Stimulating the Economy While Stopping Irreversible Climate Change Credit Risk Including Contagion©

June 21, 2013

Summary

There are extensively documented and substantial global financial benefits from accelerating the global green building secondary market; this market primarily issues bonds. One unappreciated benefit is that this market can significantly reduce, and perhaps even eliminate, unacceptable near term risks to the world's financial markets imposed by dangerous climate change. Reliable peer-reviewed estimates are that $2 trillion or more are be needed to reduce 18 gigatons of CO2 emissions, stabilize the climate, and mitigate risks to financial markets through the exposure of insurance companies to unprecedented claims and documented ongoing systemic damages in a number of other sectors.

The global green building secondary market can easily provide this investment funding through the issuance of fixed-income bonds. In addition, this secondary market is expected to:

- Accelerate global green building equity investment
- Shift the market significantly by large scale investment in profitable green building and energy technologies
- Overcome the ideological gridlock and bias that currently prevent policy makers from effectively dealing with the unprecedented and unacceptable risks of climate change
- Stimulate additional government action reducing climate pollution

If other programs similar to the global green building secondary market can be identified that are also poised to provide a financial stimulus and the needed trillions of dollars for near term substantial pollution reductions, they should be pursued as well.

This Report advances several related points in making its case:

- In many regions of the world, systemic climate change damages are rising, and this increase threatens financial markets.
- Pervasive bias, including negative market responses to disruptive clean energy technologies, prevents accurate recognition of the risks to financial markets posed by climate change. Acceleration of the green building secondary market will help overcome this bias.
- The safe level for climate pollution is 350 parts per million (ppm) CO2. We are currently at a dangerous level of 400 ppm and rising rapidly.
- There are many well-documented environmental tipping points at which additional incremental change can trigger irreversible, and highly detrimental, systemic change—change that threatens global financial markets.
- Similarly, the financial economy has tipping points at which further incremental change brings about rapid systemic change—escalating crises of debt repudiation, deleveraging, sudden shifts in market expectations and investors' confidence and panic which is commonly called "contagion."
- The irreversibility of tipping points and the calculations of needed reduction in climate change pollution to stop Irreversibility are well defined by leading climate scientists and leading financial institutions.
- The expected manifestation and negative effects of unacceptable climate change credit risks from financial contagion
- It is possible to predict the expected manifestation and negative effects of unacceptable climate change credit risks from financial contagion

- Proposed solutions and responses to climate change credit risk and contagion fall into distinct categories.
- Our analysis leads to a clear program to stimulate the economy and also stop climate change credit risk, including the risk of contagion
- Appendix: Green buildings have top of the market rents, occupancy and valuation based on national statistically valid data released at the NYSE.

Green buildings are energy and environmentally efficient and reduce climate pollution. The building industry is the world's largest, generates the most climate change pollution, and the expected global green building secondary market is estimated to be well over $2 trillion.

These preceding benefits were covered at National Green Building Financing / Green Building Bond Launch on September 18, 2012 at TIAA-CREF (a $600B investor) in New York City by Citi, the States, Jones Lang LaSalle, Fireman's Fund Allianz, Federal Home Loan Bank, National Wildlife Federation and the Capital Markets Partnership.

There are documented systemic climate change damages identified by the insurance and investor industries and governments in at least the following sectors: insurance, government, investment, agriculture, fisheries, forestry, and the built environment. Peer-reviewed Wall Street due diligence released at the NYSE identified that both Moody's and the Mortgage Bankers Association (MBA) stated that climate change is a serious credit risk (Oct. 15, 2010)(Due Diligence Released at NYSE Transmittal to Treasury & the Fed, consisting of over 30 reports, consensus standards, and investor surveys at request of Treasury Under Secretary Mary Miller and Ben Bernanke's Office). MBA's statement was based on rising climate change risk to the insurance sector and potential insurance coverage challenges for mortgages including for the real estate capital markets.

For example for insurance, the due diligence reported that the Reinsurance Chief Risk Officers stated that worsening climate change damages could be the end of insurance (Chief Risk Officers Position Paper on Climate Change at 10, July 12, 2006). The Reinsurance Association of America called for aggressive action on climate change and stated that climate change related damages for 2011 were over $40B and are expected to rise in the future (Reinsurance Association of America Briefing to the Senate, Mar. 1, 2012, Report by Vermont Senator Bernie Sanders). Frank Nutter, Reinsurance Association of America President said *"[f]rom our industry's perspective, the footprints of climate change are around us and the trend of increasing damage to property and threat to lives is clear. We need a national policy related to climate and weather."* This Reinsurance Association Senate briefing stated that property and casualty insurers in the United States experienced an estimated $44 billion in losses in 2011 when hurricanes, droughts, tornadoes and other natural disasters were more severe, longer, more frequent and less predictable than in the past. Allianz estimates that climate change induced extreme weather damages are expected to exceed $400B/yr.

The National Oceanic and Atmospheric Administration (NOAA) announced that 2012 extreme weather events cost $110B with Sandy responsible for about $65B and drought nearly $30B, making it the second costliest year on record:

> *"The worst losses of life were also sustained during Sandy, which caused over 130 fatalities. Sandy's large size, with tropical storm force winds extending nearly 500 miles from the center, led to record storm surge, large-scale flooding, wind damage, and mass power outages along much of the East Coast.*
>
> *The yearlong drought, which affected more than half the country for the majority of 2012, and the associated heat waves caused over 100 direct deaths. The number of excess mortality deaths (indirect) is still unknown. It was also the largest drought extent in the United States since the 1930s, with U.S. Department of Agriculture Drought Disaster Declarations reaching more than*

2,600 of the Nation's 3,143 counties. While drought impacts are often most costly to agricultural centers, their conditions also led to several devastating wildfires that burned over 9 million acres nationwide during 2012." ("Extreme weather events caused $110 billion in damages in 2012," NOAA Media Release, June 13, 2013).

Reinsurers recognize that bias is a primary cause of the inability to make global climate pollution reductions to reduce the unacceptable risk.

Due to rising climate change damages, insurers have been excluding coverage in high-risk highly populated coastal areas. According to the National Association of Insurance Commissioners, insurance is about 10% of GDP and required for commerce. As an example, insurance is required for all properties whose mortgage is contained in a commercial mortgage-backed security bond. If insurance is not available for properties in mortgage-backed security pools, the credit rating agencies would likely have to reduce the credit rating for these pools. If the market becomes aware of these risks and the likelihood it won't change because of rising insurer climate change damages and lack of substantial climate pollution reductions, this permanent lack of coverage could set up a trigger point for financial contagion like that contagion accompanying credit crises. Trigger points for financial contagion could also occur in other markets where there are systemic climate change damages.

As contained in Wall Street Due Diligence released at the NYSE documenting the added green building value, both the UK and Bush II White House reported that climate change damages will affect every aspect of society if substantial climate pollution reductions are not made (peer-reviewed Capital Markets Briefing Paper 2009 released at NYSE).

Accelerating the global secondary green building market is easy since green building financial and climate change benefits were extensively documented in peer reviewed Wall Street due diligence released at the NYSE including with nationally statistically valid data:

- Green buildings are more profitable, less risky, and preferred by investors with top of the market rents, occupancy and value.
- Added green building value can be measured by the consensus green building underwriting standards identifying green building attributes increasing cash flow, net operating income, and value like efficiency, onsite renewable power, proximity to transit, improved indoor air, climate neutral operations.
- Buildings generate over 50% of climate pollution and green buildings have about a 40% climate pollution reduction per building. In high-density cities like Chicago with extensive transit, buildings cause over 70% of climate pollution (Karen Weigert, Chicago Chief Sustainability Officer Energy Efficiency Presentation to the Appraisal Institute, May 13, 2013).
- The green building secondary market is the needed financial engine to retrofit the building stock expected to create a $1 trillion financial stimulus, 800,000 new jobs, $400B in new wages (US), and provide the necessary climate pollution reductions to stop dangerous climate change from going irreversible (*Creating and Economic Stimulus & Stopping Climate Credit Risk / Irreversibility, prepared with the State of California, IPCC Scientists and NASA 2009-2011)*
- Acceleration of the secondary green building market is expected to be a substantial catalyst for further needed climate change actions by government.
- According to the leading global climate scientists, massive near term climate pollution reductions are required to stabilize climate change and prevent irreversible tipping points. However, global climate pollution loadings are increasing, and CO2 concentrations are rising just reaching 400 parts per million (ppm), but the recognized safe level by the leading climate scientists is 350 ppm. Four hundred parts per million and rising is recognized as a dangerous level and according to *Scientific American "the last time CO2 levels … were this high … was more than 2.5 million years ago, an era known as the Pliocene, when the Canadian*

Arctic boasted forests instead of icy wastes. The globe's temperature averaged about 3 degrees C warmer, and sea level lapped coasts 5 meters or more higher" ("400 PPM: Carbon Dioxide in the Atmosphere Reaches Prehistoric Levels," Scientific America at 1, May 9, 2013).

- These preceding Wall Street due diligence data released at the NYSE are documented in Memorandum to Treasury & the Fed on the Green Building Secondary Market (Oct. 15, 2010)(transmitting due diligence consisting of over 30 reports, consensus standards, and investor surveys)

The added green building value was reviewed at national public meetings at Federal Reserve Offices and is captured into a Certified Green Value© label for properties including the appraisal and using the Appraisal Institute's and Capital Market's Partnership Model Green Building and Home Valuation Scope of Service.

The likely scenarios on potential irreversible tipping points identified by the world's leading climate scientists pose unacceptable risks to society including systemic climate change damages in insurance and other markets. Just as contagion set in when Lehman Brothers collapsed in the credit crisis and many prior historical credit crisis, knowledge of systemic climate change damages is expected to trigger financial contagion in affected markets if large scale climate pollution reductions are not being made (see *This Time Is Different: Eight Centuries of Financial Folly*, Reinhart & Rogoff (2010) for an extensive review of historical credit crises and their similarities).

Thresholds triggering financial contagion could be the next large scale extreme weather events or series of events intensified by climate change like more damaging hurricanes or droughts. Unlike contagion with credit crises that eventually stops, without substantive near term climate pollution reduction, financial climate contagion is expected to be permanent.

