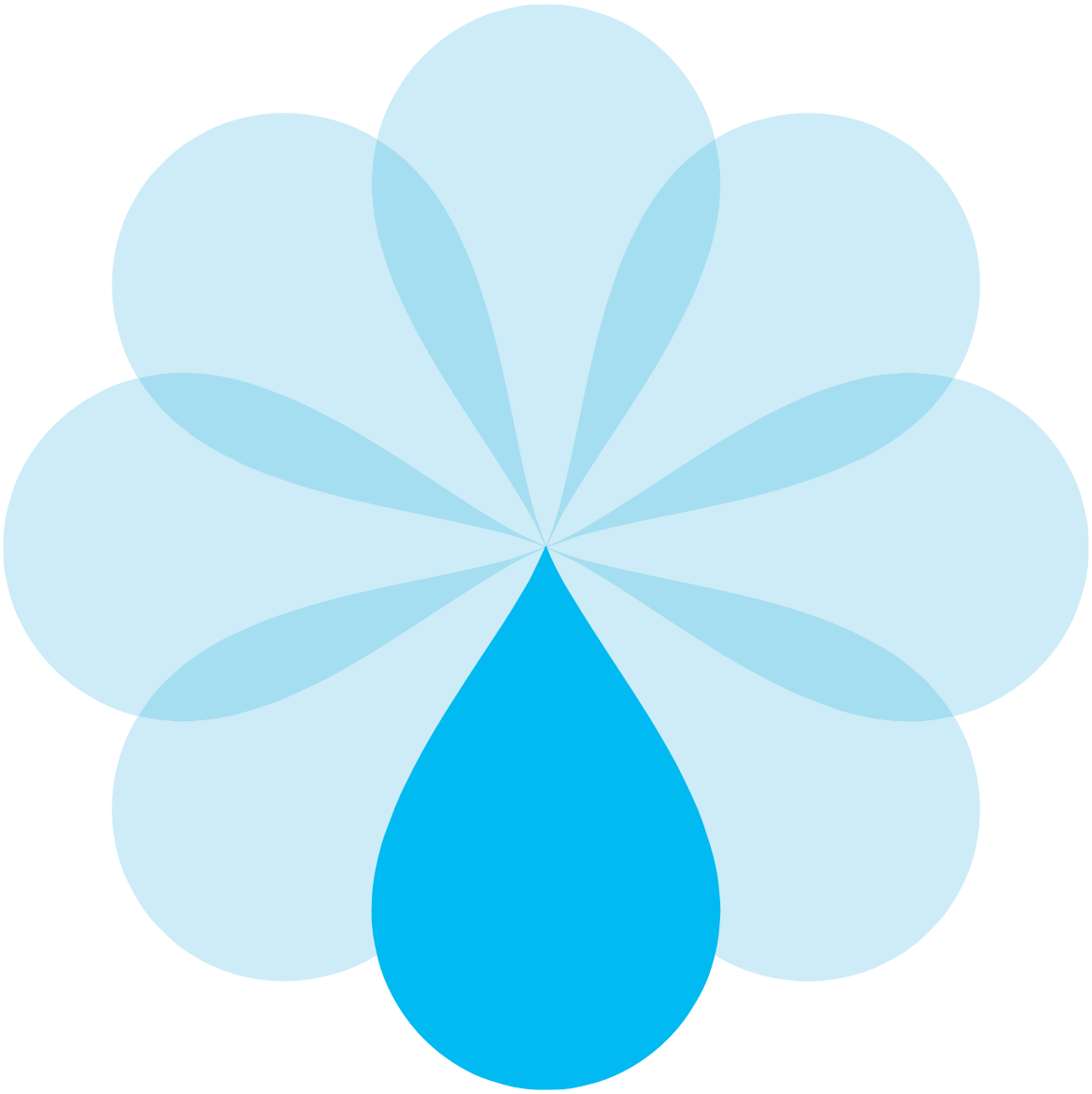
RATHER THAN THE FLOOD



By Stewart Rubin
Senior Director and Head of Strategy and Research,
New York Life Real Estate Investors

Dakota Firenze
Senior Associate,
New York Life Real Estate Investors

A comprehensive look at climate-induced water disasters and their potential impact on CRE in the US.

