WHITE PAPER

How Physical Climate Risk is Shaping the Future of US Housing

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According to the latest report by the UN's Intergovernmental Panel on Climate Change (IPCC), the Earth's climate is changing more rapidly than previously thought. Rising concentrations of greenhouse gases in the atmosphere are driving an increase in average global temperatures, placing the world on a more severe temperature projection. As average temperatures rise, physical risk perils such as heatwaves, droughts, and storms will intensify, leading to greater socioeconomic costs for communities around the world.

This growing level of physical climate risk poses significant threats to the US housing market and related actors. In this three-part series, BCG® and CoreLogic® provide a comprehensive overview of the impact that physical perils will have on the residential housing market in the US, and actions stakeholders can take to mitigate and manage this risk.

Physical Climate Risk: A Multi-Billion Dollar Threat

The US housing market was valued at $43 trillion at the end of 2022.[1] It is one of the largest asset classes in the world and a significant source of wealth accumulation for the US population.[2] It is also – like many other real assets in the world – facing significant and rising threats from physical climate risks.

According to CoreLogic's Climate Risk Analytics solution, **annual expected losses from weather-related damage to residential properties (single- and multi-family) are approximately $59 billion today, rising to over $72 billion in 2050, a nearly 22% increase.[3] (See Exhibit 1.) These figures are significant. $60 billion in average annual losses in 2023 is roughly equivalent to:**

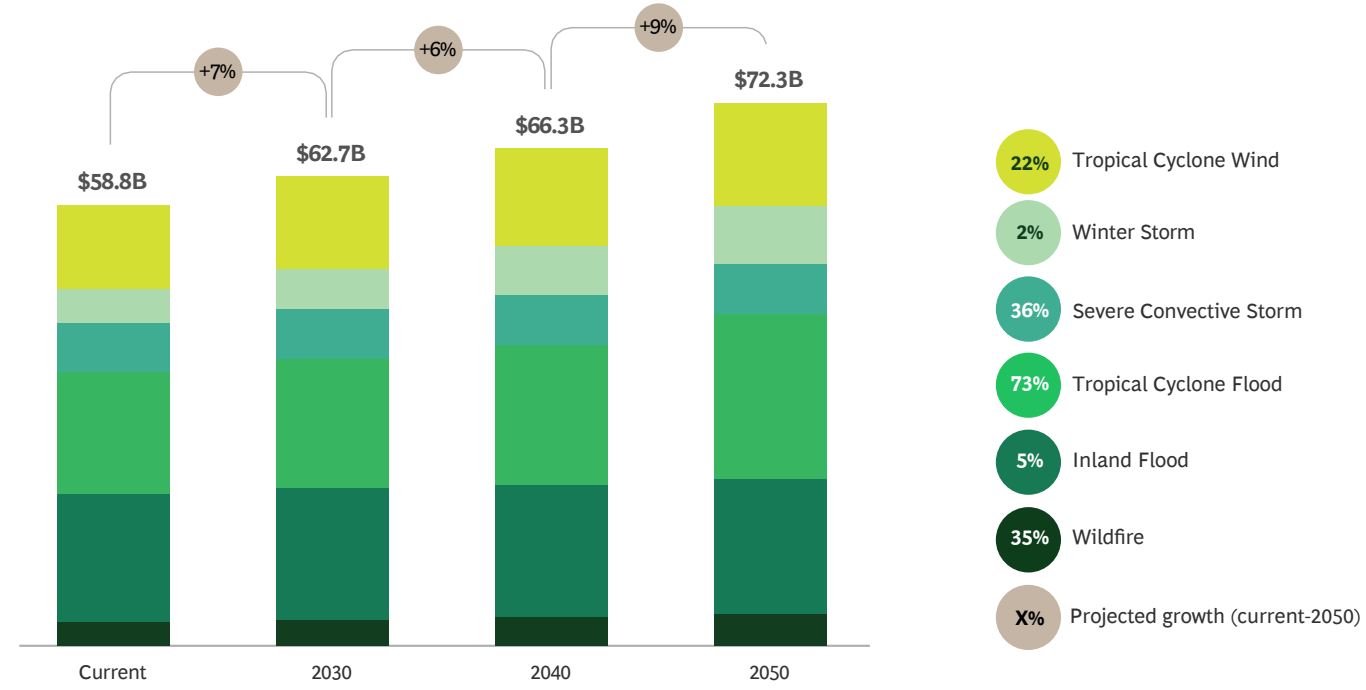
- 2% of annual household expenditure on housing ($3 trillion in 2021), 10% of annual household expenditure on utilities, fuels, and public services for homes ($564 billion), and 8% of annual household expenditure on healthcare ($728 billion).[4]