There are no technical, business or financial impediments to accelerating the global green building secondary market to stop climate change credit risk including financial contagion, other than:

- Awareness of the substantial financial opportunity for investment banks by top management, including profitable 30 year business models.
- Knowledge that accelerating the global green building secondary market releasing about $2 trillion in capital for green building retrofits is required to stop these unacceptable climate change risks to business, government, the capital markets, the rest of society, and biota.

This opportunity is consistent with estimates that 80% of the investment needed to address climate change will come from the private sector ("Investing in Climate Business Forum," International Finance Corporation 2013).

Rising Systemic Dangerous Climate Change Damages Are Occurring in Many Sectors.

The following is an overview of systemic climate change damages in key sectors identified by the insurance and investor industries and governments: insurance, government, investment, agriculture, fisheries, forestry, and the built environment.

Importantly, insurers, leading scientists as reported by the National Research Council, and economists, emphasize that damages from climate change are understated because government, the private sector, and individuals for the most part do not recognize the current changing climate and their investments and decisions assume in error, a stationery climate:

"This is a problem of broad and significant scope. Among the public and private sector organizations that are exposed to increasing but underestimated risks are

- *Local, state and federal disaster management agencies;*
- *Local, state and federal agencies that finance and build public infrastructure in vulnerable areas as well as those that own and operate vulnerable infrastructure;*
- *Private investors and owners of vulnerable buildings and other physical property;*
- *Property and casualty insurers;*
- *Creditors holding vulnerable infrastructure directly or indirectly as collateral;*
- *Vulnerable businesses and households.*

Clearly, this listing encompasses a large proportion of the American economy, and an assessment of the vulnerable regions would also extend over a large part of the country, including coastal regions subject to hurricanes, storm surges, and erosion; river basins subject to flooding; and agricultural areas subject to wind, storm and drought damage," ("Climate Change and Damage from Extreme Weather Events," Repetto & Easton, U. of Mass., at 4,5, Oct. 2009).

Presciently, this University of Massachusetts report at pages 5-9, focused on the understated damage risk to the New York metropolitan area especially a storm surge in low lying areas from a hurricane intensified by climate change which subsequently occurred from Hurricane Sandy.

Insurance. Insurance is experiencing systemic climate change damages and is a key financial sector because it comprises about 10% of GDP and is required for business including the capital markets. As noted in the Wall Street due diligence released at the NYSE, and due to damaging extreme events intensified by climate change, the Reinsurance Chief Risk Officers warned of a substantial and unprecedented systemic risk: continued climate change damages and climate pollution can be the end of insurance (Chief Risk Officers Position Paper on Climate Change at 10, July 12, 2006). The Reinsurance Association announced $40B in climate change related damages in 2011 with these levels expected to rise (Reinsurance Association Calls for Action on Climate 2012).

A publication by a recognized insurance industry climate expert in the leading international insurance think tank for strategically important insurance and risk management issues concluded: *"the insurance industry is very interested in climate change because it can damage all sides of the balance sheet, because its reputation may be affected …. We cannot insure our way out of the problem. Reinsurers and alternative capital market providers will not accept risk on terms that are not commercially viable"* ("Climate Change: Impacts on Insurers & How They Can Help With Adaptation and Mitigation," Trevor Maynard, International Association for the Study of Insurance Economics, at 142 May 2008).

Moreover, a key barrier to US insurance being able to cover increasing damages from climate change according to Allianz, one of the World's largest insurers, is the mistaken *"[b]elief that the industries' financial solvency is not at risk"* from climate change ("Climate Change and Insurance: An Agenda for Action in the United States," a 33 Allianz 2006).

The Mortgage Bankers Association (MBA) and Moody's stated that climate change is a serious credit risk (Wall Street due diligence released at NYSE). MBA's Report "Natural Disaster Catastrophic Insurance" (2006) concludes that climate change is a systemic risk to insurance interfering with insurance requirements for mortgages including for the real estate capital markets:

"[R]eports of property insurance rate increases of over 100 percent have been the norm, with some borrowers reporting increases of up to 600 percent. … Borrowers purchasing property … reported that the high catastrophic insurance costs in Florida and the Gulf Coast have caused the delay or cancellation of some deals. Deals have been cancelled either because catastrophic insurance was not available or the pricing of catastrophic insurance lowered the debt service coverage ratios to unacceptable levels" (at 39).

"Given the hard market conditions for catastrophic insurance, lenders are faced with the challenge of meeting insurance underwriting requirements without full replacement cost insurance either unavailable or unaffordable (or both) in some areas" (at 40).

"Moody's raised the concern that movement away from full replacement cost insurance policies could have "serious" credit implications" (at 42). "As indicated by Moody's, loans that are included in a pool without full replacement costs insurance coverage or have "troubling" language, may be required to have increased subordination levels. This could increase the size of the of the B piece tranche in a securitization. At this point, B piece buyers will have to carefully examine the hurricane or other catastrophic risk exposure of the loans without full coverage and factor this into their modeling and decision process for purchasing an interest in a B piece pool" (at 44).

"Insurance Company Rating Agencies'' Concerns Shrink Catastrophic Insurance Capacity" (at 45). *"Catastrophic insurance pricing may never return to pre-Katrina levels due to increased loss expectations from hurricanes and rating agency scrutiny over an insurance company's overall exposure to catastrophic events"* (Id).

"Available and Affordable Property Insurance is Essential to the Real Estate Finance Industry. Both residential and commercial mortgages require "all risk" insurance coverage to be in place during the life of the mortgage. Consequently, disruptions in the availability or affordability of property insurance seriously undermines the real estate finance industry by shifting catastrophic property damage risk from the insurance industry to the real estate finance industry which has not priced such risk into its product offering" (at 46).

In response to a 2008 Carbon Disclosure Project Survey, Allstate, the largest publicly-traded US insurer indicated:

"Allstate recognises the emerging scientific consensus that the world is getting warmer and that this trend is influenced to some extent by emissions of greenhouse gases. Climate change, to the extent it produces rising temperatures and changes in weather patterns, could impact the frequency or severity of extreme weather events and wildfires. Such changes could also impact the affordability and availability of homeowners insurance" *(E. Mills, Lawrence Berkely Lab,* A Global Economics 1018-589, May, 2009)

Further, in relation to Allstate's exclusion of homeowner's coverage in hurricane prone US coastal areas due to climate change, Allstate's CEO stressed during Allstate's1stQ 2011 earnings call on April 28: *"you see a lot more severe weather. We are acting and running our Homeowners' business as if that is a permanent change as opposed to an anomaly,"* ("Physical Risks from Climate Change," Calvert, at 14, 2012).

Europe's largest insurer Allianz stated that insured losses from natural catastrophes caused by climate change are set to surge 37% in the next decade, resulting in the need for alternative ways to manage risk. Allianz added that annual insured losses from catastrophes such as floods and hurricanes may jump to $41 billion a year in 2010-2019, up from $30 billion a year in 2000-2006, and less than $5 billion before 1989. Clement Booth, a member of Allianz's management board said that total losses in any one year may be as much as $400 billion ("Climate Change to Boost Insured Losses, Allianz Says," Angela Macdonald-Smith, Bloomberg News, Sept. 18, 2007). In the United States, Allianz concluded that climatic effects of higher temperatures are, more likely than not, driving up losses from a wide range of perils, including wildfires, floods, prolonged droughts and hurricanes. This global insurance leader said:

"Climate change poses significant risks throughout the United States, particularly to coastal, flood-prone and fire-prone areas. … Global warming will continue – and is likely to accelerate – as more green house gases accumulate in the atmosphere. Studies show that rising temperatures in recent years have likely contributed to an increase in the frequency and severity of natural disasters such as tropical storms and hurricanes…. The vice-chairman of Merrill Lynch recently declared 'we are conducting an enormous chemical experiment with potentially huge consequences for our environment, for our economies, and for human life.' And Goldman Sachs agrees: 'We believe climate change is one of the most significant environmental challenges of the 21st century and is linked to other important issues such as economic growth and development, poverty alleviation,

access to clean water, and adequate energy supplies' " ("Climate Change and Insurance: An Agenda for Action in the United States," at 3, 5 Allianz 2006).

US Re Companies and Lloyds indicate (How Global Warming Impacts Insurance / Reinsurance, 2013):

"There are clear trends in past climate data that have translated into trends in insurance claims. Sea levels have risen leading to greater storm surges causing more claims. Forest fires last longer and are more frequent leading to more property damage and more insurance claims. At Lloyd's, we have increased our disaster planning scenarios from $70 billion in 2005 to $108 billion in 2007, reflecting changes in our perception of the risk, demographic changes, and the changing dynamics of the built environment."

"Maynard points out that climate change also brings potential liability claims. "Directors and officers could be sued where it can be shown that they have not managed their company's contribution to, or exposure to the effects of climate change."

"Insurance and reinsurance company balance sheets are vulnerable from all sides, Maynard asserts. 'Unless terms and conditions or insurance coverage change, capital requirements are likely to increase as the probability of extreme events increases. We see that the assets - the other side of the balance sheet are also likely to be adversely affected, falling in value possibly at the same time that the liabilities and capital requirements are rising.' "

" 'In some regions extreme events may become annual occurrences; the level of losses may increase to such an extent that insurance premiums become higher than policyholders are prepared to pay.' Maynard says reinsurers and alternative capital market providers will not accept risk on terms that are not commercially viable. The only long-term answer is mitigation."

The property casualty industry reported on the relationship of climate change damages to insurance availability / exclusions. *"[T]he availability of private-sector insurance could become a sizable problem in those jurisdictions that limit insurers' ability to charge risk-based rates. Indeed, homeowners in certain coastal states are already well aware that their only insurance option is with a state-run insurer of last resort—whose rates are typically far from actuarially sound and whose ability to pay claims may ultimately depend on taxpayer bailouts"* ("Climate Change & Insurance: Existential Threat—or Extraordinary Opportunity?" Property Casualty 360, Feb, 5, 2013). Allianz adds:

"U.S. insurers are already raising rates or exiting markets as a result of increased risk in coastal and fire-prone areas. In areas where insurers feel the risk is too great, or their ability to raise premiums is hampered by political or regulatory limitations, the risk burden will be shifted to the public, to asset owners (such as banks and investors), and to government insurance backstops. Federal and state insurance programs distort the market's ability to reflect the true climbing costs of climate change impacts. ..."