Flooding has been a major threat to life and property since before and especially after the advent of agrarian societies—and even more so with the rise of cities. A flood in ancient Mesopotamia was part of the plot in one of the oldest pieces of literature. In the "The Epic of Gilgamesh," Uta-Naphisti and his family are saved from a flood that engulfs their world. The impact is so dire that the other vexations of humankind are considered preferable to the damage wrought by water. The author puts the following into the mouth of one of the protagonists:

> Would that a lion had ravaged mankind — Rather than the Flood, Would that a wolf had ravaged mankind—Rather than the Flood, Would that had famine wasted the world— Rather than the Flood, Would that pestilence had wasted mankind—Rather than the Flood.[1]

Extreme weather and climate change resulting in flood damage can change the trajectory of the demographic and economic success of cities. As the US enters the third decade of the twenty-first century, flood damage caused by environmental factors has begun to take on greater importance.

This article will cite several examples of historical changes engendered by flood damage and then explore which US cities are most exposed to this risk and how that risk may magnify over the next twenty years.

As the twentieth century dawned, it was not clear if Galveston or Houston would be the premier city of the Texas coast. At the turn of the previous century, one would not have been thought unreasonable if one predicted that the winner would be Galveston. Galveston had among the highest per capita income levels in the US.[2] In 1899, it was the third largest port in the US (measured by use) and was served by forty-five steamship lines. The city benefitted from its natural harbor and was the major center for trade in Texas and it hosted sixteen consulates. The city itself grew by 30% in the previous decade and as of 1900, the city of Galveston had 38,000 while the city of Houston had 45,000 people. However, as of 2018, the city of Galveston had 50,000 people while the city of Houston had 2.3 million people.

What caused the astonishing difference in growth trajectories? In 1900, the Great Galveston Hurricane effectively destroyed the city of Galveston. The hurricane resulted in approximately 8,000 fatalities and left approximately 10,000 people homeless. Approximately 7,000 buildings in Galveston were destroyed, including 3,636 homes. The catastrophe ended the Texas coast competition for primacy, as shocked potential investors pivoted to Houston. Climate impacts economic history, and Houston became the economic engine for southeast Texas.[3]

EXHIBIT 1: POPULATION IN HOUSTON AND GALVESTON

Source: US Census Bureau

YEAR	HARRIS COUNTY	CITY OF HOUSTON	GALVESTON COUNTY	CITY OF GALVESTON
1900	63,786	44,633	44,116	37,789
2018	4,602,523	2,295,982	327,089	50,039

RECENT WATER CATASTROPHES

Hurricane Katrina caused more than 1,800 deaths and $125 billion in damage in August 2005, principally in the New Orleans area.

In 2005, the city of New Orleans represented by Orleans Parish had a population of 494,294. In 2006, in the aftermath of Katrina, the population declined 53.4% to 230,172. As of 2019, the population stands at 390,144—still 21% lower than it was pre-Katrina. A similar trend is evident in the Greater New Orleans metro area, with the 2019 population still 9% lower than its 2005 level.[4]

In October 2012, Hurricane Sandy inflicted approximately $65 billion in damage on the northern Atlantic coast.[5] New York and New Jersey were particularly impacted when storm surge hit New York City, flooding streets, tunnels, and subway lines, and cutting power. Large sections of Lower Manhattan, including Battery Park, were flooded when the East River overflowed its banks. Homes, buildings, roadways, boardwalks, and mass transit facilities in low-lying coastal areas of the outer boroughs of Queens, Brooklyn, and Staten Island were flooded by Atlantic Ocean surges. There were 53 Sandy-related deaths in the state of New York.[6] Approximately 100,000 residences on Long Island were destroyed or severely damaged, including 2,000 that were rendered uninhabitable.[7] Despite the heavy damage, New York's population was far more resilient than New Orleans in the wake of Katrina. New York City's population remained virtually unchanged between 2012 and 2019. The population of hard-hit Manhattan, Staten Island, and Nassau County actually increased 0.6%, 1.2%, and 0.6%, respectively, during the same time period.[8] The impact on New York was not permanent. New York continues to be a dominant US city.

In 2017, Hurricane Harvey caused catastrophic flooding resulting in $125 billion damage, primarily from rainfall-triggered flooding in the Houston metro area.[9] In a four-day period, many areas received more than 40 inches of rain, and the subsequent deluge inundated thousands of homes, which displaced more than 30,000 people and caused 106 deaths.[10] Despite this, the population of Houston and Harris County grew 0.2% and 0.8% between 2017 and 2019.[11]

Climate-induced catastrophes do not have the same lasting effect on all places, but they all have potential impact. There are many considerations that factor into the long-term prospects of water damage, including the number and importance of structures destroyed, economic and fiscal strength, and potential for recurrence. Weather-related water damage changed the fortunes of Galveston and left a negative impact on New Orleans—even 15 years after the event. Climate-induced flooding may negatively impact CRE in certain major metro areas and may even permanently alter their host city's economic future.

