Climate Change and Real Estate Economics

This article analyzes how climate change is impacting property values and real estate markets. According to the author, the impact of Hurricane Katrina and Al Gore's documentary on climate change have transformed political and scientific issues into tangible effects that already have impacted many property owners' pocketbooks, and more financial impacts are inevitable. As such, the author proffers numerous important questions related to the future landscape of climate change and real estate economics.

231.1901 Introduction*

The Earth is real estate. When climate change impacts the Earth on a macro level, individual properties are being impacted on a micro level. As demonstrated by Hurricane Katrina and the wide acclaim of "An Inconvenient Truth," global warming has becomes less of a theoretical debate and more of a reality in the minds of a majority of Americans. This in turn already has resulted in significant real estate economic issues. Insurance companies, citing actual damages and perceived future risks, dramatically are raising many insurance premiums two- or three-fold or canceling policies altogether. This alone can and will alter financing and real estate prices. Numerous other issues must be monitored over the coming years as climate issues inevitably will have an increased role in the real estate markets.

While the effects of global warming have been dismissed by some and taken seriously by others, it is undisputed that the world's overall temperature has risen over the last 100 years. The controversy in global warming lies in the areas of "cause and effect." Some blame the industrial revolution and the unprecedented use of fossil fuels for causing the "greenhouse effect," while other scientists note the Earth has undergone cyclical warming and cooling trends for many millennia. Some envision the inevitable inundation of coastal areas and other major calamities if corrective action is not taken. In fact, both the *San Francisco Chronicle* and *New York Times* have published the "new coastlines" of coastal communities if global warming continues unabated. Still others insist the situation is a fad, a minor condition that ultimately—after much hoopla—will have the same net effect as the Y2K craze.

When real estate is viewed from a strategic viewpoint, it becomes less relevant whether global warming is the result of human behavior or not. Even if the Earth is going through a natural cycle, the cause is no less important when facing a flood. Natural or artificial, either way the flood is going to damage the building. Similarly, no matter what the underlying cause, the long-term consequences of global warming are not good. Indeed, insurance companies are citing climate change as the basis for raising some insurance rates. On a practical level, regardless of one's political or moral position on global warming, property owners still must pay their insurance bills. Thus, the issue of climate change has come home—literally.

Furthermore, perceptions—not necessarily reality—drive real estate markets. Perceptions about global warming are changing. Today, most scientists and a majority of the public from all major political parties believe global warming is a legitimate problem and something should be done to curtail it. The Environmental Protection Agency now has an entire Web site devoted to climate and global warming issues.[1] In 1997, discussions were started about an international global warming treaty in Kyoto, Japan. Today, well over 160 countries have signed and ratified the Kyoto Protocol, with the principle exceptions being Australia and the United States. The United States currently is the world's number one emitter of carbon dioxide and other greenhouse gases, yet China is expected to overcome the U.S. in this regard. A controversial aspect of the Kyoto Protocol is that China, clearly a major generator of greenhouse gases, is not required to reduce overall emissions.

Many mitigation measures are being discussed, developed, and implemented. There are groups who sponsor planting trees all over the world. Others are promoting renewable energy sources, such as biomass, cogeneration, hydro, nuclear, solar, and wind systems. Some propose more mass transit or master planned communities that allow people to live closer to their work. Flex-room, green, and "smart" real estate features have been integrated into buildings to

* Randall Bell is the CEO of Bell Anderson & Sanders LLC, which specializes in real estate damage economics and strategic planning. Bell was retained to consult on Hurricane Katrina, the World Trade Center, and the Marshall Island nuclear weapons test sites, respectively the largest climate, terrorist, and environmental cases in history. Bell sits on the advisory board of BNA's Environmental Due Diligence Guide and is the author of seven books, including Real Estate Damages, and a business management book, Bottom Line Results. He can be reached at (949) 497-7607 or by e-mail at bell@realestatedamages.com.

[1] EPA's climate change Web site can be accessed at http://www.epa.gov/climatechange.

ISBN 1-55871-369-7

increase efficiency and save energy costs, and more changes in the real estate markets are likely.

All combined, these factors transform political and scientific issues into tangible effects that already have impacted many property owners' pocketbooks. Additional financial impacts are inevitable. In turn, this raises numerous important questions related to the future landscape of climate and real estate economics.