"[I]nsurers are withdrawing from high-risk coastal locations in Florida, or the state as a whole, in part because regulators are preventing them from raising rates to reflect the increasing risk, thus hampering the market's ability to send price signals to consumers that would begin to educate the public on the perils of building along exposed coastlines or fire-prone areas. In addition to Florida, American International Group (AIG) is no longer writing new property policies in some parts of the Gulf Coast, and Allstate is limiting policies in areas as far north as New York. Neither Allstate nor Nationwide Mutual are writing new policies for the eastern half of Long Island, and MetLife has stated that it will require extra inspections and storm shutters for new customers living within five miles of the ocean before it will issue coverage. While this form of adaptation may protect insurance companies, it causes a problematic shift in risk burden away from insurance companies and onto property owners (individuals, companies, equity investors, and banks), as well as local, state, and the federal governments. … "

"U.S. insurers are facing ever-increasing rates from reinsurance companies, who (as is shown in Box 2) are studying the problem of climate change in greater detail, and are increasing reinsurance

rates to ensure solvency" ("Climate Change and Insurance: An Agenda for Action in the United States," at 7, 31, 32 Allianz 2006).

The National Association of Insurance Commissioners (NAIC) reported that climate change is a fast-emerging threat with broad impacts across the industry, clouding its ability to price physical perils, creating potentially vast new liabilities, and threatening the performance of its huge investment portfolios ("The Potential Impact of Climate Change on Insurance Regulation," White Paper, NAIC 2008).

Allianz identifies how climate change impacts greatly increase damages to both insurance and society:

> *"The link between sea level rise and impacts of storms. Sea level rise is an especially dangerous threat for society and for insurers in combination with storm surges. A storm surge is the most hazardous aspect of hurricanes, as it generates powerful waves that cause floods and can create strong, dangerous currents. Storm surges are exacerbated by high water levels, such as high tides. El Niño, in combination with increased water levels, is responsible for severe coastal flooding. Furthermore, sea level rise contributes to coastal erosion, and coastal erosion diminishes the protective capacity of the coast from storm surges. Strong storm surges also tend to lead to inland flooding, as water in streams is backlogged due to the pressure from the water forced by the surge. Strong hurricanes in combination with high sea level can cause great damage. … Future sea level rise is expected to cause inundation of coastal areas, and put the coasts of the Atlantic and Gulf of Mexico at increased risk from storm surges. Those at most risk in the United States are the Southeastern and mid-Atlantic coasts (see Figure 4), low-lying areas, developed areas and those at risk from hurricanes. The Northeast is vulnerable due to the extent of development as well as low-lying coast"* ("Climate Change and Insurance: An Agenda for Action in the United States," at 14, 15 Allianz 2006).

Insurers are excluding coverage from important coastal areas from uninsurable risks due to increasing climate change related damages including from hurricanes ("Climate Change and Insurance," Allianz 2006, and personal conversation with a leading global insurance carrier Apr. 26, 2012). Mortgage-backed securities require insurance for all properties whose mortgage is in a pool backing bonds sold to investors. If coverage is unavailable for coastal properties, these bonds are subject to downgrades from the credit rating agencies.

Contributing to increased systemic damages to insurance from climate change causing exclusion of coverage / carriers exiting markets, is the fact that most of the US industry is using outdated data and assumptions not considering climate change in their catastrophic risk modeling and weather planning ("Climate Change and Insurance: An Agenda for Action in the United States," at 26 Allianz 2006). *"Unfortunately, because current cat models used by insurance companies do not include scenarios to examine even the highly certain events (such as continued and accelerating future sea level rise, and continued future polar ice melting), U.S. insurance companies' ability to predict future risk is very slim"* (Id. at 32).

Government. Government is experiencing systemic financial risk from climate change with the Congressional General Accounting Office (GAO) adding the financial risks of climate change to its "High Risk List." *"Limiting the Federal Government's Fiscal Exposure by Better Managing Climate Change Risks. Climate change poses significant financial risks to the federal government, which owns extensive infrastructure, such as defense installations; insures property through the National Flood Insurance Program; and provides emergency aid in response to natural disasters. GAO added this area because the federal government is not well positioned to address the fiscal exposure presented by climate change and needs a government-wide strategic approach with strong leadership to manage related risks"* (GAO Feb. 18, 2013).

State flood insurance programs like in Florida have suffered serious losses and currently the Federal Flood insurance program is unfunded due to rising claims resulting from more intense floods ("Climate Change and Insurance: An Agenda for Action in the United States," at 29 Allianz 2006). The Federal

government initially balked at funding Hurricane Sandy relief efforts due to the substantial amount estimated as over $50B.

Greatly affecting increased systemic damages from climate change including to insurance and government, is the fact that leading scientists, government, and industry concluded that worsening climate change is increasing the severity, intensity, and frequency of extreme weather events. Australia's Climate Commission in two recent reports confirms that the extreme heat waves, floods, cyclones (hurricanes), droughts and wildfires that have wracked Australia over the past decade have been exacerbated by climate change, these weather events will only get worse in the coming years, and warns that health and emergency professionals as well as citizens must prepare for their impacts now. The Reports' chief commissioner Tim Flannery said record-breaking weather is becoming more common as the climate shifts from climate change, and only strong preventative action, with deep and swift cuts in emissions this decade, can stabilize climate change and halt the trend towards more intense extreme weather (The Critical Decade- Extreme Weather & Global Action, Australia Climate Commission 2013). *"Climate change is making many extreme events worse in terms of their impacts on people, property, communities and the environment. This highlights the need to take rapid, effective action on climate change."* (The Critical Decade- Extreme Weather at 4). *"All extreme weather events are now influenced by climate change. What is important is how extreme weather is changing in:*

1. *frequency*
2. *intensity or severity*
3. *geographical extent"* (Id. at 11 & 12).

NASA concluded that climate change is increasing the likelihood of extreme rainfall and drought. Lead author William Lau, deputy director for atmospheres at the NASA Goddard Space Flight Center, explained that because most of the world's population resides in temperate and arid regions, the loss of rain in these zones will have the greatest societal impact (NASA Study Projects Warming-Driven Changes in Global Rainfall, May 3, 2013). Similarly, Allianz stated *"[n]umerous peer-reviewed studies in recent years have strengthened the link between rising global temperatures and increased severity and frequency of natural catastrophes"* ("Climate Change and Insurance: An Agenda for Action in the United States," at 12 Allianz 2006).

"Across the world countries have agreed that deep cuts in greenhouse gas emissions are necessary to prevent global temperatures from rising to levels that will cause significant and irreversible damage" (The Critical Decade- Global Action at 8, Australia Climate Commission 2013).

Investment. According to the leading investor Mercer, other investors, and International Finance Corporation (IFC), the investment sector is experiencing increasing systemic damages from climate change: *"Climate change is a systemic risk … and increases investment risk"* (Climate Change Scenarios –Implications for Strategic Asset Allocation, at 4, 11, Mercer with 14 global institutional investors and IFC 2011). *"It is … prudent for institutional investors to work towards building in, ahead of time (to the extent possible), potentially large-scale systemic risks, such as climate change, into risk management and Strategic Asset Allocation decisionmaking processes. … Traditional asset allocation methodologies do not adequately capture climate change risks. …* There is *"a need to be more forward looking and go beyond quantitative analysis"* (Id. at 6-7). *"Infrastructure, private equity, real estate and some commodities are highly sensitive to climate change"* (Id. at 15).

Echoing Mercer's findings, an alliance of institutional investors responsible for managing $22.5 trillion in assets called for action on the serious climate danger requiring substantial climate pollution reductions in the near term, or we risk trillions of dollars in investments and disruption to economies from rapidly growing climate pollution and more extreme climate change induced weather increasing investment risks globally. (LETTER FROM GLOBAL INVESTOR NETWORKS TO THE GOVERNMENTS OF THE WORLD'S LARGEST ECONOMIES, Nov. 20, 2012).

In response to a petition from investors, the Securities & Exchange Commission clarified disclosure requirements for climate change risk stating:

> *"[T]here may be significant physical effects of climate change that have the potential to have a material effect on a registrant's business and operations. These effects can impact a registrant's personnel, physical assets, supply chain and distribution chain. … Registrants whose businesses may be vulnerable to severe weather or climate related events should consider disclosing material risks of, or consequences from, such events in their publicly filed disclosure documents. … [S]evere weather can cause catastrophic harm to physical plants and facilities and can disrupt manufacturing and distribution processes.… Possible consequences of severe weather could include:*
> - *For registrants with operations concentrated on coastlines, property damage and disruptions to operations, including manufacturing operations or the transport of manufactured products;*
> - *Indirect financial and operational impacts from disruptions to the operations of major customers or suppliers from severe weather, such as hurricanes or floods;*
> - *Increased insurance claims and liabilities for insurance and reinsurance companies;*
> - *Decreased agricultural production capacity in areas affected by drought or other weather-related changes; and*
> - *Increased insurance premiums and deductibles, or a decrease in the availability of coverage, for registrants with plants or operations in areas subject to severe weather."*

("SEC Guidance Regarding Disclosure Related to Climate Change," 17 CFR Parts 211, 231 and 241, at 6, 26-27, Feb. 8, 2010).

SEC emphasized that climate change was identified as the number one risk for the insurance industry by Ernst & Young, and the insurance industry is already impacted by this risk ("Strategic Business Risk – Insurance," Mar. 12, 2008). Furthering the priority of SEC's Climate Change Disclosure requirements, SEC denied PNC Bank's request to exclude a resolution of 22% of its investors representing over $5B in shares led by Boston Common Asset Management requesting that PNC's Board disclose climate pollution from PNC's investment portfolio and climate change risk from PNC's lending, investing, and financing activities (SEC Corporate Finance Division Letter to PNC, Feb. 13, 2013 & "PNC Investors Support Climate Change Risk Management," *Environmental Leader,* Apr. 25, 2013).