According to a recent report by the Urban Land Institute/ Heitman Institutional Realty Partners,[12] developers and investors are increasingly considering water damage potential in their capital deployment strategies. Included in their analysis is assessing how prepared local jurisdictions are to mitigate and react to catastrophic events. Many investors are seeking markets where "governments have the authority, function, and funding to address climate risk, whether at the municipal-government level or through supportive national policies and practices."[13]

THE NEGATIVE IMPACT OF FLOODING

The gradual increase in sea levels can adversely impact demand for CRE in coastal areas. Flooding negatively impacts CRE values in obvious and not so apparent ways. It impacts the size of the universe of potential investors. Certain investors have stated that they will not invest in parts of New York, Florida, and other locations for fear of climate-related risk. In addition to rent and occupancy being lower in buildings exposed to flooding, expenses such as insurance, repair and maintenance, and capital reserves are higher. Businesses may suffer losses resulting from property downtime and business disruption.

Insurance increases are noticeable over the past three years. In many markets, commercial insurance rose as high as 10% to 20% between 2019 and 2020, though many insurance companies believe premiums must rise higher to cover costs. Numerous owners and lenders are expecting further increases of the same magnitude or higher for 2020 and 2021. Many insurance companies do not offer or are limiting coverage in high-loss areas. Some major insurers are exiting certain markets.[14] This will certainly result in upward pricing pressure. The insurability of certain markets over the long-term may be called in to question. Insurance rates and market exits may be an additional measure of the relative risk and exposure of certain markets to climate risk.

The negative implications of high exposure to flooding, hurricanes, and tornados is not limited to the destruction of the building itself. Even if the building is free of risk (built high and structurally strong and redundant), the area may become flooded and the asset inaccessible. Should the asset remain accessible—the area will not be desirable, because businesses, retail stores, restaurants, and bars are situated on flooded streets or destroyed. They will not have the benefit of networking with other businesses in the area. Therefore, it is important to widen the focus beyond building resiliency to the infrastructure of the district, the city and even the metro area in which the property exists.

Particularly vulnerable property types include luxury apartments, hotels, and associated retail. Luxury apartment towers are frequently situated near the ocean for views. Hotels and accompanying retail are frequently placed near beaches. Higher sea levels and storm activity can pose a risk for short-term disruption as well as long-term value diminution.

Macro costs may include higher taxes to pay for flood remediation efforts such as sea walls, levees, and pumping systems. Negative impacts may include lower economic activity, declining values, and less investment. Entire districts may become low investment zones. Lower municipal bond ratings, and as consequence, higher borrowing costs, may ensue.

MOST AND LEAST EXPOSED METROS

In order to gauge potential current and future damage to American metros, we utilized the First Street Foundation Flood Factor data.[15] Many coastal cities, with their business districts close to sea level, are exposed. This is to be expected, because the economic vibrancy of many of these urban areas was predicated on having a deep-water port which facilitated the flow of immigrants, finished goods, and raw material. Not surprisingly, New Orleans was the most exposed to potential flooding risk in 2020 with almost all (98%) of its of its properties at risk. As *Exhibit 2* shows, The Florida cities of Ft. Lauderdale, Miami, St. Petersburg, and Tampa take four out of the next six risk positions. Sacramento, Charleston, Fresno, Houston, and Norfolk round out the balance of the top ten. (It is important to note that coastal flooding does not account for all the water damage risk. Fluvial, pluvial, storm surge, and tidal effects are sources of hazard that propel Sacramento, Fresno in to the top ten.)