- 40% of the total estimated losses from "billion-dollar weather events" in the US as estimated by the National Oceanic and Atmospheric Administration.[5]

1. Office of the Economist, Corelogic.
2. In 2020, home equity was the second largest source of household wealth (27.8%) after retirement accounts (36.2%). Figures exclude households in the top 1% of wealth. See US Census Bureau, 2021 Survey of Income and Program Participation, public-use data.
3. All analyses in this white paper rely on the Representative Concentration Pathway (RCP) 4.5 climate science scenario. RCP 4.5 is described by the IPCC as a moderate scenario in which emissions peak around 2040 and then decline. The climate modeling community has developed other RCPs, but until mid-century the differences in outcomes between the RCPs are attenuated.
4. 2021 figures, Bureau of Labor Statistics, available at: https://www.bls.gov/opub/reports/consumer-expenditures/2021/home.htm.
5. Based on NOAA figures from 2020-2022; NOAA has estimated the total losses from billion-dollar events in these years to be roughly $150 billion per year. NOAA, Billion Dollar Weather & Climate Disasters, https://www.ncei.noaa.gov/access/billions/summary-stats/US/2020-2022.

Exhibit 1: The Cost of Climate-Related Disasters is Expected to Increase

Annual expected losses to residential housing



Source: CoreLogic; Projections based on RCP 4.5 scenario; Data includes single- and multi-family residential properties

While the rising cost of physical climate risks is generally understood, many misconceptions remain. Dispelling five key misconceptions can help illuminate the full scope of the problem and move toward effective solutions.

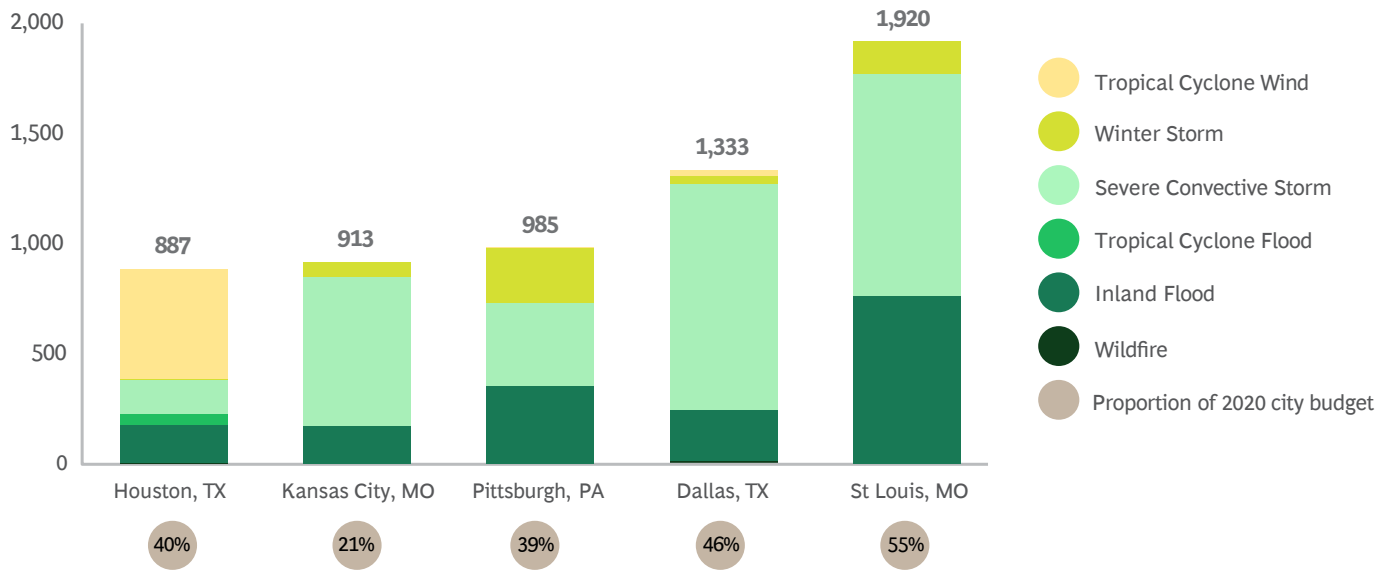
Misconception #1: Physical climate risks are mostly a "coastal" issue – the rest of the country doesn't face the same risks

The impact of climate perils is more pronounced in certain geographies, but not always in the coastal markets that make the headlines. For example, Houston has received significant media attention due to Hurricane Harvey, an unprecedented flood that affected hundreds of thousands of homes and caused $125 billion in damage.[6] In fact, there are many inland cities with higher annual per capita expected losses than Houston. (See Exhibit 2.) These cities are not heavily exposed to tropical cyclone winds, the peril that drives most of Houston's expected losses. Severe convective storms (i.e. thunderstorms), which result from heat causing moist air to rise from the surface of the Earth, account for a higher proportion of losses in these inland cities. In Dallas and St. Louis, convective storms alone are projected to result in more expected losses per capita than all of Houston's climate perils combined.