Reinforcing SEC comments on insurance climate change risk from the perspective of insurance investment portfolios, the leading investor Calvert emphasizes that Travelers concluded in its 2011 10-K Report: *"Changing climate conditions could also impact the creditworthiness of issuers of securities in which the Company invests. For example, water supply adequacy could impact the creditworthiness of bond issuers in the Southwestern United States, and more frequent and/or severe hurricanes could impact the creditworthiness of issuers in the Southeastern United States, among other areas,"* ("Physical Risks from Climate Change," Calvert at 15, 2012).

Calvert concluded that *"[v]irtually every sector of the economy faces risks from the short- and long-term physical effects of climate change—impacts across the entire business value chain, from raw materials through to the end users,"* ("Physical Risks from Climate Change," at 6 2012). Calvert identifies some 25 specific systemic adverse economic impacts and specified monetized damages from climate change, to the following industry sectors including their value chains:

- Agriculture, food & beverage
- Apparel
- Electric power
- Insurance
- Mining
- Oil & gas
- Tourism

Commenting on climate change adverse impacts on sizable insurance investment portfolios from losses from claims paid to their insureds, Calvert states (Id. at 14):

"The insurance sector has a unique—and extensive—vulnerability to physical climate change impacts, not so much because of the risks climate change poses to insurance companies' facilities or employees, but rather because the industry pays the bill for insured losses caused by weather-related perils, such as floods, storms, and wildfires. In 2011, insured losses for such perils exceeded $55 billion. In a business that relies on past events to price future risks, climate change confronts insurers with dramatically changing weather patterns and more frequent and severe extreme weather events—challenging insurance companies' abilities to underwrite and price physical risks, creating new types of liability exposures, and posing a threat to insurance availability and affordability. Property and casualty insurers are already seeing more claims due to severe weather, health insurers may start to see more claims due to the increased spread of disease, and reinsurers are exposed to all of these losses (including paying a large portion of losses from catastrophic events)." …

"The 2010-2011 Australian floods led to more than $2 billion in insurance claims, including more than $350 million in claims that were partly responsible for Munich Re's fourth quarter 2010 profit decline of 38 percent. In 2011, Axis Capital suffered a range of catastrophe losses, including $20 million in its insurance segment and $10 million in its reinsurance segment from Hurricane Irene; $18 million in insurance from Tropical Storm Lee; and a similar amount in reinsurance from the Danish floods."

Reporting on damages from climate change, RAILPEN Investments, Henderson Global Investors, and Insight Investment report that climate change has increased damages due to more intense extreme weather events: *"Munich Re stated clearly that 'capital markets have not been spared the consequences of increasingly frequent and violent natural catastrophes. On the contrary, results and share prices are affected by resulting raw material shortfalls, damage to production sites and business interruption. In addition, sectors such as agriculture, tourism, and healthcare are starting to feel the gradual effects of climate change. Ultimately, economic performance as a whole suffers.' "* ("Managing the Unavoidable: Understanding the investment implications of adapting to climate change, at 2, Jan. 2008).

The Asset Owners Disclosure Project surveys the top 1000 global asset owners with over $60 trillion under management, on how well they manage climate risks and opportunities to protect retirement savings of beneficiaries held by these owners (http://aodproject.net). Of these named companies, 131 were rated poorly based on survey results and public sources, receiving a D, the lowest in a 1-10 scale and running the risk of becoming stranded assets according to the Disclosure Project. Many of these 131 are top name brands. Stranded assets are not performing well, and are worth less on the market than on their balance sheet since they became obsolete in advance of complete depreciation. The Disclosure Project ratings are from AAA, AA, A, BBB, BB, B, CCC, CC, C to D based on five criteria:

- Transparency
- Climate risk management at the portfolio level and for fund managers performance at the fund and company level
- Low carbon investment
- Active ownership, i.e., how active the owner is in the companies they invest in
- Investment chain alignment, i.e., how well the asset owners, their advisors, and fund managers, align with the best interests of their beneficiaries

From the institutional investor's perspective, the magnitude of current investor risk from climate is very high according to the Investor Network on Climate Change comprised of investors with over $11 trillion in assets under management: *"Climate change also presents significant risks and economic costs, which require serious attention from investors. Extreme weather events that affect virtually all sectors and asset classes have been linked to climate change. Global greenhouse gas emissions increased by record amounts in 2010, and carbon dioxide concentrations in the atmosphere have reached record levels. These trends suggest that the adverse impacts the changing climate is already having on*

the global economy – and therefore on investment portfolios – will likely grow larger, further increasing the risks for investors and companies" ("Investor Action Plan on Climate Change Risks & Opportunities," Investor Network on Climate Change" 2012).

Agriculture. Systemic climate change damages have been extensively reported in the agricultural sector with more intense storms and longer periods of drought. According to a recent report commissioned by 20 governments and written by over 50 scientists, economists, and policy experts, climate change is already contributing to the deaths of nearly 400,000 people a year and costing the world more than $1.2 trillion, wiping 1.6% annually from global GDP. The impacts are being felt most keenly in developing countries, according to the research, where damage to agricultural production from extreme weather linked to climate change is contributing to deaths from malnutrition, poverty, and their associated diseases: "*THE MAIN FINDING OF THIS REPORT IS THAT CLIMATE CHANGE HAS ALREADY HELD BACK GLOBAL DEVELOPMENT: IT IS ALREADY A SIGNIFICANT COST TO THE WORLD ECONOMY, WHILE INACTION ON CLIMATE CHANGE CAN BE CONSIDERED A LEADING GLOBAL CAUSE OF DEATH,"* ("Climate Vulnerability Monitor: A Guide to the Cold Calculus of A Hot Planet," DARA group, and the Climate Vulnerable Forum, Sept. 26, 2012, emphasis in original).

USDA determined that Climate change negatively affects all agriculture:

> *"Increases of atmospheric carbon dioxide (CO_2), rising temperatures, and altered precipitation patterns will affect agricultural productivity. Increases in temperature coupled with more variable precipitation will reduce productivity of crops, and these effects will outweigh the benefits of increasing carbon dioxide. Effects will vary among annual and perennial crops, and regions of the United States; however, all production systems will be affected to some degree by climate change. … Climate change poses unprecedented challenges to U.S. agriculture because of the sensitivity of agricultural productivity and costs to changing climate conditions. … The expected increases in frequency, duration, and intensity of weather events driven by changing climate present novel and unprecedented challenges to the sustainability of U.S. agriculture. … The most common projections for pest insects, pathogens, and viral diseases are expanded or shifted ranges with increasing temperature. … The direct and indirect effects of climate change on agriculture will challenge the Nation's ability to attain the four goals of agriculture sustainability as described by a National Academies of Science report (2010):*
>
> • *Satisfy human food, feed, and fiber needs, and contribute to biofuel needs;*
> • *Enhance environmental quality and the resources base;*
> • *Sustain economic viability of agriculture; and*
> • *Enhance the quality of life for farmers, farm workers, and society as a whole."* ("Climate Change and Agriculture in the United States: Effects and Adaptation," USDA Feb. 4, 2013, at 1, 2, 139, 141, 146 emphasis in original).

The Food & Agriculture Organization (FAO) of the UN concluded *"[t]here is a long causal link starting with economic activity, and moving to greenhouse gas emissions, concentrations of greenhouse gases, radiative forcing, climate change, market and non-market impacts, and finally to economic damages … . agriculture is affected by climate change and so is an important part of impacts"* ("Two Essays on Climate Change and Agriculture, at 1, FAO 2000). *"[S]cientific assessments point to climate change as a growing threat to agricultural yields and food security. Recent droughts and floods in the Horn of Africa, Russia, Pakistan, and Australia affected food production and prices"* {"What Next for Agriculture After Durban," J.R. Beddington et al., Science, at 289, Jan. 19, 2012).

Fisheries. The oceans have adsorbed substantial amounts of carbon dioxide (CO_2) due to increased atmospheric CO_2 concentrations. Numerous reports show that the ocean's ability to assimilate this added CO_2 is substantially declining, but also rising ocean CO_2 concentrations increase ocean acidity increasing stress on marine ecology including fisheries. This is a systemic risk to fisheries. Emissions of carbon over the last two centuries have raised the acidity of the oceans to the highest levels in 21,000 years and likely beyond, according to a new study in *Nature Climate Change*. As oceans become more acidic, with a lower pH, marine organisms are

stressed and entire ecosystems are affected. The acidic environment is pushing coral reefs, shellfish, and many marine species beyond their natural survival limits. ("Detecting regional anthropogenic trends in ocean acidification against natural variability," G. E. Hofmann et al., Nature Climate Change, Jan 22, 2012).

The increasing acidity of the world's oceans is a growing threat to marine species, negatively affecting the marine environments, and definitive proof of the adverse effects of CO2 from climate pollution adsorbed by the ocean. ("Oceans reveal further impacts of climate change," J. McClintock, University of Alabama at Birmingham, *ScienceDaily*. Feb. 5, 2010). Fish catch is decreased as a result of climate change and the associated physical and chemical changes in the ocean decreasing oxygen in some oceans, and increasing ocean acidification. ("Ocean acidification turns projected climate change winners into losers," University of British Columbia, *ScienceDaily* Feb. 21, 2012).

Forestry. Numerous reports have been made about increasing systemic damages to forests from climate change including more intense forest fires, species depletion, and increased pestilence. Allianz identifies increased damages in the forestry sector from a variety of climate change induced effects:

> *"[s]ince 1980, the average area burned in a year has doubled compared to the annual average for years 1920 –1980. The forest area burned in the period 1987–2003 is nearly seven times greater than that burned in the period 1970 –1986. These increases can be attributed to a number of factors. Droughts in many fire-prone areas of the American West and Southwest have been increasing in the last few decades of the 20th century (see Figure 9), and local climatic changes leading to warmer, drier weather have, in turn, lead to drier fuel, easier ignition, and faster growth of fires. Earlier snowmelt has been linked to longer growing seasons, as well as greater soil dryness, increasing the amount and dryness of the fuel available. Higher summer temperatures increase this effect. In Northern Rockies forests, wildfire increases are strongly associated with increases in spring and summer heat along with an earlier spring snowmelt. Fires in the southwestern U.S. are responsible for increased flooding, erosion and sedimentation. … Forests in areas where the weather is turning warmer and drier are more likely to burn, such is the case in western coastal and inland mountainous areas as well as Alaska. Compounding the issue, climate change may affect the rates of both the spread and intensity of fires, factors that make containment difficult. … Climate change promotes fire-favorable temperature conditions, as well as positively influencing the availability of flammable vegetation. … In addition to property, insurers sometimes underwrite the costs of fire-fighting or lost timber."* ("Climate Change and Insurance: An Agenda for Action in the United States," at 17-20 Allianz 2006).

