

# Climate Change Risks and Changing Face of Real Estate

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**Key words:** Climate change, real estate risks, GHG emissions

Climate change has gained increasing focus since stern review. Stern review defined climate change as one of the greatest and widest ranging market failure ever seen. The major source of climate change could be attributed to the green house gas emissions emitted by several carbon-intensive industries. The UN International climate change conference in 2009 stipulated start year for cutting GHG emission as 2013. 80% reduction has been set for developing countries as compared to the country's 1990 levels of emissions. Government policies are being framed to enforce these stipulations. So cost allocations and or pricing of GHG emissions is being proposed to quantify the cost of these emissions.

These carbon-intensive industries are under the eye scanner of the governments as several governments started to allocate a price to the GHG emissions. GHG emissions once priced as per market pricing mechanisms would lead to an increased transparency of costs these carbon-intensive industries would have to bear because of the emission they contribute for a climate change. GHG emissions if not controlled could prove to be risky for the companies. So these policies in addition to technologies used could dictate the real estate market risk.

In this paper an attempt is made to identify, analyze all the risk both long term and short term due to climate change. The scope of this study is confined to the impact of climate change on real estate alone. Distribution of the GHG emissions as GHG emission per unit land gives the policy makers ease to derive the cost allocation procedures to the owners possessing the lands. This paper also emphasizes on the solution driven approach to mitigate the unforeseen risks in real estate market. So an attempt would be made to calibrate the trend in the changing asset allocation and investments in real estate's due to long term impacts or climate change. A risk assessment of each of these scenarios will be made and risk –sharing mechanisms will be proposed. A particular emphasis to raising green buildings approach for real estate to mitigate and reduce GHG emission is presented in this paper.

## 1. SIGNIFICANCE OF CLIMATE CHANGE IN REAL ESTATE

Real estate is a common attraction for institutional investor's portfolio. Inclusion of real estate in portfolio could lead to diversification and risk reduction for the entire portfolio. The reason for this is attributed to the steady growth rates of the real estate pricing in different parts of the globe. Global indices indicate that even during a burst phase of world economy, real estate due to its relatively steady growth rate can lead to steady returns. The effect of climate change on the investment portfolio performance is linked to decreasing operational performance mainly caused due to extreme changes in weather conditions. Extreme weather conditions caused due to climate change are capable of reducing the life span of the buildings. Property owners will become keen to know about the changing occupier needs and the investor's preferences due to the impact of climate change. The risk of not acting towards curbing emissions that accentuate climate change can be costly for the property owners. As national governments, international bodies draw policies to control the phenomenon of climate change; property owners will own the onus of role and reputation for acting responsibly to curb the environmental emissions that lead to climate change.

## 2. REDUCTON REQUIREMENTS : POLICY IMPACT ON PROPERTY INVESTMENTS

Scenario category	Region	2020	2050
A-450 ppm CO <sub>2</sub> -eq <sup>a</sup>	Annex I	-25% to -40%	-80% to -95%
	Non-Annex I	Substantial deviation from baseline in Latin America, Middle East, East Asia and Centrally-Planned Asia	Substantial deviation from baseline in all regions
B-550 ppm CO <sub>2</sub> -eq	Annex I	-10% to -30%	-40% to -90%
	Non-Annex I	Deviation from baseline in Latin America and Middle East, East Asia	Deviation from baseline in most regions, especially in Latin America and Middle East
C-650 ppm CO <sub>2</sub> -eq	Annex I	0% to -25%	-30% to -80%
	Non-Annex I	Baseline	Deviation from baseline in Latin America and Middle East, East Asia

Figure 1 : Regional breakdown and distribution of the actual emission reduction requirements (Source: IPCC 2007b, Fourth Assessment Report: Working Group III, Mitigation of Climate, Box 13.7, p. 776)

“For increases in global average temperature of less than 1 to 3°C, some impacts are projected to produce marked benefits in some places and sectors and impose costs on others” (IPCC 2007a). The policy changes are dependent upon the emission requirements in different regions. The reduction targets are highest for the Annexure I countries under scenario 1 case. Depending on the targets of reduction, the abatement costs will be transferred on to the property owners. “The risks of the worst economic impacts of climate change can be substantially reduced if greenhouse gas levels can be stabilized at 500 ppm CO<sub>2</sub> equivalents with a peak in global emissions in 2010. However, stabilization in this range would require global CO<sub>2</sub> emissions to be reduced by at least 50% below current levels by 2050. Taking into consideration the development needs of emerging economies, this would translate into

emission reduction paths of 80% for industrialized economies by mid-century (for a regional breakdown and distribution of the actual emission reduction requirements, see above Figure 1)” (Stern 2007).