6. National Hurricane Center.

Exhibit 2: Inland Areas will also be Significantly Impacted by Climate Risk

Annual per capita expected losses ($)



Source: CoreLogic; Lincoln Institute FiSC database (provided by US census bureau); Projections based on RCP 4.5 scenario for year 2030

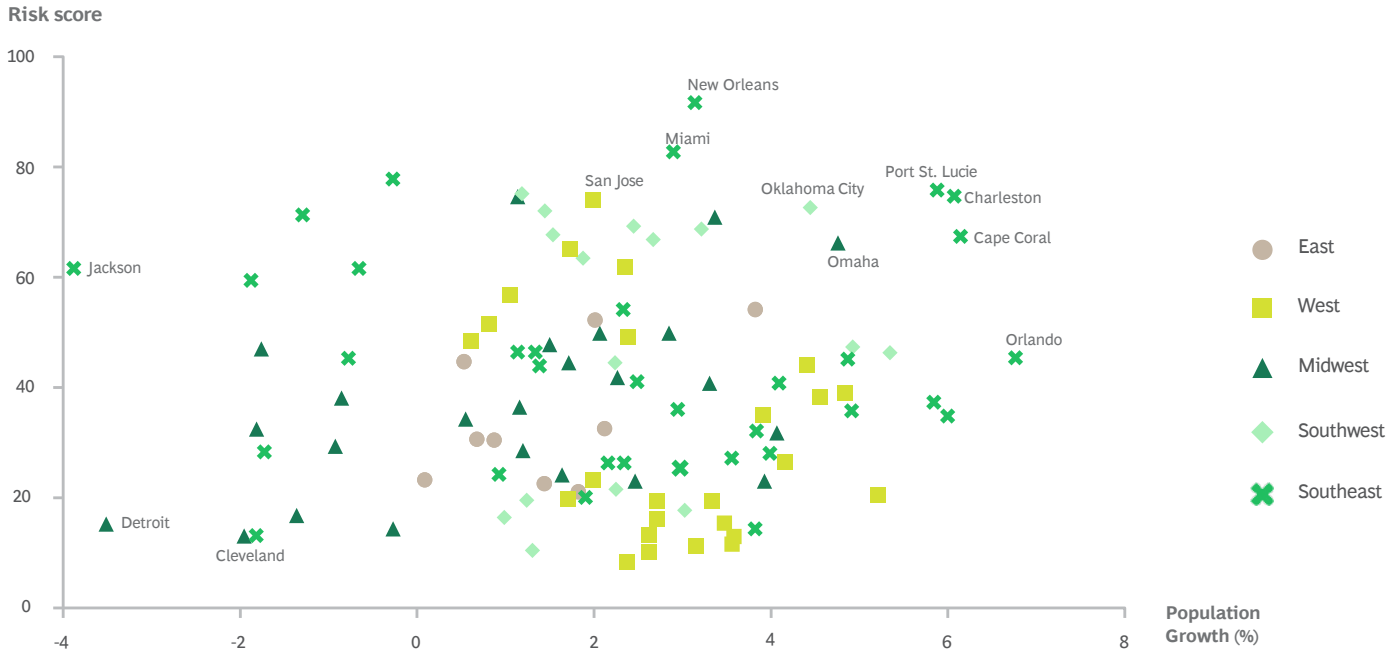
Misconception #2: Homeowners are responding to climate threats by moving out of risky areas and into less risky ones

Retreat due to climate-related events is also widely covered in the media, and in recent decades, the Federal Emergency Management Agency (FEMA) and other agencies have funded thousands of voluntary buyouts of flood-prone properties.[7] However, such instances tend to be the exception rather than the norm.

Many of the fastest-growing major metro areas across the US are also highly exposed to the effects of climate change. On the coast, Charleston (South Carolina), Port St. Lucie (Florida), and Cape Coral (Florida) all experienced over 6% population growth between 2020 and 2023 despite having relatively higher climate risk levels. Inland, Omaha (Nebraska) and Oklahoma City (Oklahoma) have had 4-5% population growth over the same period and also face relatively higher climate risk.[8] (See Exhibit 3.) There are many other examples of high population growth in cities with relatively high levels of physical climate risk (mostly concentrated in the southeast and southwest of the country), suggesting that individuals may not be aware of, and/or are not fully factoring in, climate risk when deciding where to live.