A recent NASA report using over a decade of satellite microwave radar data, concludes that increasingly severe climate induced by climate change is jeopardizing the Amazon forest due to large-scale degradation. ("Study Finds Severe Climate Jeopardizing Amazon Forest," NASA Jet Propulsion Lab, Jan. 17, 2013).

According to the US Geological Survey, forest types globally are undergoing adverse impacts from climate change ranging from increased forest fire hazards and tree mortality to detrimental beetle outbreaks and alterations to leaf abundance and bloom. ("Many Forests Feeling the Heat from Climate Change," USGS, Mar. 21, 2012).

In June 4, 2013 testimony to Congress, Thomas Tidwell, US Forest Service Chief stated that climate change has caused hotter, drier conditions making the fire season two months longer than 40 years ago, burning twice as much land as in earlier years. Tidwell said *"Hotter, drier, and longer fire season, and lot more homes that we have to deal with. We are going to continue to have large wildfires. … This is a product of having a longer fire season, and having hotter, drier conditions so that the fuels dry out faster. So when we get a start that escapes initial attack, these fires become explosive in that they become so large so fast that it really limits our ability to do anything."* Tidwell added that climate change is the key driver of the bigger more explosive fires. ("Climate change causing US wildfire season to last longer, Congress told," testimony to Senate Committee on Energy and Natural Resources, The Guardian, June 4,

2013). Many tree species such as seratenous ones requiring fire to regenerate including Ponderosa Pine, have greater difficulty doing so because these hotter fires intensified by climate change burn the entire soil profile down to bedrock in many instances.

Just as with climate induced ocean acidification and substantially decreased ocean CO2 adsorption, as part of systemic damages to forests from climate change, declining forest cover is on pace in the near term to switch forests from a CO2 sink ameliorating dangerous climate change, to a net generator of climate pollution as concluded by 35 of the world's top forestry experts ("Damage To Forests From Climate Change Could Cost The Planet Its Major Keeper Of Greenhouse Gases, Study Warns," ScienceDaily, Apr. 21, 2009).

The Built Environment is experiencing systemic damages and costs as a result of climate change (New York State Climate Risk Notice to Infrastructure Bond Investors As a Result of $40B in Damages From Sandy, Bloomberg, Mar. 26, 2013). Increased damages to the built environment from climate change documented in Australia are happening globally:

> *Extreme events adversely affect Australians through significant impacts on health, property, infrastructure and ecosystems. Extreme events take lives, cause injuries and can lead to psychological trauma and longer-term stress. Their economic costs can often be very high. For example, the cost of the 2009 Black Saturday bushfires to Victoria was estimated to be about $4.4 billion (PoV, 2010). Floods also cause significant economic damages, with the Queensland floods of 2010/2011 costing in excess of $5 billion (QFCI, 2012). The Sydney hailstorm of 14 April 1999 was Australia's most costly storm in terms of insured losses, which totaled $4.3 billion (normalised to 2011) (Insurance Council of Australia, 2013; Crompton, 2011; Crompton and McAneney, 2008)"* (The Critical Decade- Extreme Weather at 8, Australia Climate Commission 2013).

Allianz documents systemic climate change damages to infrastructure that also increases insurance damages: *"There are also expensive devastation of urban infrastructure such as roads, communications, and other, often uninsured, but exacerbating insured losses as well. Furthermore, some of the effects associated with wildfires, such as landslides, flooding, and water quality loss, can lead to further loss for the insurance industry"* ("Climate Change and Insurance: An Agenda for Action in the United States," at 20 Allianz 2006). Hurricanes intensified by climate as stated and cited by Allianz and leading climate scientists, e.g., Kerry Emanuel, MIT, greatly contribute to systemic damages to the built environment.

Swiss Re reports that intensified droughts from climate change have increased property damages: *"Property damage from drought induced soil subsidence has risen dramatically across Europe. In France alone, subsidence-related losses have increased by more than 50% within two decades, costing affected regions an average of EUR 340 million per year,"* ("The Hidden Risks of Climate Change: An Increase in Property Damage From Soil Subsidence in Europe," at 2, Swiss Re 2011).

All Aspects of Society. Although frequently rejected likely due in part to bias, UK's *Stern Review* estimated that dangerous climate change could eliminate 20% of GDP. Nick Stern said dangerous climate change is world's greatest market failure and the pace of damages is far, far worse than projected in the *Stern Review* (Wall Street due diligence released at NYSE & Guardian Interview Jan 2013). The Bush II White House Report said uncontrolled climate change (irreversibility) will have overwhelming adverse damages on all aspects of society (Wall Street due diligence released at NYSE- ("Scientific Assessment of the Effects of Global Change on the US", White House Science & Technology Council, May 2008).

Need to Overcome Substantial Bias Including Economic, Preventing Accurate Recognition of the Unacceptable Risk & Needed Climate Pollution Reductions.

Reinsurers recognize this bias preventing action and understanding, including disbelief in reinsurer public announcements of the climate change threat and $40B in 2011 climate change damages with rising levels ("Reinsurance Reserving and the Insurance Cycle," Swiss Re, 2011, and personal conversation with leading reinsurance Chief Risk Officer and leading insurer product manager, Sept. 16, 2012). One key area of bias is present bias or the psychological tendency to be more responsive to immediate consequences than delayed ones because *"buying into safe assumptions is easier than delivering bad news, even if bad news now is more helpful in the long run"* (Reinsurance Reserving and the Insurance Cycle at 17-18, Swiss Re 2011).

Effects of clean energy as a disruptive technology to the status quo is another substantial factor preventing greater understanding of and action on the unacceptable risk. Climate change mitigation is the largest disruptive technology in history causing and fueling bias. For example, the Electric Power Research Institute, the research arm of utilities, states that the solar industry could destroy utilities causing: *"irreparable damages to revenues and growth prospects"* (Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business at 3 Jan. 2013). Solar is just one disruptive green building technology. This bias from the substantial economic threat to industries that need to change to substantially reduce climate pollution, is likely evident in the conservatism of IPCC and scientific community since the pace of dangerous climate change has historically exceeded the state of scientific consensus. ("Creating an Economic Stimulus & Stopping Climate Credit Risk / Irreversibility," peer-reviewed Wall Street due diligence released at the NYSE 2009). Quantifying uncertainty has been very challenging and systemic global changes and damages from dangerous climate change are exceedingly complex and may even be operating on chaos theory.

Fueling this bias preventing objective and informed assessment of the risk and needed actions to reduce climate pollution, is the highly publicized and very well funded disinformation program by technologies threatened by disruptive clean energy needed to reduce climate pollution. This is an attempt to convince the public that dangerous climate change is not real or not an unacceptable risk.

Easily attainable profitable market shifts that will result from an accelerated green building secondary market, create a safe environment for action overcoming bias and enormous and powerful global forces of change. The federal government has not been able to act comprehensively or quickly enough, but will likely be able to do so with an accelerated green building secondary because it will want to be perceived as a leader, and because the influence of bias will be greatly diminished.

To counter bias, focus should be on substantial risk of inaction and relative ease of effective actions to accelerate the green building secondary market. Since the business case for this market is well defined and the needed standards are in place to measure added value, there are no impediments to effective action other than making capital markets' leaders aware of these facts.

The Safe Level for Climate Pollution is 350 ppm CO2. We Are Currently at a Dangerous Level of 400 ppm and rising

rapidly (*Scientific American 2013* & peer-reviewed Wall Street due diligence released at the NYSE: *Creating an Economic Stimulus & Stopping Climate Credit Risk / Irreversibility* citing Jim Hansen, NASA, statement at Dec. 2007 American Geophysical Union Meeting in San Francisco: *"The evidence indicates we've aimed too high – that the safe upper limit for atmospheric CO2 is 350 ppm."* "The Economics of 350: The Benefits and Costs of Climate Stabilization," Ackerman et al., Economics for Environmental & Equity Network, Ecotrust, Oct. 2009).

There Are Many Well-Documented Accelerating Tipping Points For Irreversible Dangerous Climate Change by world's leading scientists as part of peer-reviewed Wall Street due diligence released at NYSE including[1]:

a. Melting ice caps causing rising sea level
b. Rapidly accelerating ocean methane hydrates sublimation, and release from organic matter beneath melting permafrost. (*Storms of our Grandchildren, Hansen,* p 236, 258, 274, 276. Hansen was recognized by the President of the National Academy of Sciences and one of the top several climate scientists). Arctic Ocean methane plumes have grown from meters in diameter to kilometers.
c. Ocean acidification (*Id.)*
d. Cessation of ocean adsorption of CO2 (*Id.)*
e. Deforestation

The insurance industry has reported on this scientific consensus with Allianz emphasizing: *"Scientific consensus shows that sea level rise is directly attributable to global warming, which raises the temperature of the oceans, causing expansion of their volume. In addition, global warming causes melting of the polar ice-caps, which also contributes, potentially catastrophically, to the sea level rise"* ("Climate Change and Insurance: An Agenda for Action in the United States," at 14 Allianz 2006).

The Basis for Irreversibility of Tipping Points and Calculated Needed Climate Pollution Reductions Are Well Defined. Peer-reviewed Wall Street due diligence released at NYSE in 2009 calculated by State of California, IPCC Scientists, NASA & Harvard: 6 gigatons must be reduced by 2017 / 4 million green buildings. Updated data from NASA and other leading scientists due to pollution growth now means 18 gigatons must be reduced / 12 million green buildings ("Scientific Case for Avoiding Dangerous Climate Change to Protect Young People and Nature," Hansen et al. 2012).

Human and species extinction risk is unreasonable with business as usual "*threaten[ing] not only the millions of species on the planet but also the survival of humanity itself---and the timetable is shorter than we thought (p. ix). ...[T]oday's climate is not terribly far from the runaway situation (p. 233) ... If the world does not make a dramatic shift in energy policies over the next few years, we may well pass the point of no return" (Storms of Our Grandchildren, Hansen, p.171)*.