EXHIBIT 2: TOP 20 SHARE OF PROPERTIES AT RISK OF FLOODING IN 2020

Source: First Street Foundation

		PROPERTIES AT RISK	
		NUMBER	PERCENT
1	New Orleans, LA	148,197	98%
2	Fort Lauderdale, FL	43,762	80%
3	Sacramento, CA	101,792	68%
4	Charleston, SC	29,469	59%
5	Miami, FL	34,932	52%
6	St. Petersburg, FL	40,252	47%
7	Tampa, FL	58,414	43%
8	Fresno, CA	54,255	39%
9	Houston, TX	186,481	32%
10	Norfolk, VA	18,042	27%
11	Buffalo, NY	24,613	26%
12	Chicago, IL	154,824	26%
13	San Jose, CA	56,243	25%
14	Camden, NJ	7,000	25%
15	Salt Lake, UT	15,584	23%
16	Bridgeport, CT	5,836	21%
17	Los Angeles, CA	132,046	20%
18	Portland, OR	45,951	20%
19	Virginia Beach, VA	28,943	20%
20	Boston, MA	19,177	19%

Houston, Chicago, Los Angeles, and New York emerge as risk-exposed cities when considering the number of vulnerable properties and, as a corollary, the potential damage.

When the high value of CRE in these expensive cities is taken in to account the cost of their elevated exposure becomes even more apparent. The adjacent exhibits emphasize that point.

Large portions of CRE value are situated in areas at high risk of being impacted by coastal flooding resulting from a rise in sea-level. *Exhibit 4* details metro areas ranked by the value of their aggregate CRE.

EXHIBIT 3: TOP 20 NUMBER OF PROPERTIES AT RISK OF FLOODING IN 2020

Source: First Street Foundation

		PROPERTIES AT RISK	
		NUMBER	PERCENT
1	Houston, TX	186,481	32%
2	Chicago, IL	154,824	26%
3	New Orleans, LA	148,197	98%
4	Los Angeles, CA	132,046	20%
5	New York, NY	121,202	14%
6	Sacramento, CA	101,792	68%
7	Phoenix, AZ	62,351	13%
8	Tampa, FL	58,414	43%
9	San Jose, CA	56,243	25%
10	Fresno, CA	54,255	39%
11	Philadelphia, PA	53,378	10%
12	Jacksonville, FL	48,408	14%
13	Portland, OR	45,951	20%
14	Fort Lauderdale, FL	43,762	80%
15	St. Petersburg, FL	40,252	47%
16	Detroit, MI	39,744	10%
17	Miami, FL	34,932	52%
18	Indianapolis, IN	34,124	11%
19	Nashville, TN	33,153	13%
20	Memphis, TN	32,455	14%

EXHIBIT 4: TOTAL ASSET VALUE OF CRE BY MARKET; TOP 20

Source: CoStar Group

		VALUE ($)
1	New York, NY	1,587,917,209,600
2	Los Angeles, CA	893,578,084,352
3	Washington, DC	452,783,296,512
4	Chicago, IL	404,237,230,080
5	Dallas-Fort Worth, TX	367,990,964,224
6	Boston, MA	338,198,601,728
7	San Francisco, CA	329,007,390,720
8	Seattle, WA	326,054,211,584
9	Houston, TX	295,095,619,584
10	Orange County, CA	275,966,005,248
11	San Jose, CA	266,311,688,192
12	Atlanta, GA	251,505,479,680
13	San Diego, CA	221,729,640,448
14	Philadelphia, PA	215,030,091,776
15	East Bay, CA	204,616,359,936
16	Inland Empire, CA	198,887,399,424
17	Phoenix, AZ	186,438,197,248
18	Denver, CO	180,460,879,872
19	Miami, FL	166,434,390,016
20	Portland, OR	143,102,070,784

Note: Total Asset Value includes Multifamily, Industrial, Office and Retail asset data as of Q3 2020

The geographies most exposed are situated on the Gulf Coast, Atlantic Coast, Pacific Coast, around the Great Lakes, the Great Salt Lake, and certain low-lying and river-adjacent areas. Cities with high CRE value, including New York, Los Angeles, Chicago, Boston, Houston, San Jose, and Miami are among the most exposed to water damage. In many of these urban conurbations, a substantial portion of CRE is in CBDs and/or located close to bodies of water.

In contrast, there are cities that front oceans and lakes that are not nearly as exposed. These include Milwaukee, Seattle, Cleveland, San Diego, and San Francisco. Desert-bound Tucson and Las Vegas, as well as land-locked Greensboro, NC, and Denver, CO, are also amongst those least likely to suffer substantial flood damage.