7. "Managed Retreat Through Voluntary Buyouts of Flood-Prone Properties," Science Advances, October 9, 2019, https://www.science.org/doi/10.1126/sciadv.aax899.
8. Climate risk levels are measured here based on Composite Risk Score (CRS). CRS is a metric developed by CoreLogic to represent aggregate climate risk across nine major perils. These include the after-effects of earthquakes such as tsunami and fire. Also abstracted into other composites are rolled-up perils such as flood, earthquake, and non-flood weather.

Exhibit 3: Many High-risk Areas also Have High Population Growth



Source: CoreLogic, US Census Bureau; Composite Risk Score is a metric that represents aggregate climate risk across nine major perils, inclusive of the after-effects of earthquakes such as tsunamis and fire following; Data presented here are for CBSAs; Projections based on RCP 4.5 scenario for year 2050

Misconception #3: Physical climate risk impacts all socioeconomic groups to the same degree

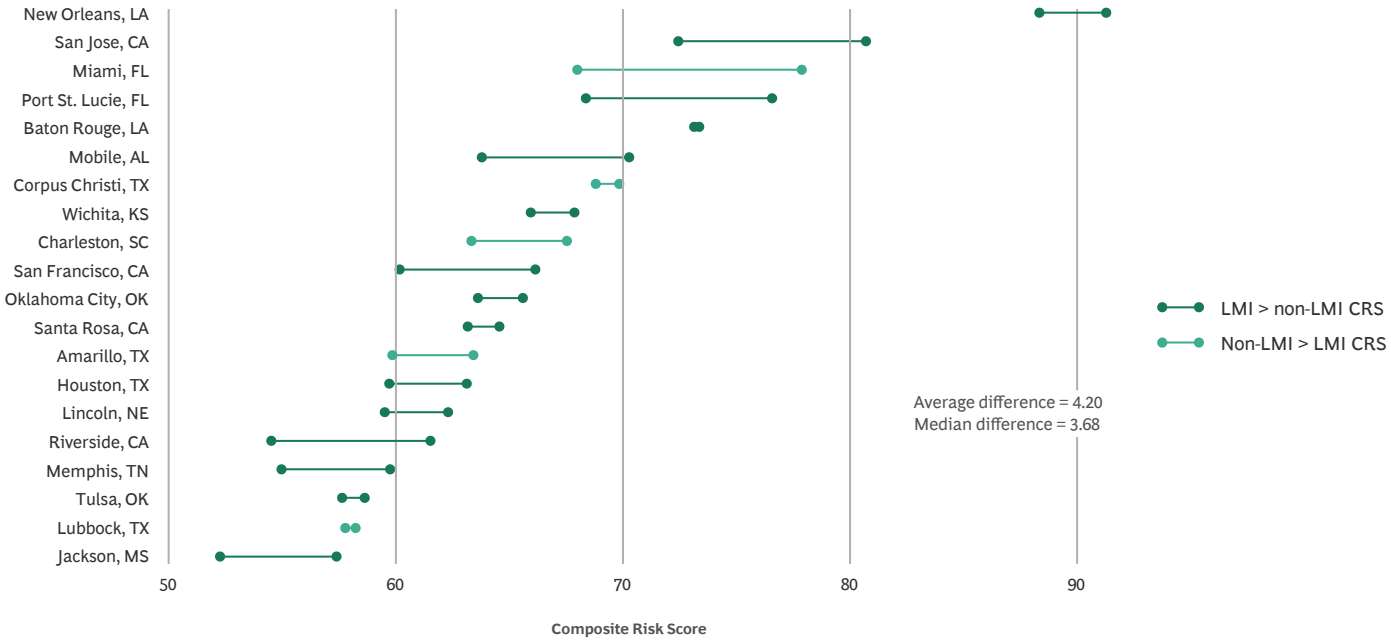
Existing research shows that households more likely to be struggling financially pre-disaster are harder hit, financially speaking, by natural disasters. They have higher declines in credit scores and greater mortgage delinquency rates after a disaster hits.[9] This is primarily because those with less of a financial buffer struggle to absorb the shock of the event.

There is a (secondary) compounding factor that is less well known: households in low-to-moderate income (LMI) communities tend to face higher levels of climate risk than households in non-LMI communities – even within the same city.[10] (See Exhibit 4.) Looking at a sample of 20 large metro areas with high levels of overall risk, we find that in most (15 of 20) cases, LMI communities have higher average risk than non-LMI communities in the same city. The magnitude of the risk differential between LMI and non-LMI communities varies across cities and is likely driven by historical zoning and settlement patterns that have tended to disfavor lower income populations.