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[1] *Creating an Economic Stimulus & Stopping Climate Credit Risk / Irreversibility* part of Wall Street due diligence released at the NYSE documenting the added value and reduced risk of green buildings and certified sustainable products: the world is subject to serious and / or irreversible impacts to: food supply, infrastructure, health, water resources, coastal systems including rising sea level, ecosystems with high confidence of extinction of many species and reduction in ecosystem diversity, global biogeochemical cycles with increasing ocean acidity adversely impacting organisms including corals, ice sheets with partial or near-total irreversible deglaciation of Greenland and West Antarctica, modes of oceanic and atmospheric circulation, migration, conflict, aggregate market impacts and distribution.

In Connecticut v. AEP (at 8, No. 05-0514, 2d Cir. Sept. 21. 2009, rehearing denied May 2010) (ruling for the States against the utilities for climate damages) (reversed No. 10-174, U.S. S. Ct (June 20, 2011):

> *"the States caution that the earth's climate 'can undergo an abrupt and dramatic change when a radiative forcing agent causes the Earth's climate to reach a tipping point. Carbon dioxide emissions constitute such a radiative forcing agent due to its heat-trapping effects, and therefore, as stated by the National Academy of Sciences,*
>
> > *'the unrestrained and ever-increasing emissions of greenhouse gases from fossil fuel combustion increases the risk of an abrupt and catastrophic change in the Earth's climate when a certain, unknown, tipping point of radiative forcing is reached. An abrupt change in the Earth's climate can transpire in a period as short as ten years. Defendants' emission of millions of tons of carbon dioxide each year contribute to this risk of an abrupt change in climate due to global warming.'*
>
> *As a result, the States predict that these changes will have substantial adverse impacts on their environments, residents, and property, and that it will cost billions of dollars to respond to these problems."*

Similarly, leading climate scientists concluded that *"current emissions of anthropogenic greenhouse gases (GHGs) have already committed the planet to an increase in average surface temperature by the end of the century that may be above the critical threshold for tipping elements of the climate system into abrupt change with potentially irreversible and unmanageable consequences. ... Scientific and policy literature refers to the need for early, urgent, rapid, and fast action mitigation to help avoid ... abrupt climate changes"* (Reducing Abrupt Climate Change Risk at 1, Proced. National Academy of Sciences, Aug. 31, 2009, Molina et al.)

Along these same lines of thinking from actual data and not models, *"we find that global CO2 emissions reduction of about 6%/year is needed, along with massive reforestation,"* in order to avoid catastrophic irreversible tipping points from dangerous climate change (*Scientific Case for Avoiding Dangerous Climate Change to Protect Young People and Nature,* Hansen et al, 2012).

Expected Manifestation and Effects of Financial Climate Change Contagion. The Encyclopedia World Economy states:

> *"in an influential analysis, the economist Paul Masson (1999) defined contagion as a consequence of sudden shifts in market expectations and investors' confidence. Such shifts are particularly relevant in the context of second-generation crisis models in which a country's fundamentals can be in an intermediate vulnerable zone between good and bad. In such situations, a crisis in one country can directly affect expectations of the situation in other countries, and hence move an economy from a good equilibrium to a bad one and end in a crisis."*
>
> *"Contagion is more frequent during crisis periods than non crisis periods, however, and is an important explanation of emerging market crises of the late 20th and early 21st centuries. Crisis contagion beyond what can be explained by fundamental links is often called 'pure contagion.' 'Unjustified' contagion refers to pure contagion resulting from panic and other forms of irrationalities and market imperfections. No commonly accepted name has yet been given to rational pure contagion that is transmitted through financial channels such as portfolio rebalancing. A country can be an 'innocent victim' of fundamental-based contagion or of pure contagion. For example, the contagion effect from Argentina to its small neighbor Uruguay in 2001 was due primarily to economic interdependence, while the spread of the Asian crisis has often been attributed to panic contagion. The degree of a country's innocence and the degree to which contagion is unjustified by fundamentals are often matters of considerable dispute."*
>
> *"Financial market imperfections, such as asymmetric information, a situation in which one party has more information than another, and ill-designed incentive structures for fund managers, can also contribute to the spread of a crisis from one market to another. When a market is less transparent*

and information is not readily available, investors are more likely to herd. When investors are relatively uninformed they may assume that if someone else takes an action, it is because that person has better information. Such behavior would increase the size of market swings."

Federal Reserve policy is to identify and contain contagion although none of the containment measures are applicable to systemic and irreversible climate change damages and resulting contagion (Identifying and Mitigating Contagion, prepared for Federal Reserve Jackson Hole Symposium, Aug. 31, 2012 by Kristin Forbes, MIT Sloan).

Most recent effects of contagion occurred during the credit crisis in particular when Lehman Brothers failed, and during the recent EU sovereign debt crisis. Global economic policy operates to warn of and obviate contagion and this was a standard operating procedure of the Federal Reserve during the credit crisis (See "Bernanke Reassures Markets That Subprime Contagion Contained," *In the Money, May 17, 2007)*. Federal Reserve Board Chairman Bernanke identified the near failure of Bear Sterns and failure of Lehman Brothers during the credit crises and the role of contagion from panic due to failure of investor confidence: *"As we saw last fall, when a vicious funding spiral of this sort is at work, falling asset prices and the collapse of lender confidence may create financial contagion, even between firms without significant counterparty relationships. In such an environment, the line between insolvency and illiquidity may be quite blurry," (Bernanke speech* At the Federal Reserve Bank of Kansas City's Annual Economic Symposium, Jackson Hole, Wyoming, Aug. 21, 2009).

Climate change has been implicated in increasing the threat of contagion by disease, which is not a subject covered herein, although it is one of many adverse impacts of dangerous climate change affecting all aspects of society as noted previously by the UK's *Stern Review*, and Bush II White House ("Scientific Assessment of the Effects of Global Change on the US", White House Science & Technology Council, May 2008).

As described below by Knudsen at JPMorgan, climate change can operate based on contagion greatly accelerating through recognized tipping points, identified as "Black Swan" events that are seemingly improbable, but in actuality have a strong likelihood of near term occurrence. More importantly, Black Swan events like irreversible dangerous climate change, can only be fully understood retrospectively when it is too late, and not prospectively.

Climate change has also been identified as an expected cause of financial contagion covered by the United Kingdom and Knudsen (JPMorgan) as follows.

The likelihood of financial climate change contagion from climate change has increased with the consensus by leading climate scientists as covered in the preceding pages, that the likelihood of irreversible dangerous climate change tipping points has increased to near term events. Corroborating this scientific consensus is the likely near term occurrence of these irreversible tipping points as Black Swan events.

The UK's *Stern Review* covered climate change contagion:

"Extreme weather events (storms, floods, droughts, and heat waves) are likely to intensify in many cases. The risks of large-scale and abrupt impacts will increase significantly, such as melting/collapse of ice sheets or shutdown of the thermohaline circulation (Gulf Stream). Large Scale shocks and financial contagion originating from poorer countries who are more vulnerable to climate change (Chapter 4) will also pose growing risks for rich countries, with increasing pressures for large-scale migration and political instability" at 139.

"As the impacts become increasingly damaging at higher temperatures, the effects on the developing world may have knock-on consequences for developed economies, through disruption to global trade and security (Box 5.7), population movement and financial contagion" at 155.

As noted previously, Nick Stern who led the UK's *Stern Review* stated recently that climate change has gotten much, much worse than when the UK published the Stern Review in 2007, thus likely affecting the timing of the Stern Review's projections of climate change impacts to more near term.

Knudsen at JPMorgan (2010) published an important article as quoted below, that not only concurs with the leading climate scientists on the near term likelihood of irreversible dangerous climate tipping points based on probability analysis as Black Swan events, but also on the possibility of financial climate change contagion ("Turning Black Swans Green: The Vittorio Santaniello Memorial Lecture," OK Knudsen, J.P. Morgan, *AgBioForum* (13(2) 2010).

> *"In a world economy so interlinked and with uncertainty and new risks increasing over time, history becomes a poor predictor of the future. In addition, contagion which can be transmitted through interlinked global markets becomes more likely, resulting in severe events once thought to be rare. But with the threat of such severe events also comes opportunity—specifically the opportunity to dramatically transform economies and how risk is managed, accelerate the development of clean energy technologies, and build paths to low-carbon growth"* at 105.
>
> *"A Black Swan event is a seemingly improbable but highly consequential and far-reaching event. The misjudgment of the likelihood of the event can come from a psychological blindness to the actual probability of the event. Nassim Nicholas Taleb, who made popular the term, elaborates:*
>
> > *'What we call here a Black Swan is an event with the following three attributes. First, it is an outlier, as it lies outside the realm of regular expectations, because nothing in the past can convincingly point to its possibility. Second, it carries an extreme impact. Third, in spite of its outlier status, human nature makes us concoct explanations for its occurrence after the fact, making it explainable and predictable. I stop and summarize the triplet: rarity, extreme impact and retrospective (though not prospective) predictability. A small number of Black Swans explain almost everything in our world, from the success of ideas and religions, to the dynamics of historical events, to elements of our own personal lives' (2007, pp. xxi-xxii)* at 105-106.
>
> *"In this article, I extend the definition of a Black Swan event such that the actual event may have a very low probability of occurring with any one participant but because of the number of participants and contagion, it actually has a higher probability of leading to a severe outcome"* at 106.
>
> *"If this potential for contagion is not assessed accurately, then the probability of … the failure of any one investment bank could be unlikely but because of interlinkages the low probability event could have severe consequences. With many such participants facing low probabilities, the aggregate probability of a severe event could be high, as contagion spreads the effects from one institution to another. I label this as a Type II Black Swan event—a mistaken assessment of the actual probability due to contagion of many low probability events leading to a severe outcome"* at 106.
>
> ***"The Current Black Swan Event: The Financial Crisis"*** *…*
>
> *"It was not that banks were not assessing risks, as sophisticated models had been developed throughout the banking system to adjust portfolios and balance risk with reward. But these were well behaved models, not geared to take into account contagion between banks driven by illiquid markets." …* at 106.
>
> *Although the probability of any one institution failing was small, the number of institutions with potential contagion effects taking leverage positions lead to an aggregate probability significantly higher, with potential to trigger through contagion a Black Swan event in the global financial system"* at 107.