(a) The Physical Impacts of Climate Change

There are several impacts that climate change have or potentially could have in the future, specifically (1) changes in land use, (2) rises in sea level, (3) changes in annual precipitation and soil evaporation, (4) extreme weather, (5) glacier retreat, (6) extinction of some species of plants and wildlife, and (7) new diseases and the spreading of disease. Of these issues, the first four already have or potentially could impact real estate values in the future:

(1) Changes in land use, such as deforestation, could impact both the economic value of forests themselves as well as construction and lumber costs. Other related land-use changes could include effects from bark beetles in mountain and resort areas as well as the rising mosquito line in some areas.

(2) Rising sea levels obviously could impact all properties constructed in proximity to a coastline, resulting in the construction of new sea walls, raising properties onto stilts, or their destruction altogether. Furthermore, the seas are getting warmer, which already has killed off coral reefs in some areas. This could have an impact on resort properties that cater to scuba diving and snorkeling.

(3) Changes and redistribution of annual precipitation and soil evaporation could impact agricultural properties, increase the price of wheat and other agricultural products, and require additional infrastructure to provide dependable sources of water.

(4) Extreme weather, the most obvious of the climate issues, recently has been witnessed on a large scale. While some may question a direct tie to global warming, most scientists are convinced this is no coincidence.

(b) Hurricane Katrina

In August 2005, Hurricane Katrina slammed a wide area of the Gulf Coast, killing more than 1,800 people and causing tens of billions of dollars in property damage. The wind, flood, and tornado damage destroyed entire towns and cities far beyond New Orleans.

In the aftermath, anyone driving through New Orleans and the Gulf Coast would be astounded at the scale of destruction. House upon house, street upon street, neighborhood after neighborhood, and city after city have been completely destroyed. Not only were homes ruined, so were infrastructure, offices, restaurants, and retail stores. The damage is so immense many areas still remain uninhabitable. This has left many municipalities in a difficult position because rebuilding the infrastructure is enormously expensive but not rebuilding could result in inverse condemnation suits brought by the property owners. Given the fact many believe New Orleans and its infamous levy system never should have been built in the first place, there are no easy solutions.

The unprecedented damage caused by Katrina has resulted in astounding human suffering, financial losses, and property damages, which in turn greatly amplified the awareness and legitimacy of global warming concerns. It is difficult to ignore the fact that Katrina occurred in 2005, also the hottest year in recorded history. Prior to Hurricane Katrina, climate issues were more of a debate and less of an accepted public reality. However, this storm hit the national pocket book so hard it already has started to fundamentally alter the real estate markets. Citing climate issues, insurance companies have raised premiums significantly in high-risk areas or canceled policies altogether. In turn, this impacts the ability to finance a property. All summed, this translates to property value losses.

(c) The Movie

No matter what side one takes in the debate regarding climate change, the documentary "An Inconvenient Truth" featuring Al Gore has had a profound impact in bringing these issues to the forefront of discussion.

Winning an Academy Award, the movie takes the point of view that "Humanity is sitting on a ticking time bomb. If the vast majority of the world's scientists are right, we have just ten years to avert a major catastrophe that could send our entire planet into a tailspin of epic destruction involving extreme weather, floods, droughts, epidemics, and killer heat waves beyond anything we have ever experienced."

Some consider the movie hype while others are convinced of its accuracy and truthfulness. Still others believe the truth is somewhere in the middle.

ISBN 1-55871-369-7

Certainly many of the movie's points are universally accepted as valid: hot spells are at an unprecedented high, glaciers are retreating, and weather patterns have changed. Strange weather events now seem almost common.

(d) Insurance

Both Katrina and "The Movie" have had an awakening effect on the insurance industries. The perspective of current and future insurance risk can be understood better in the context of history. In 1938, the "Long Island Express," a Category 3 hurricane, hit several areas of New England, including New Hampshire, New York, and Rhode Island. The storm killed 500 to 700 people and caused an estimated $6.5 billion worth of damage in current dollars. Today, the same storm would cost approximately $200 billion. According to Evan Mills, an environmental scientist at the U.S. Department of Energy, weather-related damage increased from approximately $1 billion per year in the 1970s to an average of $17 billion per year over the last decade. In 2005, which includes Katrina, the figure rose to between $70 billion and $80 billion, with $45 billion being insured losses.[2] In other words, a real risk exists that another single event could result in a financial liability of over four times that of Katrina. These and similar facts and figures have gotten the attention of the insurance industry. Such an event simply would wipe out many insurance carriers altogether, not to mention completely overwhelm many federal government agency and volunteer resources.

In addition to Hurricane Katrina, insurance companies have noted a host of other extreme weather events, including citrus crops freezing, freak ice storms, flooding of lettuce fields, wildfires, windstorms, and other conditions. Consequently, insurance companies have announced a variety of new policies and practices that actually are impacting some real estate markets. Coastal property owners in the East from Maine to the Carolinas and Florida are losing their policies or their premiums are doubling and sometimes tripling. This is no minor issue because 54 percent of the nation's population lives within 50 miles of the coast. Further, the most expensive homes in the nation largely are located on the coasts of Florida; Long Island, N.Y.; and Southern California.

