

The Real Riddle of Changing Weather: How Safe Is My Home?

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BY now it is no longer news that people are jiggling the planet's thermostat.



New York Office of Emergency
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One response is to go green: New Yorkers who were terrified into action by [Al Gore](#)'s movie, "An Inconvenient Truth," are shaping up their lives and homes with a compulsion formerly reserved for the Atkins diet.

All this carbon cutting is a boon, and it certainly provides a moral high ground. But it fails to address one pesky truth: no matter how green [New York City](#) becomes, it remains hostage to huge amounts of heat-trapping carbon dioxide emissions already in the pipeline and from the future environmental transgressions of others, facts made clear in the bleak conclusions of the Intergovernmental Panel on Climate Change, released last month in Paris.

With no obvious savior in the wings, there is a growing urgency that [global warming](#) be understood at a local level, right down to the block, starting with: How could a rising sea level and pummeling storms affect the trillion dollars' worth of property New Yorkers call home?

"It's all pointing in a bad direction," said Stuart Gaffin, an associate research scientist at the Center for Climate Systems Research at [Columbia University](#). "There's nothing good to encourage you to think we're going to avoid long-term flooding events."

Estimates provided by the center, and relied upon by New York City planners, predict that sea levels will creep up about five more inches by 2030 and another few inches by 2050. More dire estimates call for 12 inches or more between 2030 and 2080.

But while widespread permanent inundation — the sort vividly illustrated in Mr. Gore's movie — is possible, it isn't likely to occur in the city in our grandchildren's lifetimes, or even their grandchildren's. And an extra 5 to 10 inches of water over the next few decades won't pose devastating problems for most of the city.



[Projected Storm Surge Over Northeastern Seaboard \(Quicktime\)](#)

[\(Windows Media Player\)](#)

The bigger threat to property is the possibility of more frequent and increasingly vicious storms that could propel already encroaching waters onto the shore, could dump larger amounts of precipitation, and could lash glassy skyscrapers and crumbling tenements.

And even before that happens, real estate values in low-lying areas could erode as heightened awareness of global warming draws attention not only to long-term exposure to storms but also to near-term damage from severe storms that could happen regardless of any long-term warming trend — like the major hurricane that experts say is overdue in New York City.

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THINKING AHEAD Malcolm James Bowman, a professor of oceanography at the Marine Sciences Research Center at the State University at Stony Brook, N.Y.

One Manhattan real estate agent said the fear was already weighing on some clients' minds. "After Katrina, they saw how ineffective the U.S. is at holding back water compared to some other places, and it has made some people concerned," said the agent, Tom Hemann of Brown Harris Stevens, who sells downtown. He said last month's gloomy report on global warming prompted four former clients who had bought downtown to voice concern about living in low-lying neighborhoods.

Mr. Hemann — who said he was confident that there would be solutions before there was real trouble — is nevertheless working with a couple in their 30s who are selling their loft on Elizabeth Street. They had planned to buy again in Lower Manhattan, but the February report "changed everything," Mr. Hemann said. "Now they're telling us that one of the main considerations is to make sure it's not an area of low ground. They're also considering getting a smaller place here and investing in a property in a city way above sea level."



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Joe Tortorella, a structural engineer, is a member of the Disaster Preparedness Task Force of the

Most urban planning and environmental groups have just begun grappling with how to protect the city's property from climate change. Last fall, Mayor Michael R. Bloomberg created the Office of Long-Term Planning and Sustainability and named as its director Rohit Aggarwala, a 35-year-old former McKinsey & Company consultant with four degrees from Columbia.

As part of the new office's broad mandate to address housing, transportation and other infrastructure needs over the next 25 years, it will coordinate the development of a climate adaptation strategy.

Drawing on other city agencies, including the Department of Environmental Protection and the Department of Buildings, the new long-term planning office has also met with more than 100 advocacy organizations, conducted community meetings in each borough and digested thousands of individual e-mail messages collected through its Web site, nyc.gov/planyc2030.

American Institute of Architects.



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Paddington M. Zwigard, a broker with Brown Harris Stevens, shown with her family, just sold her penthouse on Chambers Street.

The early fruit of these efforts will be a plan — or at least a framework for one, to be announced by the mayor in early April — to tailor the city to its future 25 years hence.