"The Opportunity: The Renewed Quest for Energy Security" … at 107.

"Black Swan events are considered not as the distant outlier that can be disregarded for all practical purposes but as a real threat and likely in the near future" at 107.

"Global Warning: The Climate Crisis" … at 108.

"As already indicated by the probabilistic nature of the simulation results, the probabilistic distribution of temperature changes also have fat tails. As the planet warms, positive feedback loops are likely. For example,

- *as the frozen tundra melts, it will emit more methane (a greenhouse gas), which is more than 20 times as toxic as CO2;*
- *as atmospheric temperatures rise, warmer oceans absorb less carbon; and*
- *as snow cover is reduced, less radiation is reflected.*

"With such feedbacks operating, a nicely stable lognormal distribution of temperature change is unrealistic. The likelihood is that as some yet unknown level of CO2 is approached, positive feedback (or contagion) between events could be reached. Many climate-related events, perhaps in themselves relatively insignificant in emissions, in aggregate will accelerate the accumulation of the amount of carbon in the atmosphere; these then result in subsequent rounds of rising temperatures. Such "contagion" of the consequences of temperature rises would be the fat tail of much more extreme temperature changes. At what threshold of carbon accumulation when such feedback would be reached can only be simulated very imperfectly" at 108.

"*A few of these* [climate pollution reduction] *measures standing alone may be feasible or halfway achievable, but most in aggregate are formidable challenges even over 40 years. Note that the longer the delay in doing any of these measures (which is likely), the more will need to be done later, as the atmosphere will be further accumulating stocks of carbon dioxide. The target cannot be reached just at the end of the 2040s or 2050s—emission reductions must be a process taking place continuously and beginning as soon as possible. Delay just makes the problem larger and the costs higher. And the contagion created by global warming creates the prospect for more global warming through positive feedback loops and with it even more extreme weather events. What was a once in a (say) hundred year event could become an event of much greater frequency, such as once every few years. The direct and indirect costs of such extreme weather events could be enormous—well above the costs of vigorously mitigating carbon emissions"* at 109.

"The recognition coming from the financial crisis that Black Swan events are not rare and that the seemingly improbable is indeed much more probable has been penetrating energy and climate policy" at 110.

"The question remains as to whether it will take more Black Swan events to further accelerate investment, or even more dire, whether we will reach the day when the necessity of investment in adaptation overwhelms that for mitigation" at 111.

Reclifts et al. note the likelihood of financial climate contagion:

"Where market mechanisms are relied upon for the distribution of basic needs, access is susceptible to price fluctuations caused by external events including natural disasters, but also wider events in the global political economy. Globalized cities are also vulnerable because of their openness to contagion effects through exposure to global markets" ("Climate Change & Human Security" Reclifte et al. 2011 at 30).

Financial contagion from fear of irreversible dangerous climate change is likely because of:

- Growing awareness of systemic climate change damages in many sectors
- Growing awareness of systemic climate change damages in insurance and large-scale exclusion of coverage. The market requires insurance to function properly.

- Well-recognized inability of government to effectively act to reduce needed near term global climate pollution reductions to stop unacceptable risks
- Extreme difficulty of recovery from climate change financial contagion due to the massive amount of climate pollution reductions needed according to the world's leading climate scientists (*Scientific Case for Avoiding Dangerous Climate Change to Protect Young People and Nature,* Hansen et al, 2012).
- Manifestation of irreversible dangerous climate change tipping points from likely near term Black Swan events, means that climate change financial contagion would be permanent.

The possible adverse effects of climate change financial contagion on capital markets and commerce are real just as contagion exists during credit crises from loss of investor confidence, panic selling in order to avoid losses, and substantial economic interconnectivity among financial institutions. To the extent that there is awareness that systemic climate change damages are not being ameliorated in key market sectors and global climate pollution continues to not be sufficiently decreased, investor confidence can be lost. Since systemic climate change damages are also affecting government, government's ability to stabilize these damages and climate contagion can become impeded.

Investors especially institutional investors, are keenly aware of climate change risks and have been pursuing shareholder resolution on climate change and calling for clean energy investments and substantial near term climate pollution reductions. In an open letter, a coalition of the world's largest investors responsible for managing $22.5 trillion in assets, said rapidly growing climate pollution and more extreme weather were increasing investment risks globally, and clean-energy investment should be boosted or we risk trillions of dollars in investments and disruption to economies ("Global Investors Call for Action on Serious Climate Danger," *Insurance Journal,* Nov. 20, 2012).

There is uncertainty of when climate contagion will manifest without substantial near term climate pollution reductions, but the economic and social risk of likely damages is unacceptable. Expected triggers of climate change financial contagion include the next or subsequent large-scale extreme event intensified by climate change like severe hurricanes or droughts.

Categories of Responses / Solutions to Climate Change Credit Risk Including Financial Contagion. What Would it Take to Counter or Neutralize the Problem?

Measurable and publicized climate pollution reductions stopping pollution growth are needed since this is the only means of reducing rising systemic climate change damages, and thus stopping climate change credit risk including financial contagion.

National and global government efforts to reduce climate pollution have so far been insufficient with global climate pollution growth continuing. Thus other means need to be addressed to make progress, overcome bias, and facilitate a change in the political will of government to sufficiently act. *"Globally emissions are continuing to rise strongly, posing serious risks for our society"* (The Critical Decade- Global Action at 6, Australia Climate Commission 2013), ("World Carbon Emissions Rise to Record Levels in 2012"—International Energy Agency SustainableBusiness.com News, June 10, 2013).

There is a scientific and economic consensus that fast action climate pollution reductions are needed (*U.S. Scientists and Economists' Call for Swift and Deep Cuts in Greenhouse Gas Emissions* 2010; *Scientific Case for Avoiding Dangerous Climate Change to Protect Young People and Nature,* Hansen et al, 2012).

Non government market solutions gaining sufficient traction e.g., additional green building secondary market financing which include substantial capital expenditures on pollution reduction technologies due to a positive business case, can provide the needed leadership and political will for the federal government to act more aggressively.

Reducing short-lived climate pollutants is important by focusing on needed government action where there is the political will, and market based approaches that can quickly deploy needed capital for climate pollution reductions. A well informed scientific basis and framework for needed near term large scale climate pollution reductions is set forth in: (*Scientific Case for Avoiding Dangerous Climate Change to Protect Young People and Nature,* Hansen et al, 2012;)

Stimulating the Economy & Stopping Climate Change Credit Risk Including Contagion.

Accelerating the global green building secondary market can tap into the substantial funds of investors wanting to invest in green technologies. It was stated at the national green building financing launch at TIAA-CREF in NYC, a $600B investor, that investors with over $70 trillion in assets under management, wish to buy green building bonds (Vickie Tillman presentation, former S&P Global Ratings Head, CMP Vice Chair Sept. 18, 2012). This confirms prior investor surveys by the Capital Markets Partnership at the initiation of S&P and Allianz Global Investor surveys as reported in Wall Street peer-reviewed due diligence released at the NYSE.

The due diligence documented with the State of California, IPCC Scientists and NASA that:

- This secondary financing market is expected to create a $1 trillion / yr. private sector economic stimulus adding 800,000 new jobs & $400B (US) in new wages from commercializing green buildings.
- This secondary financing market is expected to stop Irreversibility since the building industry is world's largest, generates the most climate pollution, and green buildings on average reduce climate pollution by about 40%. Global real estate capital markets can provide the 18 gigaton climate pollution reduction (12 million green buildings) needed in five years. An estimated $2 trillion is needed to retrofit the US building stock.
- The needed business case has been defined: green buildings and certified sustainable products are more profitable, less risky & preferred by investors based on national statistically valid data.
- Unanimously approved consensus underwriting standards and Model Green Appraisal measure green building and sustainable manufacturing increased cash flow, cover about 70% of global economic activity over the supply chain, are the basis for new debt and equity products, and were launched by leading investment banks, investors, insurers and other leading financial institutions. Wall Street requires these consensus standards to reduce risk and uncertainty and measure value and profits. Further, these standards uniquely comply with national green building financing requirements of the Federal Housing Finance Agency, Office of the Comptroller of the Currency, Federal Trade Commission, and Attorney Generals.
- Underwriting green building attributes that increase cash flow the most also reduce climate pollution: efficiency, onsite renewable power, proximity to transit, commissioning, climate neutral operations.

Accelerating the global green building secondary market is expected to:

- Shift the market significantly by large scale investment in profitable green building and energy technologies
- Overcome the ideological gridlock and bias that currently prevent policy makers from effectively dealing with the unprecedented and unacceptable risks of climate change
- Stimulate additional government action reducing climate pollution

Conclusion. Key capital markets leaders should be briefed on this expected unacceptable near term contagion threat and viable solutions so that fast and comprehensive action can be taken.