This is a critical situation because obtaining property insurance is a fundamental aspect of real estate financing and ownership. Simply stated, a property that cannot be insured conventionally generally cannot be financed conventionally. Discounts to the values of properties that cannot be financed conventionally are well documented. On top of that, owning a property that is uninsurable, and thus is entirely exposed to calamity, is troubling at best.

While the full impact on real estate markets has yet to play out, it is apparent real estate financing and insurance issues will continue to impact considerable portions of the market. With more than $6 trillion worth of real estate in the United States, the stakes are high. For example, if insurance rates are increased just 1 percent as a result of climate-change issues, and assuming a 50 percent land-to-building ratio, this translates into a $30 billion cost to property owners per year. Considering the incremental costs of construction, financing, insurance, lumber and municipal infrastructure, the confluence of climate-change conditions could create exponential economic damages to property owners.

(e) Real Estate Damage Valuation Methodologies

Whether for climate change or any other detrimental condition, the starting point with properly measuring real estate damages is the use of the Detrimental Conditions Matrix (see table next page). The concepts of the matrix have been incorporated into the Uniform Standards of Professional Appraisal Practice as promulgated by the Appraisal Foundation under an act of Congress. This is the methodology used in measuring the real estate damages resulting from Hurricane Katrina.

[2] "The Insurance Climate Change," *Newsweek*, Jan. 29, 2007, available on the Web at http://www.msnbc.msn.com/id/16720746/site/newsweek/.

ISBN 1-55871-369-7

Detrimental Conditions Matrix

	Assessment	Repair	Ongoing
Cost	Cost to assess climate-related damage or the potential of such damage.	Costs to repair damaged property, mitigate future damage, or increased financing costs and insurance premiums. This also could include concrete construction, construction on piers, storm walls, etc.	Ongoing costs i.e., monitoring.
Use	Impact on use while the situation is assessed.	Impact on use while the property is reinforced, repaired, or remediated.	Ongoing impact on use or impact on highest and best use.
Risk	*Uncertainty Factor* Risk, if any, associated with a condition is known or believed to exist, but prior to the damage being assessed.	*Project Incentive* Financial incentive, if any, to repair or remodel a property that has been damaged or improperly is exposed to climate risks.	*Market Resistance* Risk, if any, associated with a property that historically has been damaged by a climate-related issue. For example, rebuilding in New Orleans.

While the nine quadrants within the matrix may not all be applicable, they all should be considered in the context of every assignment.

When conducting a damage study, one must look to the marketplace for answers and analyze what the marketplace itself actually is saying.

Of all the quadrants of the matrix, mitigation and remediation costs often are the most obvious. This could include increased financing costs and insurance premiums. This also could include construction on piers, storm walls, stronger concrete construction, and so forth.

Determining the responsibility for costs is key. For example, if a better levy system or storm wall is required, one may not deduct those costs from the value of a waterfront house if the local municipality has responsibility for the costs and the homeowner does not.

Another example could be a mountain resort. Here, the costs could be artificial snow generation in a resort area, keeping in mind that even artificial snow can be generated only when the temperature falls below freezing. Other costs could include creating alternative water sources for agricultural areas where the climate may be less reliable, increased insurance premiums, lack of conventional financing, solar paneling, or increased HVAC costs.

"Use impacts" may include studying what practical impacts climate issues have on the property. The question should be asked, "Does a property have the same utility in light of a climate issue as without it?"

"Stigma," which is better termed "risk," reflects any discounts by the marketplace as a result of the detrimental condition.[3] For example, there may be some element of risk or "market resistance" associated with a rebuilt property in New Orleans because of the historical situation.

(f) Climate Change and New Real Estate Industries

Climate change has created a world of opportunity for the development of more fuel-efficient transportation, new technologies, and renewable energy sources. As concerns over climate and demands for energy efficiency increase, so will the demand for new technologies to be integrated with real estate. Climate issues still are evolving rapidly, but already there are a number of issues and organizations of which real estate professionals should be aware:

- CoStar (http://www.costar.com) is beginning to add Energy Star ratings to its database of sales comparable property data.
- Energy Star (http://www.energystar.gov) is a joint effort between EPA and the Department of Energy that rates energy efficiency.
- Green Building Finance Consortium (http://www.greenbuildingfc.com) is a consortium of trade groups and corporations that research investment in green buildings and technology.