Some of the policy framework followed world over is:

- The Kyoto Protocol which came into force in 2005 and introduced CO<sub>2</sub> emission targets for the most developed economies in the world is the first widely known global policy instrument.
- National or regional CO<sub>2</sub> legislations and policy instruments were introduced such as the EU Emissions Trading System (EU ETS), in place since 2005. The European Union had already enacted in 2002 (with amendments in 2010) the Energy Performance of Buildings Directive requiring the establishment of minimum energy performance levels for new and existing buildings.
- The UK Carbon Reduction Commitment (CRC) is targeting carbon emission reductions of large energy-consuming companies in the UK by introducing a cost for carbon that touches all industry sectors and not only those that have a high carbon intensity and that are already covered by the EU ETS.
- Between 2009–2010, France enacted the Grenelle environmental laws outlines the requirements for existing buildings and new building constructions as :
  - 1) Current and future requirements for existing buildings: (a) The provision of an energy performance certificate showing energy consumption and CO<sub>2</sub> emissions for commercial real estate proposed for lease or sale; (b) the declaration of exposure to natural risks, such as flooding. (c) the addition of an environmental appendix to leases covering building energy consumption details and the potential need for energy performance investments, applicable from 1 January 2012 for new leases and from 14 July 2013 for existing leases; (d) an obligation for energy performance retrofits of all commercial real estate by 2020, starting on 1 January 2012.
  - 2) Future requirements for new building constructions: (a) The objective of not surpassing 50kWh per square meter per year of energy consumption, for new building permits from 1 July 2011; (b) the objective of zero net energy buildings for new constructions from 2020 onwards.

Depending on the nature of a company’s business and its sensitivity to public opinion, climate change policy could also present reputational risks as the issue rises in importance with staff, customers, investors and media organizations, as well as nongovernmental organizations.

Property owners also might face extra costs due to implementation of policy driven rules that control climate change. These policy driven rules encourage the property owners to resort to actions that minimize the emissions unfriendly to environment. These policy changes might bring in a behavioral change in the investor psychology to favor for more environmentally acceptable properties. The continuing introduction of policy instruments

across the global economies will lead to increasing compliance obligations for real estate industry players and stakeholders – representing both financial consequences but also providing potential arbitrage opportunities.

### **3. IMPACT OF CLIMATE CHANGE ON ASSET MANAGEMENT & FINANCIAL SERVICES**

Impact of climate change is considered to have both short term and long term effects. The physical impacts of climate change relevant to Real estate sector are mainly decrease in the durability and performance of the material, pressure on water resources, subsidence due to which delays in construction might become repetitive.

Real estate management being part of “Asset management is confronted with threats related to the unpredictable impact of climate change on global markets as well as the impairment of equity valuations or equity/bond issues due to climate-related effects or mitigation policies. As a consequence, investment strategies will need to incorporate climate change by assessing, for example, forecasts of future carbon prices, and emission footprints of companies, revenue opportunities arising from climate change, and hedging strategies using carbon markets.”

“Investment banking is a potential beneficiary of climate change given the role of primary and secondary capital markets during periods of economic change. Primary markets would benefit from any rapid technological change and associated investments to address the impact of climate change. Secondary markets would profit from new trading markets. If climate change leads to greater market volatility, trading revenues may be impacted. However, if monetary authorities loosen monetary policy to offset economic dislocation, trading revenues are likely to increase. New business opportunities related to the renewable energy market and the global carbon market will emerge and increase in scope. Examples include initial public offerings for companies in the renewable energy sector, exploiting the Kyoto mechanisms, developing weather derivatives, providing emission trading services, and offering financial advice on climate change management” (Furrer and Hoffmann, 2009)

Greenhouse gas emissions analyses have shown that activities concerning building construction and operation, for both residential and commercial properties, are some of the single most significant contributors to greenhouse gas emissions, at comparable levels to the transport and industrial manufacturing sectors. As a consequence, regulatory instruments and market-based solutions are increasingly and specifically targeting built assets.

### **4. MANAGING RISKS**

In the context of identifying the risks of climate change it is relevant to understand the four fallacies of extrapolation. The four fallacies of extrapolation (Yu Chen et al, 2011)

- (a) The Fallacy of Replication: “Properties that currently experience floods are of type x and not type y. Therefore, properties that experience floods in the future will also be of type x, and not type y.”
- (b) The Fallacy of Composition: “Significant financial safety nets are viable if a single area is flooded. Therefore, significant financial safety nets will be viable if all areas are flooded.” With respect to climate change, there are two important fallacies of composition worth highlighting, those with respect to (i) insurance markets, and (ii) state bailouts
- (c) The Fallacy of Linear Scaling: “The impact of a flood of severity is of magnitude z. Therefore, the impact of a flood twice the severity of y, will be twice the magnitude of z.” Labour market effect, Social network effect, Psychological and informational effect
- (d) The Fallacy of Isolated Impacts: “The price of house A is reduced because it is flooded. House B is not flooded and, therefore, its price will not be reduced, irrespective of its proximity to A.”