9. See, e.g., "From Bad to Worse: Natural Disasters and Financial Health," Journal of Housing Research, November 30, 2020, https://www.tandfonline.com/doi/full/10.1080/10527001.2020.1838172.

10. Analysis again relies on the CRS metric from CoreLogic, which includes nine major perils and is inclusive of the after-effects of earthquakes such as tsunami and fire following.

Exhibit 4: LMI Communities Often Have Higher Exposure to Climate Risk



Source: CoreLogic; Composite Risk Score is a metric that represents aggregate climate risk across nine major perils, inclusive of the after-effects of earthquakes such as tsunamis and fire following; Data presented here are for CBSAs; Projections based on RCP 4.5 scenario for year 2050

Misconception #4: Insurance will cover most of the future losses of climate perils

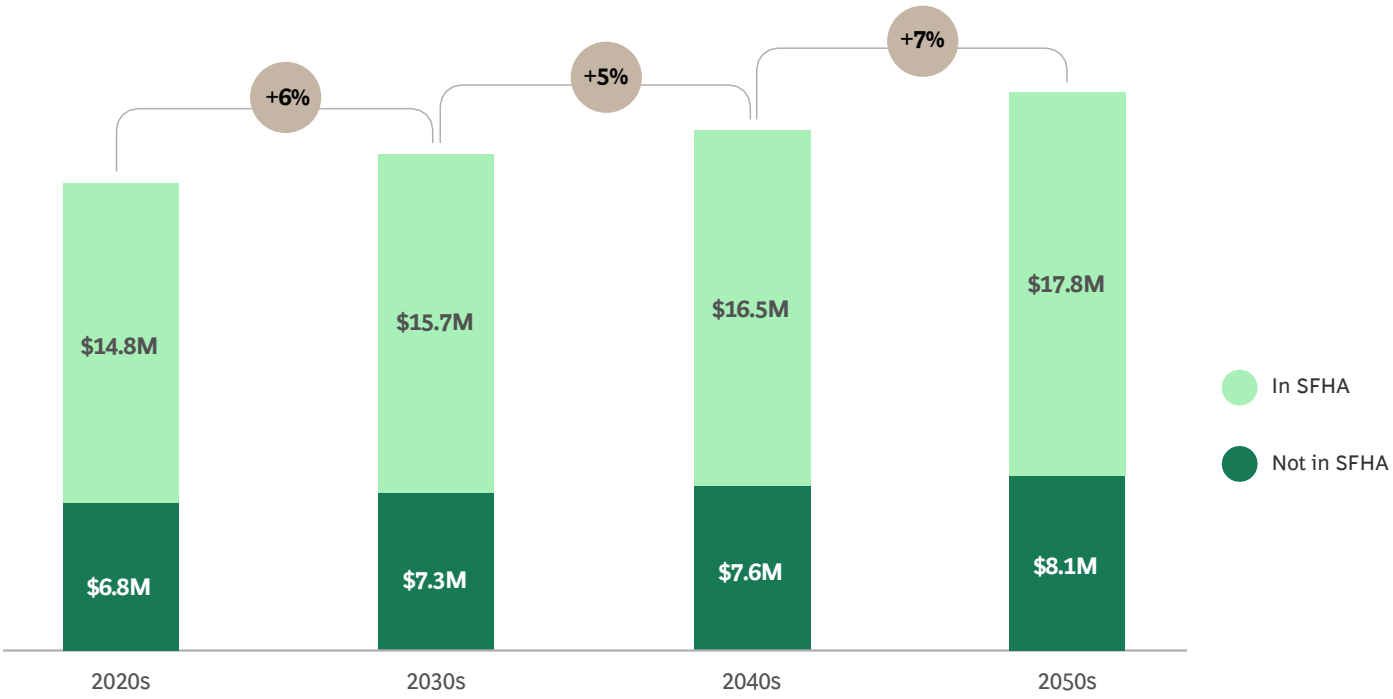
Insurance can provide some protection against physical climate risk. However, there are numerous market shortcomings that pose potential issues.

First, there are varying levels of coverage maturity across different climate perils. Flood insurance has been widely available throughout the US for several decades through the National Flood Insurance Program (NFIP), which provides affordable flood insurance to property owners in flood-prone areas. Similarly, insurance for meteorological events, like storms, has been available for many years, especially in coastal areas. However, other perils, like wildfires, have started to become more common in areas where they were historically rare. In such instances, risk can be difficult to quantify and price, leading insurers to charge higher premiums, provide limited coverage, or provide no coverage at all.