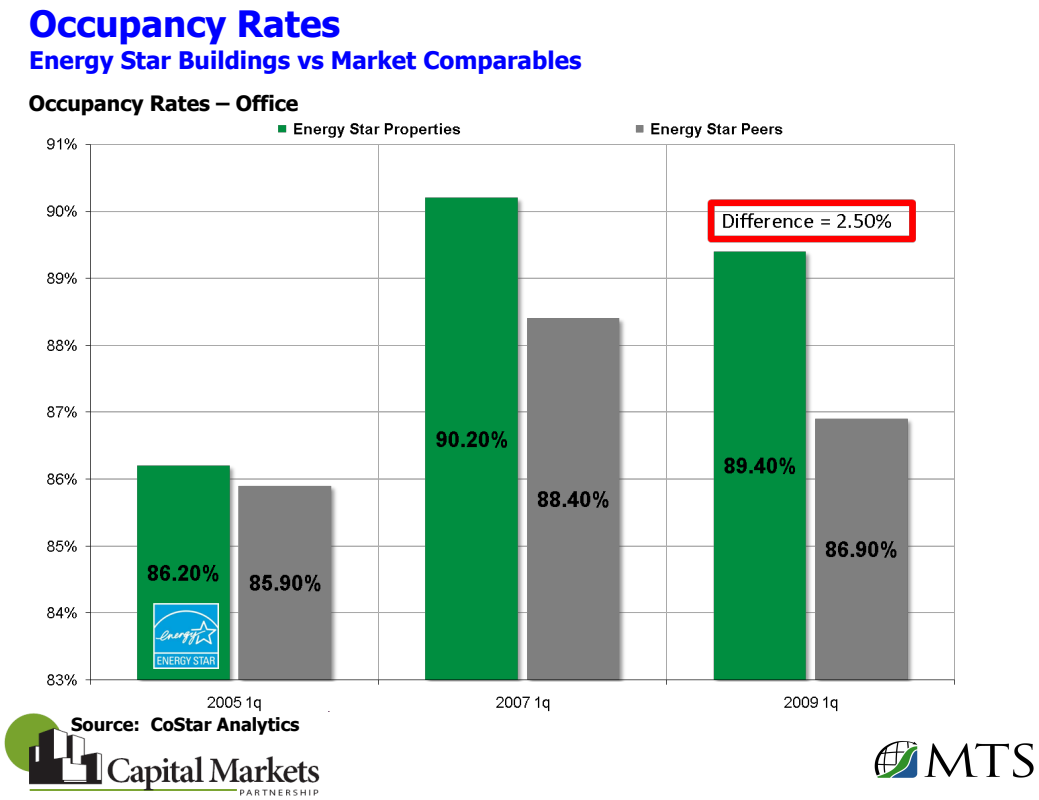
Since the green building secondary market has been recently launched, the business case is well defined, consensus and market tested underwriting standards are in place to measure increased cash flow, there are no bona fide impediments to accelerating the market and achieving the needed near term climate pollution reductions and financial stimulus.

Time is of the essence to act.

Appendix

Green Buildings Have Top of the Market Rents, Occupancy & Value

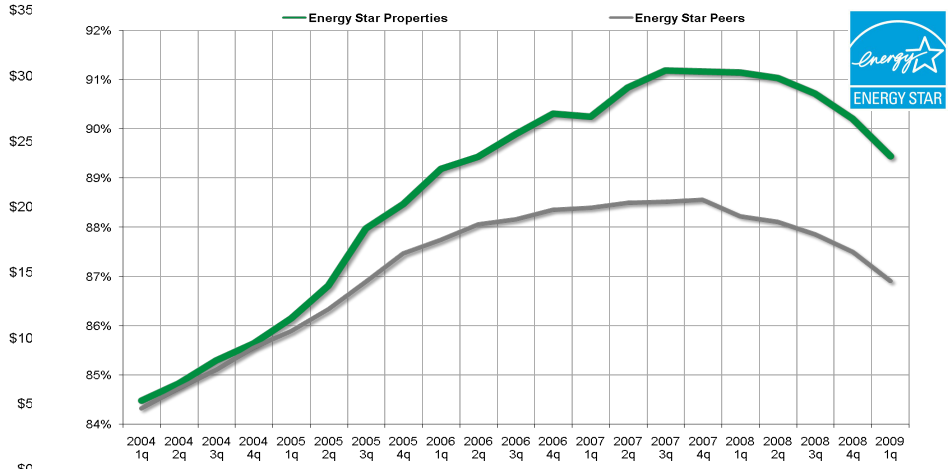
National statistically valid data contained in Wall Street due diligence released at NYSE documented that green buildings have top of the market rents, occupancy, and value.



Down Market – Flight to Quality

Energy Star Buildings vs Market Comparables

Occupancy Rates – Office



Source: CoStar Analytics

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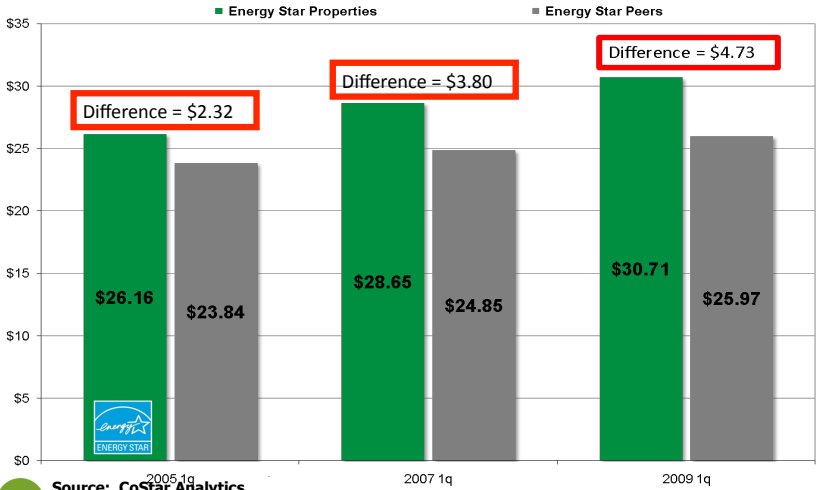
Rental Rates

Energy Star vs. Market Comparables

Direct Rental Rates – Office



Source: CoStar Analytics

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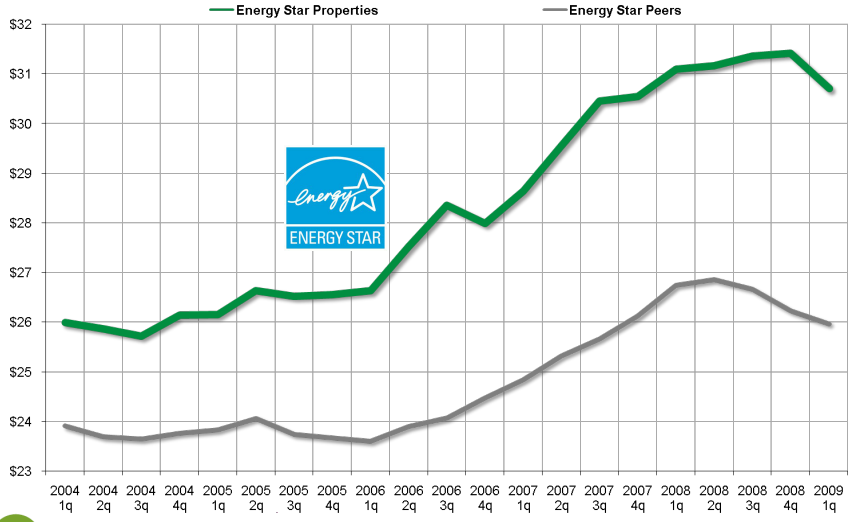
Rental Rate Separation

Doubled in Two Years From $2.30 to $4.60

Direct Rental Rates – Office



Source: CoStar Analytics

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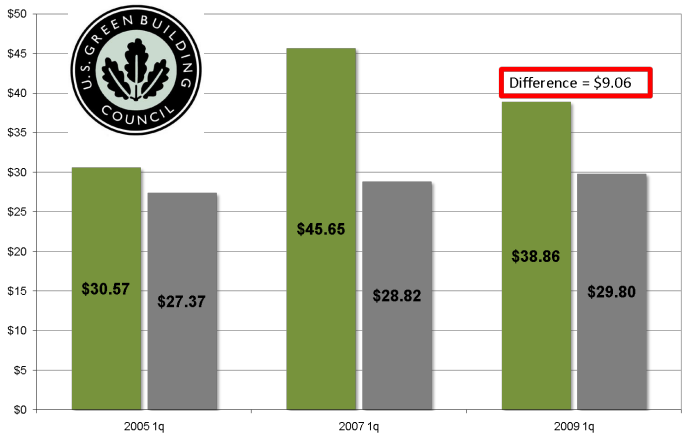
LEED Certified Rental Rates vs Peer Group

Early Returns on Minimal Data Points



Source: CoStar Analytics

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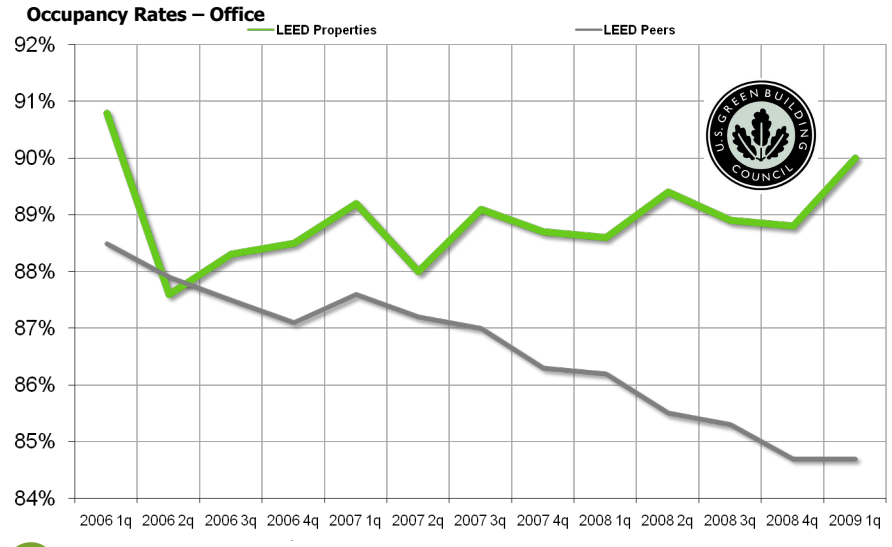
Occupancy Rate Superiority

Significant Outperformance in Down Market



Source: CoStar Analytics

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Academic Studies – Similar Results

Over 3,000 green buildings compared to their peers - statistically validated. In 2012, Notre Dame/PNC study, PNC green branches had over $3M more per branch in deposits, $1M more in annual loan balances, with $675 lower utility costs per employee. Study controlled for newness of branches.

- **CoStar Building Peering Study (2007)**
- **Miller, Spivey, Florance (2008)**
  - **EPA Energy Star Partner of the Year**
  - **American Real Estate Society Best Paper 2008**
- **CoStar Building Peering Study – Update 1 (2008)**
- **Fuerst and McAllister (2008)**
- **Eicholtz, Kok & Quigley (2008)**
- **CoStar Building Peering Study – Update 2 (2009)**
- **Pivo & Fisher (2009)**

Note: CoStar continues to make its data set available to academic researchers for further analysis

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