The extrapolation gains significance if the management of risk is continuously maintained. The evolving standards to control and mitigate the regulatory, financial, reputational risks create an atmosphere to tap the potential opportunities without missing. The risks that are to be managed are summarized in the figure 2 and Figure 3.

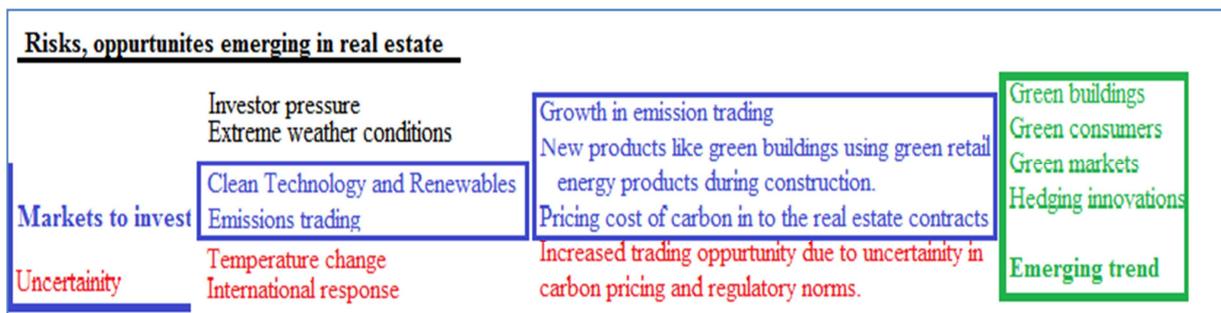


Figure 2: Risks, opportunities emerging in real estate.

While direct risks has direct implications on the real estate prices and if not controlled could lead to changing tenancy relations. The new tenants or investors if risk averse would prefer to shift to new buildings where the risks associated with climate change are minimized due to which a preference towards green building and bias in existential contracts of old buildings might arise. These shifts in the investor behaviour might impact the existing markets of consumers. As green consumers evolve, new markets will be created due to which there will be new opportunities. While the cost of non-mitigation of direct risks is foreseen, it will be difficult to quantify the unforeseen costs due to indirect risks associated with climate change towards real estate markets. For example – “ the Canadian commercial buildings sector is currently not covered directly by any GHG emissions regulations. However, assuming the Canadian federal government follows the US and regional initiatives, this could change. Initial regulations will most likely focus on only the largest facilities, including office, shopping, and entertainment complexes (e.g., those with over 25,000 tonnes of CO<sub>2</sub>-equivalent emissions). This doesn’t mean that real estate investors and managers won’t be affected. On the contrary, anchor tenants from regulated industries or those who have

committed to voluntary emission reductions will be (if they are not already) demanding energy and refrigerant-use information. Expect this demand to be formalized in amendments to standard lease agreements. Be proactive and understand this request while protecting the confidential and competitive use of energy performance data.

Because of the uncertainty associated with evolving GHG emissions regulations, regulators are often unable to provide specific guidance. When it comes to zoning variances and permit requests, municipal officials are under public pressure to include climate considerations. Commercial real estate developers and investors who are unprepared to address climate considerations risk unfavorable treatment, delays, and additional fees.”