Second, existing insurance maps are not up to date and do not factor in projected risks within an area. Given that flood maps are compiled based on historical data, they fail to adequately account for the future effects of climate change. As a result, many homeowners in flood-prone areas underestimate or are not aware of the extent to which their properties are at risk of flooding. Our analysis shows that over 30% of expected losses due to flooding occur outside of the designated Special Flood Hazard Areas (SFHAs). (See Exhibit 5.)

Exhibit 5: Expected Cost of Flooding in vs not in SFHAs

Annual expected losses



Source: CoreLogic; Projections based on RCP 4.5 scenario

Third, in many parts of the country, insurers are struggling to service or, in some cases, are actively pulling out of higher risk markets. This trend is particularly pronounced in Florida, Louisiana, and California, where major hurricanes and wildfires have pushed insurance markets to their limit. Multiple insurers in these states have exited markets in recent years, in part due to financial pressures and re-insurance companies backing away from carrying the risk and/or substantially raising rates. The state-run property insurer in Florida has stated that it might impose a surcharge on millions of policyholders if another major hurricane hits, given recent events have significantly depleted its reserves.[11] Insurers in high-risk areas are left with only two options – hike premiums or exit markets – which means homeowners are ultimately left bearing the cost through higher insurance premia and/or less protection.

11. "Climate Change Is Destabilizing the Insurance Industry", *Scientific American*, March 23, 2023, "Climate Change Is Destabilizing the Insurance Industry", Scientific American, March 23, 2023.

Misconception #5: Markets will adjust and price in the risks of climate perils

There are significant potential market distortions and second-order exposures to physical climate risk that pose a threat to the broader US economy. Given the large role that homes and housing play in the economy and the fact that housing equity is a significant portion of US wealth, these knock-on impacts could manifest in unexpected ways.

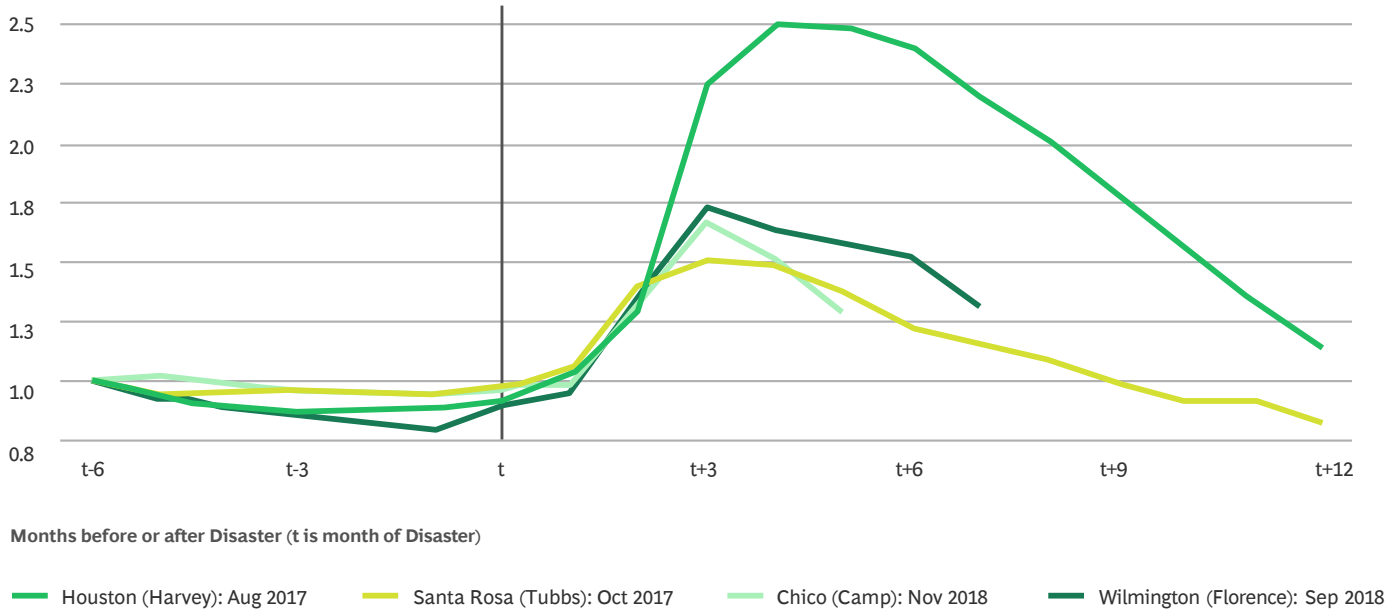
First-order distortions include –

1. **Home prices do not fully price-in climate risk, leading to overvaluation.** Given the issues with current flood maps, properties exposed to flood risk are overvalued by between $121 billion and $237 billion.[12]