But like Mr. Hemann's clients, some New Yorkers are not willing to bet their nest eggs that the dice will roll their way.

Among insurers, all of whom factor climate change into their risk assessments, some like Allstate are already refusing to renew homeowners' policies in the eight downstate counties (including metropolitan New York) most vulnerable to hurricanes and other major storms that could proliferate in a warming climate. (Allstate continues to insure individual co-op and condo units.)

“When you have trillion-dollar exposure, it doesn't take much bad weather to cause extensive damage,” said L. James Valverde Jr., the vice president for economics and risk management at the Insurance Information Institute, a trade group based in Manhattan. “That's really on the mind of the industry. When you've got this kind of concentration of people and property in a very important sector of the country, the potential for economic and insured loss really is great.”

Structures at particular risk from storm-related flooding include tenements, brownstones and any building with old masonry foundations, said Joe Tortorella, a vice president and a structural engineer at Robert Silman Associates in Manhattan and a member of the Disaster Preparedness Task Force of the [American Institute of Architects](#).

Mr. Tortorella noted that much of the West Village and Lower Manhattan — neighborhoods whose low elevation renders them vulnerable to flooding — is on a precarious perch. “It's like the finest sand you can find, so that even if you could put it on a table, you can't mound it up in a pile,” he said.

In a hurricane or severe northeaster, Mr. Tortorella said, “if the water moves fast enough and recedes fast enough, there could be scouring like a tide that takes sand with it on the beach. As the water recedes, it pulls silt out and could undermine the building. It could be a disaster of epic proportions in New York for the smaller buildings.”

Unlike New Orleans, where water from Hurricane Katrina was trapped in the city's tidal basin, a hurricane storm surge in New York City would most likely retreat after a single tidal cycle, except for the water pooled underground, where it could disable power lines, drown the subway system and choke basements, among other things. Standing water in basements could breed mold, rendering entire buildings uninhabitable.

And flooding isn't an issue just with hurricanes. Though climate models are at odds with one another, some scientists expect the number of northeasters to increase in the next several decades, along with the amount of rain they unleash. While the storms won't push rivers and oceans as far

onto land as hurricanes could, northeasters cover more territory and linger far longer, over several tidal cycles.

In a city increasingly fashioned of glass, there are also winds to consider. Category 3 hurricanes generate sustained winds of 111 to 130 miles per hour, and Category 4 hurricanes blow at 131 to 155 m.p.h. But the city's building code requires that windows in even the newest buildings withstand winds of just 110 miles an hour.

"Glass is a hot thing in New York City," Mr. Tortorella said. "There's a lot of glass structures, and you get more aggressive with what you can do with glass — actually using it for structure as opposed to just a skin on the building. The biggest problem with hurricanes is a 2-by-4 or signage from another building that falls off and blows through the glass and creates interior suction — causing the windows to blow out, the walls to blow out."

Stronger windows could keep the winds at bay, but what about the water?

"There's not going to be anything easy or cheap," said Mr. Gaffin of the climate research center at Columbia. "There's not going to be a magic silver bullet."

One long-term but unappetizing option is to ring the city with enormous concrete sea walls. In Manhattan, this would require a wall several dozen feet high and wide enough to fit a four-lane highway on top. The higher a sea wall or levee is, the broader it has to be, and in New York City, which is interlaced with rivers, such barriers would encroach on some of the priciest real estate in the world.

(In the Netherlands, in some otherwise picturesque villages guarded by sea walls, it is possible to hear the waves crashing, see the seagulls circling and smell the salt air but never see the ocean.)

Somewhat more palatable though infinitely more complex and expensive — and politically explosive, since some waterfront acreage would not be protected — is the possibility of erecting a series of storm-surge barriers in local waterways.

"What we're talking about is a ring of protection for metro New York that would require four large barriers, like removable dam structures, that could block off the ocean when needed," said Malcolm James Bowman, a professor of oceanography at the Marine Sciences Research Center at the State University at Stony Brook, N.Y., and the leader of the storm-surge group there that is studying ways to protect metropolitan New York and [Long Island](#).