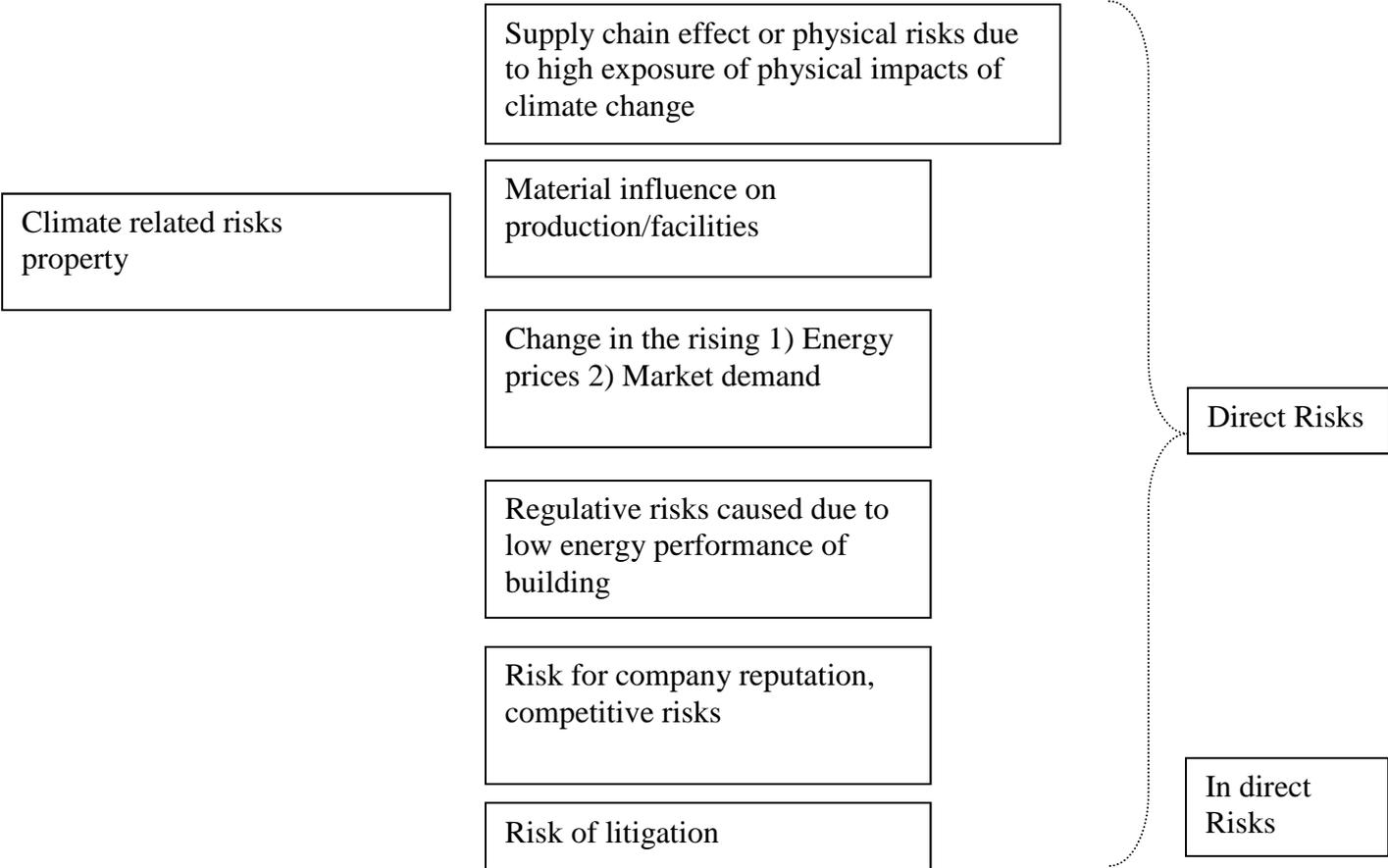


Figure 3: Types of climate change related risks relevant to real estate.

**5. OPPURTUNITIES FOR CONSUMERS : RESPONSIBLE PROPERTY INVESTMENTS**

Behavioral change in the investor psychology to favor for more environmentally acceptable properties, leading to responsible property investments (RPI)." the value of green products lies in their contribution to the overall brand identity of an institution rather than in the individual revenue streams they might produce"(Furrer and Hoffmann, 2009).

Responsible investors after being appraised of the affects on the property investments due to climate change resort to planned action in reducing the environmental impact of their property. A planned action may be in the form of constructing and designing “green buildings”. Green construction outlook report defines green buildings as :

“Green building is one built to LEED standards, an equivalent green building certification program or one that incorporates numerous green building elements across five category areas: energy efficiency, water efficiency, resource efficiency, reponsible site management and improved indoor air quality. Projects that only feature a green building products (e.g. HVAC systems, waterless urinals) or that only address one aspect of a green building, such as energy efficiency, are not included in this calculation”

An investor if involved in the construction of the green building will have the opportunity to control the extra damage to the environment due to new building’s construction. These measures are long term solutions to reduce the environmental emissions caused due to the buildings. During the different phases of life cycle of the building viz, constructing the building, building development and refurbishing the building - the building development and refurbishment also permits the property owner to plan for emission reductions, however the scope of such a reduction plan is on a maintenance level and may not involve major reduction strategy and hence forth sometimes is considered a short term measure for reduction in environmental emissions. “Minimization of waste in construction, increased refurbishment rather than demolition, use of sustainable features in development processes, partnering and knowledge management can all be seen as sustainable-driven improvements within the development process”. (Plimmer, 2009)

During the process of RPI, investors look for oppurtunities from the financial services like banks. Financial services play a pivtoal role in maintaining the momemtum of investments in to green buildings. Consumers that are interested to invest in green buildings and are keen to participate in the control of climate change and are addressed as green consumers.

## **6. GREENING CONSUMERS**

Green consumers according to International Institute for Sustainable development are consumers that have the following characteristics:

- commitment to green lifestyles
- critical of their environmental practices and impact
- looking for companies that incorporate green practices
- want environmental protection to be easy
- tend to distrust companies environmental claims
- lack knowledge about environmental issues, but eager to learn.