2. **Lending markets do not adequately price in climate risk.** Mortgage underwriting does not currently account for climate risk. As Exhibit 6 shows, areas that have been impacted by a climate related disaster see a rise in mortgage delinquencies in the months following a disaster. Homes impacted by weather events also tend to see higher prepayment rates, as some homeowners choose to use insurance to pay off their mortgage early and walk away rather than rebuild. (See Exhibit 7.)

Exhibit 6: Delinquency Rates Jump After a Disaster

Serious Delinquency Rate (as a multiple of rate 6 months before disaster)

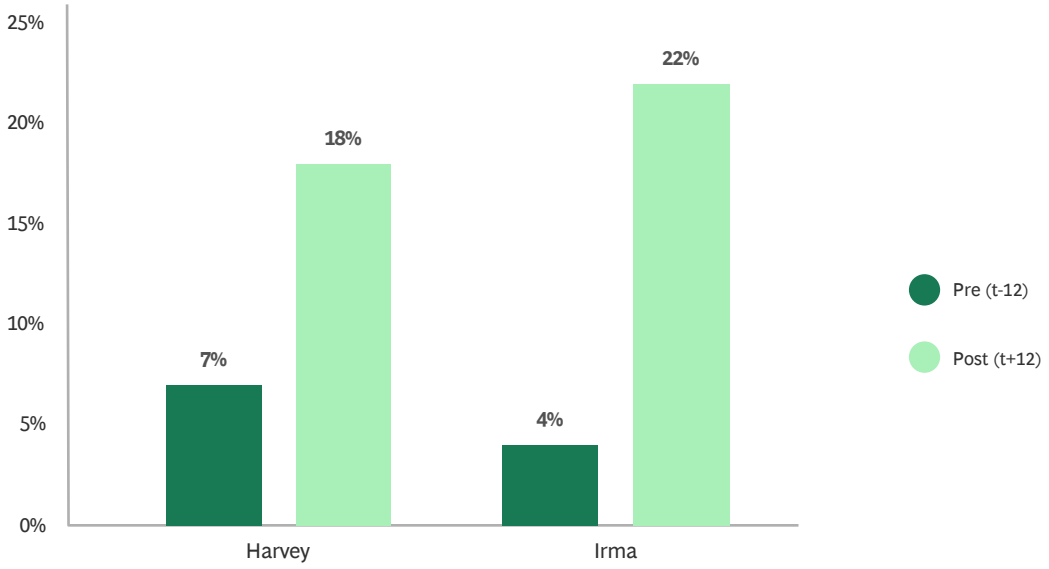


Source: CoreLogic; serious delinquency rate is the percent of loans 90 or more days delinquent or in foreclosure.

12. "Unpriced climate risk and the potential consequences of overvaluation in US housing markets," Nature Climate Change, February 16, 2023, https://www.nature.com/articles/s41558-023-01594-8.

Exhibit 7: Loan Termination Rates (12-months Before and After Hurricane)

Annual expected losses



Source: CoreLogic; loans within Presidentially Declared Major Disaster Areas (PDMDA) impacted by hurricanes are included in analysis.

There are also second-order impacts that are even harder to "price" in–

1 **Local climate shocks can impact homeowners' ability to pay mortgages even if their houses are not directly impacted.** Academic research has shown that natural disasters impact labor markets and income particularly in the first year after a natural disaster.[13] As a result, homeowners may struggle to stay current on mortgages, even if their homes are not directly impacted.

2 **The long term macro-economic health of an area can be chronically impacted.** An Urban Institute report found that households in areas affected by a natural disaster experience significant and persistent reductions in credit scores, on average, when compared with those located in unaffected areas.[14] This results in increased risk for banks and other businesses servicing the areas and has implications for their continued viability. The trend is more pronounced for medium-sized disasters when compared to larger ones, suggesting that federal support may mitigate this effect, but in the absence of a targeted recovery program, high exposure to climate risk can lead to a self-perpetuating cycle of decline.

13. "The Economic Impact of Hurricane Katrina on Its Victims: Evidence from Individual Tax Returns," AEJ: Applied, April 2018, https://www.aeaweb.org/articles?id=10.1257/app.20160307.