EXHIBIT 5: BOTTOM 20 SHARE OF PROPERTIES AT RISK OF FLOODING IN 2020

Source: First Street Foundation

		PROPERTIES AT RISK	
		NUMBER	PERCENT
56	Milwaukee, WI	12,203	8%
57	Oklahoma, OK	19,852	8%
58	Omaha, NE	12,616	8%
59	Seattle, WA	13,977	8%
60	Fort Worth, TX	20,648	8%
61	Charlotte, NC	17,545	7%
62	Cleveland, OH	12,261	7%
63	Dallas, TX	21,687	7%
64	Raleigh, NC	8,469	7%
65	Richmond, VA	5,067	7%
66	San Antonio, TX	30,587	7%
67	Baltimore, MD	13,705	6%
68	Columbus, OH	17,728	6%
69	Las Vegas, NV	11,947	6%
70	Wilmington, DE	1,590	6%
71	Denver, CO	10,136	5%
72	Greensboro, NC	5,121	5%
73	San Francisco, CA	7,839	5%
74	San Diego, CA	10,434	4%
75	Tucson, AZ	5,404	3%

EXHIBIT 6: BOTTOM 20 NUMBER OF PROPERTIES AT RISK OF FLOODING IN 2020

Source: First Street Foundation

		PROPERTIES AT RISK	
		NUMBER	PERCENT
56	Denver, CO	10,136	5%
57	Grand Rapids, MI	9,448	15%
58	Raleigh, NC	8,469	7%
59	San Francisco, CA	7,839	5%
60	St. Paul, MN	7,345	10%
61	Camden, NJ	7,000	25%
62	Rochester, NY	6,953	11%
63	Newark, NJ	6,790	15%
64	Stamford, CT	5,836	21%
65	Worcester, MA	5,424	13%
66	Tucson, AZ	5,404	3%
67	Providence, RI	5,176	13%
68	Greensboro, NC	5,121	5%
69	Richmond, VA	5,067	7%
70	Stamford, CT	4,803	19%
71	Jersey City, NJ	4,668	9%
72	Columbia, SC	3,927	10%
73	Hartford, CT	3,689	19%
74	New Haven, CT	2,944	12%
75	Wilmington, DE	1,590	6%

CLIMATE CHANGE AND INCREASED FLOODING EXPOSURE

The Arctic sea ice covered 1.4 million square miles in September 2020—the second smallest range of coverage since satellite monitoring began forty years ago.[17] The figure marks the second time that Arctic sea ice dropped below 1.5 million square miles.[18] This key metric for climate change reveals that the low in 2020 was more than 40% below the average from 1981 to 2010. The fourteen years with the lowest sea-ice area have all occurred in the last fourteen years.[19] Scientists have found that airborne industrial pollution gets captured in snowfall on the glaciers where the black soot sharply diminishes the reflectivity of the ice, which melts into pools, which absorb heat, and melt more ice in a continuous cycle. The meltwater runs down through cracks to the bedrock where it acts like a lubricant to help slide the glacier into the sea where it becomes a giant iceberg that instantly raises sea levels.[20]

Since 1880, the global average sea level has risen eight to nine inches.[21] Melting Arctic ice is expected to speed up sea level rise. Should oceans rise substantially higher, major coastal cities would flood. It is likely that waterfront property in low lying areas will be at serious risk over ten to thirty years. In addition, hurricanes and cyclones have become stronger over the past several years.

Coastal flooding is growing because of the increased frequency of high-tide flooding, the greater magnitude of extreme weather events, and topographical changes. The increases in high-tide flooding and the greater magnitude of extreme weather are likely caused by global warming. Topographical changes, including land subsidence, is caused by commercial and residential development as well as oil and gas extraction.[22]

The list of cities projected to be most at risk in 2050 includes some of the same ones noted in 2020. What is particularly of note is the magnitude of change for cities at various levels of current risk. For example, the number of properties exposed in Jersey City, NJ is expected to increase 205% by 2050. Norfolk, VA risk is expected to grow by 200% by 2050, resulting in a jump from the tenth to the third spot on the risk list. Other notable increases in risk exposure include Virginia Beach (80%), Boston (45%), New York (38%), Jacksonville (32%), and Wilmington, DE (32%).