In particular focus to the green consumers of real estate - are the financial products in Canada:

“The Canada Mortgage and Housing Corporation offers mortgages and home equity loans for homes that meet energy-efficient criteria; Citigroup also offers loans for the installation of renewable energy equipment, such as solar panels. Other examples within banking include Barclays, which has introduced the Breathe credit card with low borrowing rates for consumers buying green products and services. The bank subsequently gives 50% of the card’s profits to fund emissions reduction projects worldwide. Within insurance, firms such as Tokio Marine & Nichido have begun to offer discounts on auto insurance for low pollution, low fuel consumption and low emission vehicles, while Aviva offers car insurance that bases premiums more precisely on mileage.” (KPMG LLP, 2009)

In addition to the aforesaid schemes followed by various financial institutions in Canadian mortgage and housing markets, there are developments in the regulatory carbon markets internationally. There is a growing importance to Green Power certificates. The significance of concept of Green buildings and Green power certificates is being emphasized even by companies like The CoStar Group. An Illustration of the works of The CoStar Group is presented below -

“The CoStar Group, an information company that tracks 44 billion square feet of US commercial space, reports that LEED buildings generate rent premiums of USD\$12.25 per square foot over other buildings, enjoy a 4.1 percent higher occupancy rate, and sell for USD\$184 more per square foot. Nevertheless, LEED buildings incur no more than a 2.5 percent cost premium upfront to design and build. Commercial real estate groups should realize that the economics are becoming even more compelling, particularly since a Canadian national market for carbon offsets related to building efficiency is on the horizon. It is important to track developments in regulatory carbon markets internationally, especially those involving energy efficiency and related carbon credits (offsets). Before this happens, forward-thinking companies will have long-term real estate agreements in place addressing development, ownership, and sale of all environmental attributes accrued from their commercial property. Don’t assume the environmental benefits accrue to you because you own the property. Unlike energy-efficiency projects, the production and purchase of Green Power Certificates are a very hot topic. Commercial building owners with large rooftops or those found in windy areas are finding opportunities to generate and sell renewable or “green” power. Not only does the electricity have value—more than the market rate—but also, more importantly, the resulting Green Power Certificates have a value that is growing by the day. In Canada, the market for Green Power Certificates is voluntary. Assuming integration between US and Canadian environmental markets, the opportunity could be quite large for Canadian commercial building owners. Even if commercial real estate groups don’t want to get into the power generation business, there is a fast growing number of alternative-energy project owner/operators that could handle project development. These kinds of subleasing arrangements are yet another mechanism to enhance total real estate development value.” (KPMG LLP, 2009)

## 7. REAL ESTATE ALLOCATION

Real estate allocation is defined by the methodology adapted by the investors in managing risks. The scale of risks will vary based on the scenarios for strategic asset allocation. There are several methodologies defined in identifying scenarios for strategic asset allocation, for example by UN IPCC – “Six ‘emissions marker scenarios’ Assesses scientific, technical and socio-economic information concerning climate change, its potential effects, and options for adaptation and mitigation”, our scope of scenarios for Real estate allocation is based on the 4 scenario model developed by Mercer et al 2011.

The 4 scenarios including one based on Stern, Attempts to build on prior studies to explore the impact of climate scenarios on markets through asset class and regional analysis, undertaken by Mercer, climate change experts and some of the world’s largest asset owners.

### Scenario 1 : Regional Divergence

Most likely scenario

Cost of Carbon \$110/t CO<sub>2</sub> e globally

#### Relevance to Real estate:

Policy changes and regulatory environment needs strong leadership for execution of emission reduction targets. So Real estate prices might be affected due to new policies, rules and regulations. Property taxes might include carbon tax.

### Scenario 2: Delayed action :

Business as usual until 2020

Cost of carbon 15/ t CO<sub>2</sub> e to 2020 then dramatic rise to \$220/ tCO<sub>2</sub> e

Global policy Schock most likely.

#### Relevance to Real estate :

Investors panic and prefer investing only in green buildings. Tenancy agreements will be biased to new constructions rather than existing constructions.

### Scenario 3: Stern Action

Market anticipates smooth adjustments and this is planned action to reduce the emissions. Cost of Carbon - 110 / t CO<sub>2</sub> e globally.

#### Relevance to Real estate :

Policy and regulations impact on Real estate is less. Green consumers are aware of climate change. The stress to act under rules for emission reduction is less on property owners. Stern action is a planned action, however implementation has been difficult.

### Scenario 4 : Climate break down

Fossil fuels remain the mainsource of energy and hence the cost of carbon will be \$15t/CO<sub>2</sub> e limited to EU ETS.

#### Relevance to Real estate:

Minimum impact on property owners to take action. The concept of Green building environment will be on a back runner.