"You'd need four," he said. "One close under the Verrazano Bridge. One in Perth Amboy behind [Staten Island](#), because the water would leak around the back into the harbor from the ocean. A third from Long Island Sound in the upper East River, perhaps between the Whitestone and Throgs Neck Bridges. And then to protect Jamaica Bay and Kennedy Airport, you would need a fourth one across the Rockaway Inlet, but because the ground is low there, you would also need a sea wall running along the beach and up around Kennedy Airport."

Such barriers, including lock systems to allow ships to pass through, would cost perhaps \$10 billion each and take 5 to 10 years to construct. And that's not including the 30- or 40-year prelude of engineering studies, debate, financing and court challenges.

"If you look at the European experience," said Professor Bowman, referring to surge barriers built or under construction in the Netherlands, London and Venice, "it took up to 45 years in some cases, after a major catastrophe, before the barriers were built."

Not that the surge barriers would be a panacea. Besides the ecological side effects like erosion, the barriers wouldn't prevent wind damage and would fail to protect some areas, including the southern coast of Long Island. (There, said Professor Bowman, looking several decades ahead, "I think people will stay as long as they can and then slowly evacuate if it gets really bad.")

Shorter-term fixes include mandating a costly round of retrofitting, intelligent land-use planning and reining in coastal development, or at least requiring wider buffer areas to absorb huge storm surges capped by breaking waves.

And then there's the building code.

Even the city's newest gleaming towers were constructed under 40-year-old rules whose own foundations seem rickety when it comes to withstanding — or even contemplating — damage from severe storms.

With regard to flooding, the building code follows [Federal Emergency Management Agency](#) regulations, which set forth a bare-minimum standard for construction in flood zones and rely on the emergency agency's conservative flood maps drawn in 1983. Roughly translated, the maps identify areas that might be flooded by a Category 2 or 3 hurricane; in some places around New York City, the zones correspond to a mere Category 1 hurricane, with winds of 74 to 95 m.p.h.

Besides excluding areas that could be inundated by a severe hurricane, the flood zones are based on purely historical data and thus do not factor in climate change. That means that new construction may be inadequate to withstand the rigors of climate change 30, 40 or 50 years from now or the hurricane that could hit at any time.

Even the emergency agency's newest maps, scheduled to go into use this fall — which show slightly enlarged flood zones on the south shores of Staten Island and [Queens](#), for example; along the Hudson River in Lower Manhattan; and in Hunts Point in the [Bronx](#) — are still based only on historical data. (The new maps can be viewed online on the Buildings Department Web site: gis.nyc.gov/dob/fm/index.htm.)

"The future is just too theoretical, and FEMA maps have to tell people what has happened in the past," said Paul Weberg, a senior engineer in the agency's office that covers [New York State](#). "We need something to hang our hat on."

(Mr. Weberg himself made sure to buy a home in one of the highest neighborhoods on Staten Island. “As much as I like the water, I wasn’t going to buy a place south of Hylan Boulevard,” he said, referring to the island’s southern coastline.)

For New York planners, there are other options. “If there is a concern within a city or state about long-range planning or global warming,” Mr. Weberg said, “they can always go above our regulations. We go by minimum regulations. We are almost a compromise between environmentalists and builders.”

The city’s Buildings Department has been working to modernize its code for the last three years and expects to present a plan this spring.

One section will revise the criteria for deciding how much force a window should withstand. With regard to flooding, the focus will be on shoring up a small group of critical buildings — hospitals, firehouses and the like — and only those built within identified flood zones.

But if you believe that flood zones will expand along with the frequency of storms, these zones will be inadequate.

So who’s looking out for the rest of the city?

“I do a lot of work in the West Village in new construction, and the talk of storm surges is not even on the lips of anyone,” Mr. Tortorella said. “What’s in the code is flood zones that you have to obey, and you deal with that but nothing more.”

Homeowners curious about how vulnerable they are to flooding may not find even the newest FEMA maps especially useful. Besides failing to anticipate the effects of climate change, the flood zones merely calculate odds (again, based on historical data) that a particular area will be flooded. So while it may not seem very alarming that your home (or prospective home) is in a 100-year flood zone, the designation does not mean a flood will occur only once in 100 years. Instead, it means that a flood has a 26 percent chance of occurring in any 30-year period.