[3] For more information on stigma and valuation of property, *see* EDDG Sections 140:101 and 140:201.

ISBN 1-55871-369-7

- Green Building Initiative (http://www.thegbi.org) offers alternative green assessment protocols.
- U.S. Green Building Council (http://www.usgbc.org), founded in 1996, has developed the Leadership in Energy and Environmental Design (LEED) standards, which rank green building characteristics on a scale of one to 69.

Climate change issues will continue to grow and influence real estate markets. For example, developments along coastlines increasingly may be constructed with extreme weather risks in mind. In Hilo, Hawaii, as a result of two tidal waves during the last century, the downtown areas are constructed with high-rise hotels with "blow-through designs." This feature allows for a tidal wave to blow through the lower parking areas and facilitate a "vertical evacuation" where building occupants go to the roof for helicopter rescue. Architects, developers, and engineers with experience in blow-through designs may find their expertise valuable as these same types of buildings are built in other areas with coastal risks around the country.

Similar to conservation and wetland land banking, there are opportunities in the field of "carbon credits" for property owners who emit carbon dioxide and other greenhouse gases to trade or bank shares for greenhouse gas emissions. Furthermore, there could be offsets for development and emissions by planting trees or deeding properties as perpetual open spaces. Landscape architects qualified in climate-change issues could expand their practices to include passive solar designs using trees, for example, to provide shade during the warmer hours and allow in sunlight in the cooler hours.

Likewise, the expansion of green buildings and smart buildings is inevitable. The embryonic stage of smart building involved using automated switches and computers, such as HVAC and lighting controls, primarily to save energy. Human sensors immediately can turn on and off lights as well as control the temperature of a building. Building automation systems can integrate air conditioning, heating, lighting, and security with traditional information technology infrastructure. These features provide real-time building information about utility costs and usage that, along with access throughout the building, continually are monitored and adjusted for efficiency and safety.

These smart features not only cut energy costs but also create an entirely new experience for building occupants. For example, a tenant could use a card reader or keypad for secure access, which in turn automatically sends an elevator, turns on their computer, opens or closes curtains, adjusts the shades for sunlight, turns on lights, activates thermostat pre-set preferences, plays background music, and even makes coffee using a network coffee maker. All the while, high-tech security features keep people just in the areas they are allowed to be in and out of areas where they do not belong.

In addition to smart technology, there are flex designs. The multipurpose flex design concept has been around for some time. For example, a major arena such as the Staples Center in Los Angeles can convert from a hockey rink in the morning to a basketball court in the evening and then the venue for a rock show the next day. While not high-tech per se, multipurpose rooms allow for special-use properties, such as churches, community centers, and schools, to use one space for a variety of uses. The multipurpose room concept recently has been advanced to a new level of flex-room space. Automated carpet panels can change a basketball court into a meeting room with dark blue carpet or a wedding hall with yellow carpet. Of course, the basketball hoops themselves fully retract into the ceiling and disappear altogether. A rooftop patio can be converted with the push of a button into an ice skating rink. A dance studio can be converted to a business meeting room by wood panels that slide over the mirrors. Pool tables can be transformed into conference tabletops that drop from the ceiling, allowing the room to be used for playing pool and watching a football game on the large flat screen or having a board meeting and a video conference. These flex-room features make real estate more effective and productive.

For the first time, green real estate construction has been integrated with the full spectrum of smart building technology and the intelligent verticality of flex-rooms. Combined into one project, this represents an entirely new category of real estate called an automated business & community center (ABC). Developed under the trademark of "Noah's," ABC demonstrates the possibility of property design that reduces environmental impacts. Advanced videoconferencing features reduce the need for commuting, flat screens use half the electricity of conventional screens, and human sensors and computer controls turn lights on and off.

There also are a variety of other ABC green features and technologies. Wherever possible, renewable building supplies are used, such as clay pavers, recycled concrete, re-used wood planks for flooring,

ISBN 1-55871-369-7

and roofing shingles made from recycled tires. Rare wood species and old growth lumber are not used, and plywood, which can emit formaldehyde fumes, is used only when absolutely required. Rather than a cheaper petroleum-based urethane floor sealant, a more expensive but environmentally friendly water-based sealant is used.

Energy costs are controlled on various levels. The temperature for all the rooms is monitored in real time, both saving costs and providing ideal interior temperatures. This is accomplished in part with well water kept at a consistent 58 degrees that is pumped from one side of the site, circulated through the walls to keep the building at a consistent year-round temperature that can be adjusted incrementally, and then injected back into the groundwater on the other side of the site. This system has an overall cooling effect in the summer and heating effect in the winter.