Figure 4 : Scenario’s of possible action to climate change and relevance to Real estate

**7.1 SCENARIOS COMPARED: CARBON EMISSIONS**

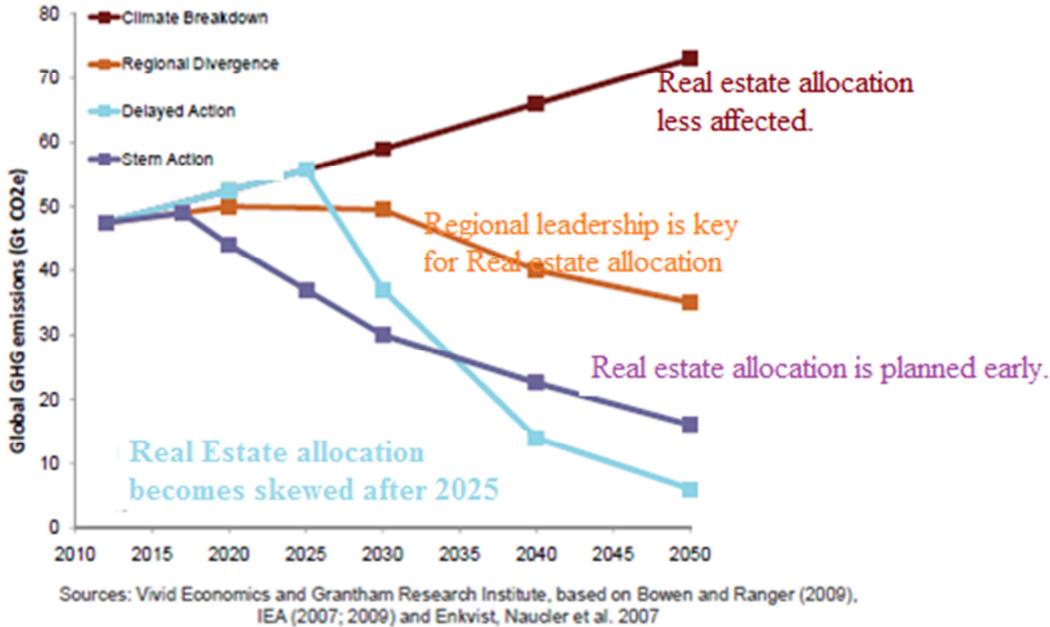


Figure 5: Scenarios compared to carbon emissions and impact on real estate allocation.

**7.2 REAL ESTATE SENSITIVITY TO CLIMATE CHANGE**

The Real estate class sensitivity to climate change is high and is considered to be highly significant. From the studies conducted by Mercer et al, 2011, Mc Kinsey 2010, Real estate abatement potential is more than 28% reduction of GHG emissions per year by 2030.

**Real estate sensitivity to climate change**

Climate Change Risk Factors	Real estate Core Unlisted
Technology	High
Impacts	Low to Moderate
Policy	High
Overall climate change sensitivity	High

Figure 6 : Real estate sensitivity to Climate change, Source : Mercer LLC, 2011

According to (Birgden, 2011)  
 “The long horizon and the “real” nature of infrastructure and real estate investments, increase the importance of climate-change risk factors  
 – Focus should be on unlisted (direct) core assets. Due to the long lives of buildings and the large global stock of inefficient buildings, the largest carbon-saving potential over the next few decades will be from retrofitting (in particular installing better insulation to reduce heating and cooling needs), not from new buildings  
 – Opportunities in energy & water efficiency management, heat pumps, and solar space & water heating in buildings”

## 8. GLOBALIZATION AND GLOBAL TRENDS IN GREEN REAL ESTATE INVESTMENT

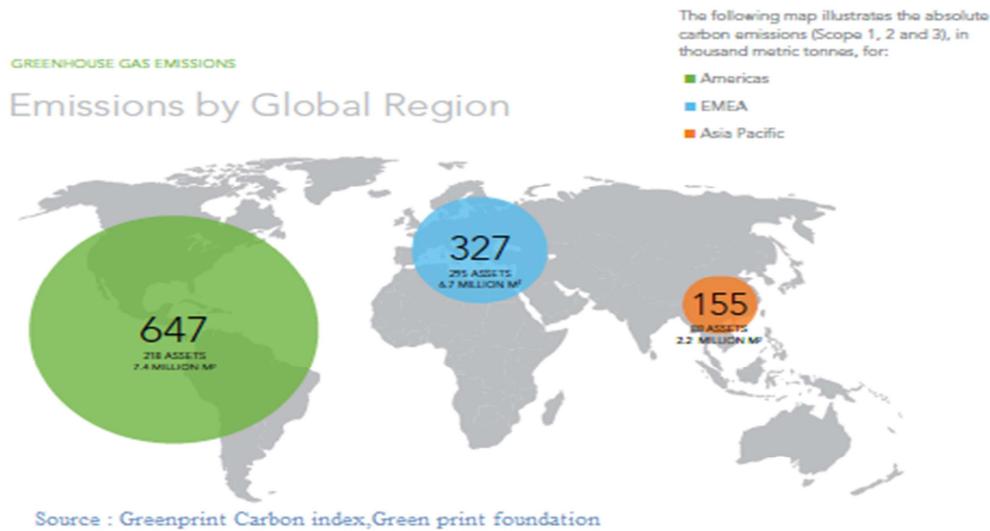


Figure 7: Emission by global region and sample allocation to real assets globally.