14. "Insult to Injury: Natural Disasters and Residents' Financial Health", Urban Institute, April 2019, https://www.urban.org/sites/default/files/publication/100079/insult_to_injury_natural_disasters_2.pdf.

Physical climate risk is already having a material impact on the US housing market, and its effects will only increase in the coming decades. Given the scale of the market and the role homeownership plays in American wealth accumulation, it is critical that stakeholders act now to mitigate and manage this risk.

In our next two papers, we will provide perspectives on two critical areas the ecosystem must address in the near-term: (1) incorporating a climate risk lens into real estate lending (largely absent today), and (2) developing adaptation & resilience solutions to mitigate the impact of natural disasters. Taking action in these areas, in combination with continued efforts to decarbonize and reduce the rate of global warming, is the best strategy we have to limit the costs of climate perils on housing markets and communities.

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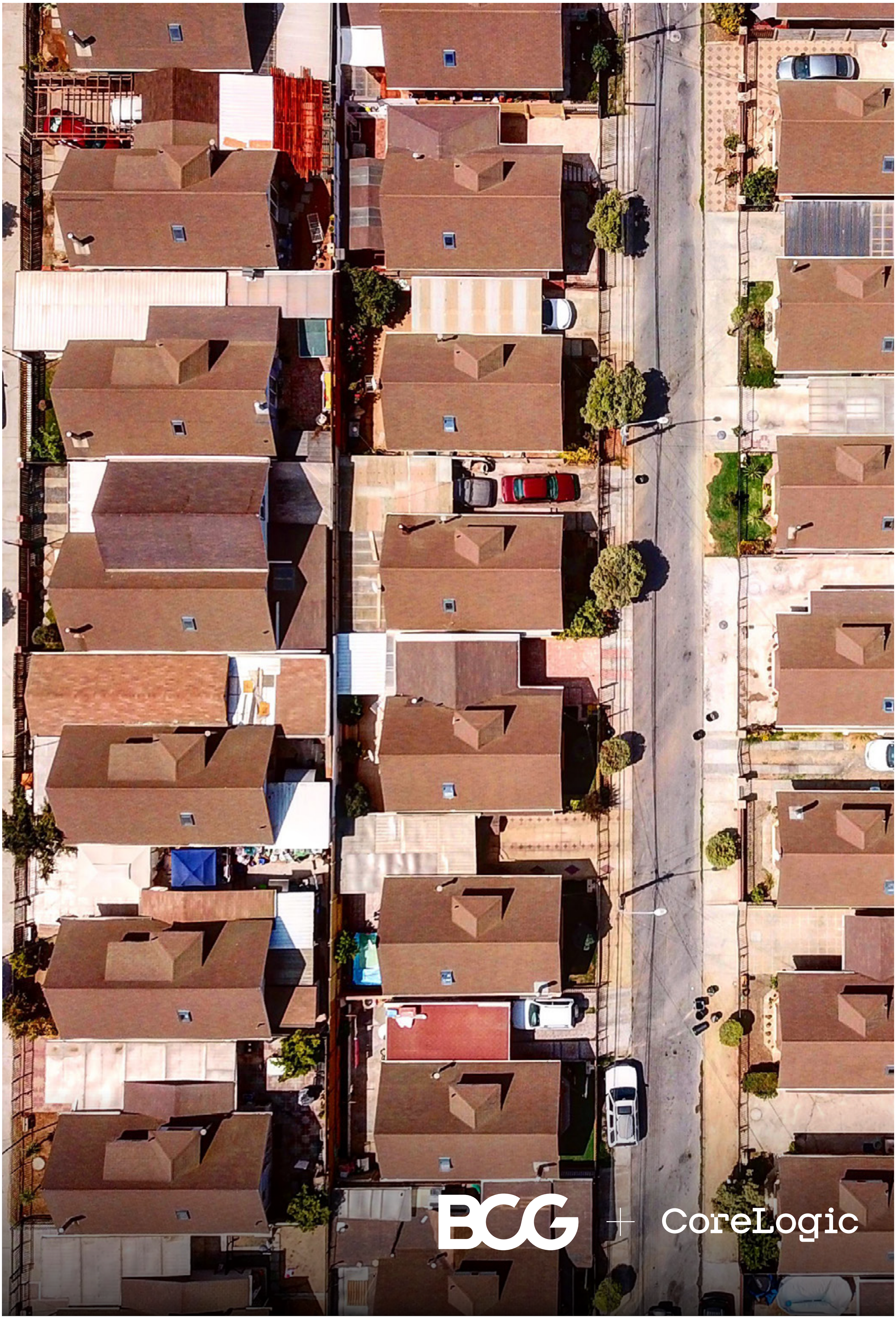
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