All combined, the ABC's flex-room, green, and smart features result in construction that has minimal impact on the environment, yields energy cost savings, and allows one room to be used for multiple purposes, thereby further increasing efficiency and reducing environmental impacts in a way that never has been achieved before. While the ABC concept itself has patent rights, real estate developers may take note of some of the features that are becoming available to construct more efficient and environmentally friendly properties.

(g) The Future Outlook

Real estate developers, investors, owners, and professionals are entering into a new frontier with climate and global warming issues. Accordingly, new questions and issues inevitably will arise, including some of the following:

- Much of the real estate market impacts will be determined by the extent to which people will invest in the new reality of global warming. Will real estate markets that historically have commanded premiums in part because of their desirable weather, such as California and Florida, become less desirable, will the market "shrug it off," or will they "head for the hills"?
- "New coastlines" are being predicted by some for coastal areas if global warming is not abated. Will coastal properties, along with their ocean views, continue to command heavy premiums?
- Glaciers are melting and mountain weather patters are changing. Will mountain resorts, which often depend on snowfall and ski-related economies, suffer financially as a result of less dependable weather patterns?
- California's Napa Valley historically has been known for its ideal climate for growing grapes, yet other parts of the state have suffered enormous losses with frost and citrus losses. Will the desirability and value of agricultural properties with historical stable weather patterns be impacted, and if so, how? Will new agricultural technologies be developed that will mitigate or offset the risks of the greenhouse effect?
- The "Malibu Factor" is the name given for the phenomena that much of the priciest real estate in the world is located in areas that often are most dangerous and risky. The name refers to expensive homes that have been built for many years on the Malibu coastline in California that intermittently are flooded by rogue waves. Indeed, many conventional insurance policies have not been made available for some beachfront homes. In some cases, there has been government-subsidized flood insurance to allow the wealthy to build in these areas. Will similar government subsidies and intervention increase in other high-risk areas?
- Entire small nations, such as the Marshall Islands, have average elevations of only five or six feet above sea level. Will real estate development in these developing countries halt pending some kind of forthcoming answers on the topic of climate change? If seas continue to warm and coral reefs continue to die, will the resort and tourism industries be affected?
- Many of the central business districts (CBDs) in the United States are located on the coast or near the banks of a large river or lake (i.e., Chicago; Miami; New York; San Diego; San Francisco; Seattle; and Washington, D.C.). The same is true around the world (i.e., Hong Kong, London, and Paris). Could climate change have a disproportionate detrimental impact to CBDs?
- New extreme climates could have a significant impact on property cooling and heating costs. Will solar glass need to be installed in high-rise office towers? Will additional insulation be required in real estate construction?
- "Carbon footprints," which are a measure of a business' carbon dioxide emissions, are likely to be scrutinized more closely over time. Industrial properties designed so they have a smaller carbon footprint indeed may be more marketable than an otherwise similar facility with a larger

ISBN 1-55871-369-7

footprint. Accordingly, will industrial facilities constructed to yield a smaller carbon footprint be worth more than another facility with a larger footprint?

- It is conceivable climate issues are not necessarily bad news for every real estate market. For example, many northern areas, and certainly Canada, are known for particularly long and harsh winter seasons. Will global warming moderate the harsher climates in some of these areas, extend tourist seasons, and generally increase the desirability of some regions?
- Will real estate markets look to government as the solution to climate issues rather than adjusting individual or regional property values?
- The ABC model demonstrates the capabilities of combining flex-room, green, and smart technologies. Will smart building technologies be implemented more aggressively by real estate developers in their efforts to contribute to the solutions to global warming? If so, what effect will that have on construction costs and rents?

As demonstrated by the immense property damage caused by Hurricane Katrina, the wide acclaim of "An Inconvenient Truth," and the Kyoto Protocol, global warming has become less of a theoretical debate and more of a reality. This in turn already has resulted in significant real estate economic issues. Insurance companies, citing global warming, unprecedented damages, and perceived future risks, are raising premiums dramatically or canceling policies altogether. This alone can alter conventional real estate financing. Any diminution in value, whether from physical property damage like Katrina or intangible damage like financing and insurance issues, can be measured using advanced valuation methodologies.

Global warming also means enormous opportunity for new advancements and technologies, and the real estate industry is no exception. By combining flex-room, green, and smart technologies, properties have been constructed that are remarkably efficient and economically can outpace almost anything ever built before. Much is known and there is much yet to be learned, but climate issues inevitably will have an increased role in future real estate markets.

ISBN 1-55871-369-7