost during the occupancy phase. Involving facility managers in every step of the process starting the site/building selection would prove their valuable input in the life cycle of the project.

The owners’ educated inputs are extremely important in any project but especially crucial in green building process. Design professionals should emphasize that green building is not just another building type or product; it is a unique process and needs careful consideration every step of the way, most importantly in the very beginning of the project.

STRATEGIES FOR LEGISLATIVE RISKS
- Following the incentives and tax reduction rules that are offered by states, counties or cities in the US in order to obtain them,
- Lobbying for green building incentives, (Yudelson, 2007)
Informing the legislative bodies about the savings, creating a feedback loop.

There is no doubt that state, county and municipal bodies are supporting green buildings but the risks mostly lay in the complicated tax laws, many different incentives (changing state to state), and complicated bureaucracy with federal acts and grants. Additionally, legislative decisions are slow and sometimes behind the curve of following the trends.

Creating a feedback between the legislative bodies and the industry would be a good strategy if their intention is taking the right position for successful green movement. These strategies mentioned above may help to manage some of the risks by adding decision maker’s input to this process.

CONCLUSION AND FUTURE WORK
The market growth and demand for both green building and green retrofit will continue to grow in time with more experienced professionals, higher performance & quality and reduced cost. Although this paper is based on the US examples of green buildings and green standards, the findings are applicable to any green standard; therefore the results can be used to promote green building and to identify the risks in developing countries.

With future research focusing on cost and rate of return of green retrofits; showing different levels of retrofitting can accomplish substantial savings, would help decision makers with this process and it would affect the speed on retrofitting the existing buildings further. The industry needs green material data bases in order to use the best material for the best solution and research and development of green materials and recycling methods should be supported in order to supply the growing demand.

Additionally, green building-specific insurance, legal issues related to possible liabilities need to be addressed by the industry. Standardization on the practices, information sharing among the professionals with “lessons learned”, more research mentioned above will promote green building practices faster and more efficiently and help to create “best practices” consensus.

Several of the strategies in this paper are focused on the construction industry coming together as a group to develop standards, information portals, and education programs for realtors, lenders and buyers alike. It is worth mentioning that some groups, such as the Mindshift Consortium, (www.haworth.com) have already begun the campaign of public education and enlightenment. These groups have accepted the reality of the need for the green building movement and have become very proactive on their actions.

All evidence points to the fact that green standards and green buildings are here to stay. (Riley et. al, 2006) Green building is the solution to many problems from local to global scale, from environmental to financial, from community to industrial. The future of green building will be carbon neutral and zero emission buildings, which could also be called “next generation”, green building. (Boake, 2008) By going forward with the strategies mentioned above the industry will be ready to achieve the challenge of “next generation” green buildings. In the future, green building is going to be the common practice for the construction industry and common necessity for owners, facility managers and tenants in if not now. It is safe to say that green building will be shaping the future of the construction industry.

REFERENCES
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