EXHIBIT 7: TOP 20 CHANGE IN PROPERTIES AT RISK OF FLOODING, 2020–2050

Source: First Street Foundation

		PROPERTIES AT RISK	
		NUMBER	PERCENT
1	Jersey City, NJ	9,585	205.0%
2	Norfolk, VA	36,012	199.6%
3	Virginia Beach, VA	23,182	80.1%
4	Boston, MA	8,642	45.1%
5	New York, NY	45,673	37.7%
6	Jacksonville, FL	15,705	32.4%
7	Wilmington, DE	509	32.0%
8	Atlanta, GA	3,567	26.4%
9	Bridgeport, CT	1,370	23.5%
10	Stamford, CT	1,126	23.4%
11	New Haven, CT	649	22.0%
12	San Francisco, CA	1,482	18.9%
13	Fort Lauderdale, FL	7,505	17.1%
14	Newark, NJ	1,028	15.1%
15	Camden, NJ	1,005	14.4%
16	Tampa, FL	15,199	13.7%
17	Philadelphia, PA	7,183	13.5%
18	Miami, FL	4,696	13.4%
19	Baltimore, MD	1,673	12.2%
20	Charleston, SC	3,605	12.2%

Eight states along the eastern seaboard have lost a total of US$14.1 billion in home values in coastal areas because of sea-level-rise flooding since 2005.

According to several studies cited by the Urban Land Institute, "The impacts of the actual and perceived risks of climate change are already beginning to be reflected in residential market pricing. Studies published in 2017 and 2018 looking at the US, Germany, and Finland found that homes exposed to flood risk or sea-level rise have sold for less than comparable properties or have seen values increase at a reduced rate in comparison to similar properties without flood risk."[23] The First Street Foundation's Flood Factor data showed in 2018 that eight states along the eastern seaboard have lost a total of US$14.1 billion in home values in coastal areas because of sea-level-rise flooding since 2005.[24] Cities that can demonstrate that they are fiscally strong, prepared for an emergency, and invest in protective infrastructure, may be better positioned.

PLANNING FOR FUTURE RISKS

Damage from coastal flooding, fluvial, pluvial, storm surge, industrialized groundwater extraction, and tidal sources are significant risks in certain metro areas. New Orleans, plus four Florida cities, take five out of the top seven risk positions ranked by share of metro properties. In terms of number of exposed properties, Houston, Chicago, New Orleans, Los Angeles, and New York are the most at risk. Historically, there have been times when extreme weather resulting in flood damage changed the fortunes of cities. Climate change is placing formerly and relatively safe areas at risk and will likely alter investment decisions. The gradual increase in sea levels can adversely impact demand for CRE in coastal areas. Jersey City, NJ as well as the Hampton Roads cities of Norfolk and Virginia Beach are expected to see the greatest increase in water damage exposed properties over the next twenty years.

The impact of significant water damage potential on CRE values is reflected in lower rent and occupancy as well as the higher costs of insurance, repair and maintenance, and capital reserves. The potential likelihood of catastrophic water damage will impact the size of the universe of possible investors in exposed areas.

Investors need to be cognizant of water disaster potential not only in target properties but also in the asset area. The magnitude of water damage risk is a major consideration in twenty-first century CRE investing. It is important to differentiate short-term interruption from long-term secular consequences. Likewise, it is vital to bifurcate the practical risk implications of investing with a seven- to ten-year holding period verses an investment horizon that would not concern the grandchildren of anyone living today.

Read more and get a city-by-city analysis of key metros at *afire.org/summit/ratherthantheflood*

ABOUT THE AUTHORS

Stewart Rubin is Senior Director and Head of Strategy and Research, and Dakota Firenze is a Senior Associate, for New York Life Real Estate Investors, a division of NYL Investors LLC, a wholly-owned subsidiary of New York Life Insurance Company.

DISCLOSURE

NOTES

[1] Unknown ancient Mesopotamian authors, N.K. Sandars (translator, introduction) The Epic of Gilgamesh, The Story of the Flood, (Penguin Classics 1987), circa 1,800 BCE, Page 112

[2] "Galveston marks anniversary of disaster". Longview News-Journal. Longview, Texas. Associated Press. September 9, 2000. p. 4A.

[3] Eric Larson, Isaac's Storm, A Man, a Time, and the Deadliest Hurricane in History, (Random House, 2011)

[4] US Census Bureau

[5] nhc.noaa.gov/news/UpdatedCostliest.pdf

[6] Centers for Disease Control and Prevention (May 24, 2013). "Deaths Associated with Hurricane Sandy — October–November 2012". Centers for Disease Control and Prevention Morbidity and Mortality Weekly Report. Retrieved October 13, 2020.