An arguably more useful gauge is the hurricane evacuation map that can be downloaded at the city’s Office of Emergency Management Web site, nyc.gov/html/oem/html/ready/hurricane_guide.shtml.

Dispensing with probabilities, it illustrates the areas expected to be affected by hurricane storm surges based on today’s sea levels — block by block and neighborhood by neighborhood. The agency itself takes the threat quite seriously: it not only redrew its disaster plan after Katrina, but will soon solicit designs for an urban alternative to the FEMA trailer — pods to shelter thousands of New Yorkers displaced by a disaster.

Along with global-warming talk, the hurricane map has surfaced often enough in the media to make at least some home buyers and owners aware of the potential risk. But if Lower Manhattan is an example, most people even in low-lying areas aren’t thinking about it too much.

Paddington M. Zwigard, an avid environmentalist and a downtown real estate broker with Brown Harris Stevens, just sold her \$4.15 million “green” penthouse on Chambers Street between Hudson and Greenwich Streets. Though she was long aware that its location near the river made it vulnerable to flooding — either from a hurricane or a long-term rise in sea levels — she was willing to stomach the risk to live downtown and near the river.

When she decided to sell, she thought the apartment’s location would prompt at least some questions from buyers, though when it didn’t, she suspected she knew why.

“I’ve lived downtown for 20 years, and there’s definitely a new wave of TriBeCans — younger, self-absorbed, mass-materialist consumers who are really not aware of anything outside their whatever,” Ms. Zwigard said.

She speculates that the extensive condo development has attracted a certain type of buyer: wealthier, more mobile and disinclined to look more than a few years into his or her homeownership future. Ms. Zwigard is planning to buy other apartments downtown, renovate them and sell them — betting, in effect, on others’ short-sightedness.

Wayne Tusa, a former board member of the New York chapter of the United States Green Building Council, echoed that thought. “People generally think about what’s in their face today,” he said. “You’re not thinking: ‘Gee whiz, what will happen 30 years from now? Will the value suddenly go poof because my basement is flooded three times a week?’ ”

Mr. Tusa, who lives at the edge of a 100-year flood plain, on East 90th Street between First and Second Avenues, is looking for a parking garage on higher ground. He is also considering buying a second home in the Catskills to get away from the coast.

One downtown broker, Jon Phillips, a vice president of Halstead Property, said his buyers don’t worry because they reason that “the safest place to hide is in a bank.” In other words, with so much capital at risk, if New York City flounders, they believe somebody will do something before it’s too late.

What if somebody doesn’t? Is New York one catastrophic hurricane — or a few awful northeasters — away from a huge shift in ownership?

“There are several horror stories to be written,” Mr. Tusa said.

“How does New York City survive if 20 percent of it is flooded and nothing works? What if we lose one airport, or what if the subway system doesn’t work anymore? What if the waste-water treatment systems don’t work anymore? What if 50 percent of the time there’s waves on the F.D.R.? New York City would not be habitable —that’s really the worst-case scenario. And before that begins to happen, people will make different choices like, ‘Should I move my office?’ ”

But some thoughtful voices are being heard. “The fact that the city has started raising the question now is to their credit,” said Mark E. Ginsberg, a partner in Curtis & Ginsberg Architects in Manhattan and a leader of New York New Visions, a coalition of architecture, planning and design

organizations concerned with rebuilding Lower Manhattan. “Do we deal with it before something bad happens, or as is often the case in human nature, do we deal with it after something bad happens? Look what happened to New Orleans.”

Errata: The estimated costs of storm surge barriers was misquoted and could seriously mislead government planners as to the projected construction costs of barriers. The sentence:

"Such barriers, including lock systems would cost perhaps \$10 billion each and take five to ten years to construct", should have read:

"Four barriers, including lock systems and seawalls might cost \$10 billion in total and take five to ten years to construct. Individual barriers might cost as little as \$1.5 billion".

The statement: *"If you look at the European experience," said Professor Bowman, referring to surge barriers built or under construction in the Netherlands, London and Venice, "it took up to 45 years in some cases, after a major catastrophe, before the barriers were built."*

would be more accurately stated as:*"it took from 5 years (The Netherlands) up to 44 years (Venice), after a major catastrophe, before the barriers were built".*

*Malcolm Bowman
26 March 2007*