America's region has been contributing to highest amount of global emissions as per the Green print Carbon index. The global trends show that the emission will grow in similar trends - the asset allocation and Emission distribution ratio continue to have this regional disparity due to which real estate assets in those regions of higher emissions example the America's bear higher pressure on a global perspective to come up with stringent norms to reduce the emissions with in the pool of real estate assets.

### Leading Real Estate Investment Markets Scaled by Value of Investible Stock - 2007

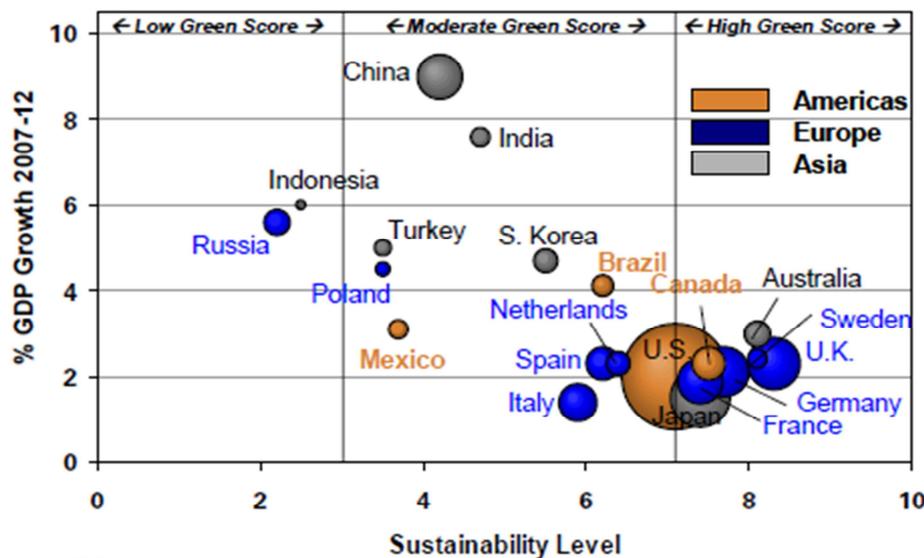
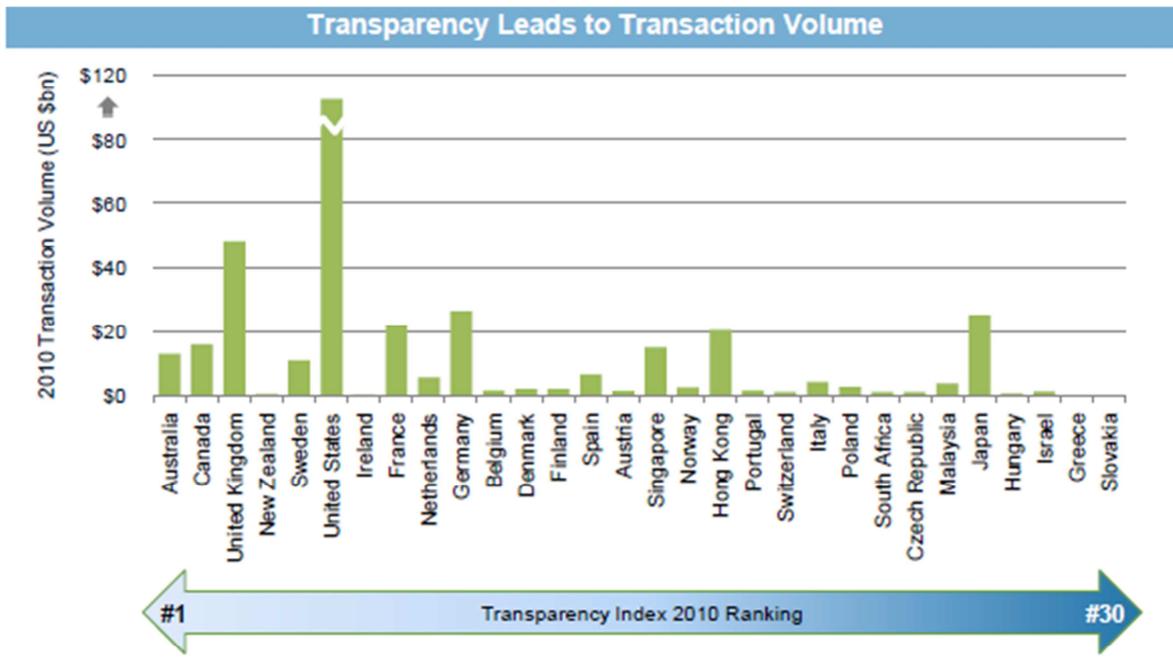