[7] newsday.com/long-island/officials-sandy-destroys-more-than-2-000-li-homes-1.4316744

[8] US Census Bureau; the fact that the populations of Queens and Kings Counties declined by 0.8% and 0.2% during the observation period was not necessarily the result of the damage inflicted on coastal areas.

[9] nhc.noaa.gov/news/UpdatedCostliest.pdf

[10] teamcomplete.com/hurricane-harvey/

[11] US Census Bureau

[12] americas.uli.org/research/centers-initiatives/urban-resilience-program/climate-and-real-estate-investment/

[13] americas.uli.org/research/centers-initiatives/urban-resilience-program/climate-and-real-estate-investment/

[14] AIG and Zurich, have begun to considerably pull back exposure from certain markets prone to catastrophe losses (Charlie Wood, "US Flood Risk Awareness Increasing as major insurers pull back", Reinsurance News, September 26, 2019

[15] The First National Flood Risk Assessment, Defining America's Growing Risk, First Street Foundation, 2020: "The model was produced in partnership with researchers and hydrologists from First Street Foundation; Columbia University; Fathom; George Mason University; Massachusetts Institute of Technology; Rhodium Group; Rutgers University; The University of California, Berkeley; and University of Bristol. This collaboration makes use of open government data and builds upon decades of research, modeling, and expertise, brought together to develop a high-resolution, property-specific flood risk information at a national scale. First Street Foundation is a non-profit research and technology group committed to defining America's flood risk. The Foundation provides this information for every property in the contiguous US, in a format that is publicly and freely accessible via Flood Factor™, an online database and visualization tool(www.floodfactor.com). The tool presents past, present and future flood risk with particular attention paid to recent and projected environmental changes contributing to flood risk. The public availability of this data is a benefit for property owners, and the wider public, as it represents the first freely available data of its kind across the nation."; According to First Street Foundation, the model has certain advantages over FEMA maps as it contemplates the risk from any type of flooding event by considering inundation from fluvial (riverine), pluvial (rainfall), storm surge, and tidal sources. The national results indicate that the First Street model generally captures approximately 1.7 times as many properties at risk as the FEMA SFHA designation. An analysis of these differences reveals that the inclusion of pluvial flood risk, sea level rise, and ungauged streams are responsible for most of this additional risk

[16] As with all such references in this report—exposure is based on First Street data.

[17] Laura Millan Lombrana and Eric Roston, "Arctic Sea Ice Shrank to Its Second-Lowest Level on Record", Bloomberg News, September 21, 2020

[18] nsidc.org/arcticseaicenews/

[19] Laura Millan Lombrana and Eric Roston, "Arctic Sea Ice Shrank to Its Second-Lowest Level on Record", Bloomberg News, September 21, 2020

[20] nsidc.org/cryosphere/glaciers/life-glacier.html and nrdc.org/onearth/greenland-new-black and metro.co.uk/2020/09/14/42-3-square-mile-ice-shelf-breaks-off-greenland-glacier-amid-rising-temperatures-13271484/

[21] climate.gov/news-features/understanding-climate/climate-change-global-sea-level#:~:text=Global%20mean%20sea%20level%20has,of%20seawater%20as%20it%20warms

[22] First Street Foundation, The First National Flood Risk Assessment, Defining America's Growing Risk, 2020

[23] As cited by americas.uli.org/research/centers-initiatives/urban-resilience-program/climate-and-real-estate-investment/ - Asaf Bernstein, Matthew Gustafson, and Ryan Lewis, "Disaster on the Horizon: The Price Effect of Sea Level Rise," Journal of Financial Economics (forthcoming), published online May 4, 2018; First Street Foundation, "As the seas have been rising, Tri-State home values have been sinking," August 23, 2018; Jesse H. Keenan, Thomas Hill, and Anurag Gumber, "Climate gentrification: from theory to empiricism in Miami-Dade County, Florida," Environmental Research Letters 13, April 23, 2018; Jens Hirsch and Jonas Hahn, "How flood risk impacts residential rents and property prices: an empirical analysis," Journal of Property Investment & Finance, 36, no. 1 (2017), 50–67; Athanasios Votsis and Adriaan Perrels, "Housing Prices and the Public Disclosure of Flood Risk: A Difference-in-Differences Analysis in Finland," Journal of Real Estate Finance Economics 53, no. 4 (November 2016), 450–471.

[24] Jameelah Robinson, "Real Estate Investors Want to Know What Cities Are Doing About Climate Risks", Bloomberg News, October 30, 2020

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