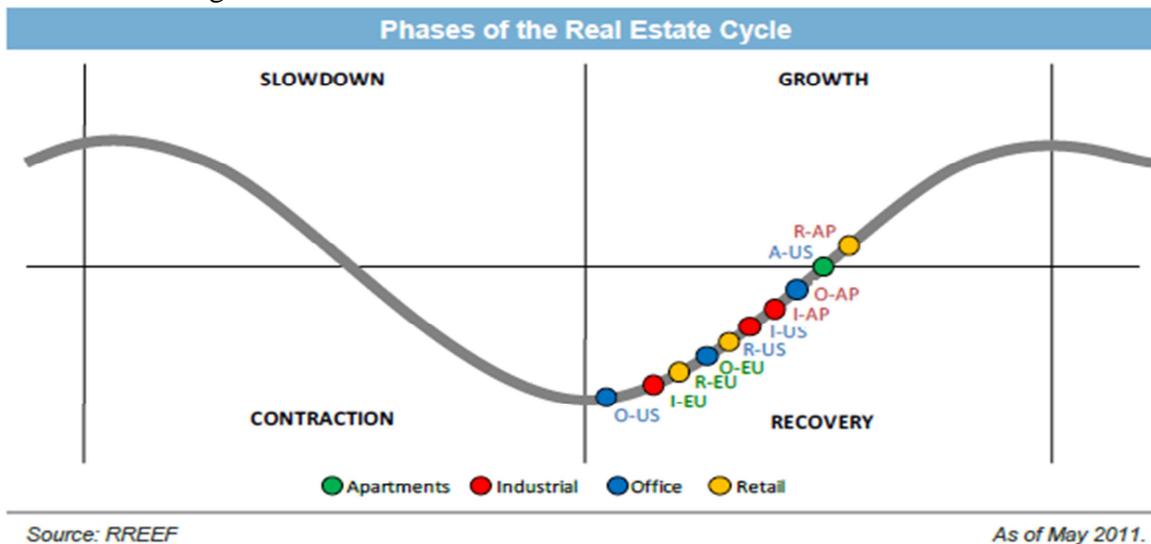
Figure 8 : Leading real estate investment market s ( source : Nelson, 2008)



Sources: Jones Lang LaSalle, Real Capital Analytics.

As of May 2011.

Real estate fundamentals are improving globally and all property types and regions are in recovery. As the economic growth is giving business to expand the recovery is expected to continue accentuation in 2012 since its start in 2011. It is in this context the global assets and emission chart presented in figure 7. Need to be correlated to the leading real estate markets. Correlation interprets that the highest emission regions are also the highest investing markets. So the concern for “green” real estate is rising in the higher investing markets. The transparency of these investments under the transparency index also suggests the same justifying the fact that the transaction volumes for investments in real estate keep growing in US as shown in figure 9.



Source: RREEF

As of May 2011.

Figure 10: Phases of Real estate cycle

## 9. CONCLUSION

Tenants are increasingly demanding greener facilities and many new firms are fully integrating their tenancy decisions into their sustainability reporting to the extent of breaking leases or selling energy-inefficient or otherwise less sustainable buildings. Industrial properties are likely to lag other property sectors in converting to greener construction and greener building environment. The Recovery trajectory as shown in figure 10 of the REEF research indicates that most of the growing economies has crossed the contraction stage and this should be supplemented by adequate policies by the national and international policy making bodies to lift the Real estate pricing cycles despite the impact of climate change.

## APPENDIX:

### Formula for risk quantification :

$$R_{i,t} - RFR_t = \beta_i + \sum \beta_{i,j} \times F_{j,t} + \epsilon_{i,t}$$

$R_{i,t}$  = the return for asset  $i$  at time  $t$  (synchronised for private equity / real estate)

$RFR_t$  = the risk free rate (nominal 3 month treasury-bills)

$F_{j,t}$  = the return for factor  $j$  at time  $t$

$\beta_1$  = the asset class unique premium (roll yield, alpha or illiquidity). A full multivariate model splits  $\beta_1$  into a set of different betas

$\beta_2$  = sensitivity to unexpected inflation premium ("real asset" premium)

$\beta_3$  = sensitivity to equity premium (S&P 500 – 3 month t-bills)

$\beta_4$  = sensitivity to small cap premium (Russell 2000 – S&P 500)

$\beta_5$  = sensitivity to term premium (Barclays Government bond index – 3 month t-bills)

$\beta_6$  = sensitivity to credit spread premium (Barclays high yield - Government)

$\epsilon_{i,t}$  = the unexplained portion (error term, or residual)

Source: Mercer et al 2011.

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Rome, Italy, 6-10 May 2012

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