



# Climate Change, Real Estate and the Bottom Line.

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# Commercial real estate (CRE) is an important asset class

- ▶ Nareit estimates that the 2018 total dollar value of CRE in the U.S. was \$16 trillion.
- ▶ As of 2020, MSCI Inc. estimated that roughly \$10.5 trillion in global real estate assets were held for investment purposes.
- ▶ According to the Mortgage Bankers Association, total commercial debt outstanding was \$3.98 trillion at the end of the second quarter of 2021.
- ▶ As of 2019, pension, endowment, and foundation funds control over \$9 trillion in total assets, with nearly \$800 billion invested in real estate.

**Despite the significance of CRE as an asset class, and its importance in the overall institutional portfolios, little is yet known about how climate risks affect the performance of commercial real estate.**

# Climate risk and CRE

- ▶ CRE has always been exposed to extreme weather events. Still, an increase in those events has greater financial consequences borne by owners, occupiers, insurers, and governments.
- ▶ **To which extent do CRE markets price in the risks from extreme weather and climate change?**
- ▶ **Through which channels do these risks on value materialize? Cash flows, capitalization rate, or financing?**
- ▶ To help answer these questions, I reviewed the recent academic literature on climate risk and real estate.
- ▶ I consider the exposure to: Flood, hurricane/cyclone, sea level rise, wildfire, and extreme temperatures.

# Flood

Main concerns of CRE stakeholders (Bhattacharya-Mis et al. (2011)):

- ▶ Potential risk of disruption to business, including lack of essential services and loss of profit.
- ▶ Higher cost of relocation to other properties.
- ▶ Higher repair, replacement and reinstatement costs.
- ▶ Potential increase in the cost of insurance.
- ▶ More difficulty in obtaining mortgage finance resulting from higher risks and reduced insurance cover.

**The positive effect of waterfront amenity outweighed the negative impact associated with risk from flood (Miller et al. (2019)).**

This implies either buyer's short-term horizon, or a moral hazard problem whereby owners are dependent on and subsidized by government and the failure of insurers to reflect the risks adequately.

# Flood

- ▶ Mulder (2022) shows that flood risk classification provides valuable information not only for insurers, but also for homeowners.
- ▶ Misclassifying high-risk homes as low-risk causes owners to underestimate their current and future flood risk, invest less in risk-reducing adaptation, and buy less flood insurance despite substantially lower premiums.

# Hurricane/Cyclone

- ▶ Fisher and Rutledge (2021) investigate the impact on CRE values and returns from all the significant hurricanes that occurred during the past 30 years in the U.S..
- ▶ They find on average an immediate price impact that worsened over time, taking three years to bottom out, then prices reverted back to “normal”.
- ▶ There did not seem to be a permanent price discount.
- ▶ Addoum et al. (2021) examined the impact of Hurricane Sandy on property prices using CRE transactions from 2001–2017.
- ▶ They report a permanent price discount for impacted properties, with properties exposed to flood risk experiencing slower price appreciation after the storm than unexposed properties.
- ▶ **Impact channel primarily via an increased risk premium.**

# Hurricane/Cyclone

- ▶ Henkel et al. (2022) study hurricane post-disaster relief in the US.
- ▶ Hurricanes close to Election Day lead to increased post-disaster relief.
- ▶ Households respond to current post-disaster policies by sorting in hazard-prone coastal areas.
- ▶ Holtermans et al. (2022a) investigate the capitalization of climate shocks in commercial real estate.
- ▶ They find clear evidence of a decline in transaction prices in hurricane-damaged areas after the hurricane made landfall compared to unaffected areas.
- ▶ Moreover, the price discount is larger when the particular buyer has more climate awareness and has a more geographically diverse portfolio.

# Hurricane/Cyclone

- ▶ Holtermans et al. (2022b) show that both Harvey and Sandy led to elevated levels of commercial mortgage delinquency.
- ▶ Ellen et al. (2021) show that natural disasters, like Sandy, generates two important shocks that can affect real estate markets:
  1. it causes physical damage to properties
  2. it provides new information about the risk of future damage.
- ▶ Residential houses hit by high storm surges drop 16 percent and remain 12 percent lower six years after the storm.



# Sea Level Rise

- ▶ No consensus in the literature.
- ▶ The still seemingly “far off” nature leads to a view that it is still early to find backward-looking literature.
- ▶ Owner-occupiers and renters may not have access to, or consider, information regarding long-term impacts.
- ▶ Nonetheless, for investors, there is some evidence of early price movement in high-risk areas where there is limited confidence in municipality ante-event mitigation schemes and insurance or public bail-out protection.

# Wildfire

- ▶ Short-term price impact (5-13% percent fall) for homes proximate to wildfires (Hansen and Naughton, (2013) and McCoy and Walsh, (2018)).
- ▶ Long-term price effects depend on:
  - Changes to landscape and view (McCoy and Walsh, (2018))
  - How frequent the wildfires are (Mueller et al. (2009))
  - Awareness of wildfire risk (Donovan et al. (2007))
- ▶ Evidence that destructive wildfires in California are driving some insurers of high-end homes out of the state's market.
- ▶ E.g., AIG and Chubb are cutting back on coverage of multimillion-dollar homes, following years of nonrenewals by midrange insurers.

# Extreme temperatures

- ▶ Cvijanovic and van de Minne (2021), study the impact of exposure to extreme temperature shocks on investment performance of CRE at the individual asset level.
- ▶ They find that exposure to extreme temperatures significantly reduces average realized total returns in CRE.
- ▶ This result is driven by reduction in asset returns and not by income return.
- ▶ **Impact channel primarily via time-varying CRE risk premium due to decreased predictability of future rental income.**
- ▶ Lee and Zheng (2022) report that extreme temperature negatively affects weekly retail consumption activities.

# Perception and beliefs

- ▶ Evidence that pricing of residential properties subject to climate risks are influenced by beliefs (Baldauf et al. (2020) and Bernstein et al. (2019)).
- ▶ E.g., republican states versus democratic states.
- ▶ Owner beliefs are not static and are a product of experience, knowledge of the scientific data and confidence in governments to mitigate future risks and insurers to compensate losses.
- ▶ Intuitively, CRE investors are more sophisticated and better informed than homeowners.
- ▶ **Perceptions and beliefs, probably play a smaller role for CRE.**

## Adjacency and amenity

- ▶ Adjacency to the amenity offered by being in areas known to be at risk of climate events can still add value (Chen and Hua (2019)).
- ▶ However, that greater climate risk awareness and belief in climate change are countering this premium in some markets.
- ▶ Greater persistence of proximity premiums for assets close to business centers, whatever the risk.
- ▶ **This may imply investors' view that such areas are more likely to attract funding for risk mitigation and post-event restoration work or simply the dominance of agglomeration value impacts.**

# Governance

- ▶ There is limited evidence that the approach, and expenditure, of local and national governments towards physical climate change measures influences values directly.
- ▶ Level of trust in the local government to prevent catastrophe or/and repair and compensate those affected, leads to a positive relationship between good governance and values (Bakkensen and Barrage (2021)).
- ▶ E.g., Collier County's coastal storm defense plan (<https://gsacnaples.org/2021/03/23/higher-dunes-and-barrier-gates/>)



# Valuation practices

- ▶ Links between valuers' due diligence and the prevailing governance, datasets, insurability, and regulation.
- ▶ Valuers are increasingly aware of heightened climate risk but are generally not explicitly incorporating it into market valuations (Meins et al. (2010)).
- ▶ **Addressing climate risk gaps in valuation practices, will improve valuers' contribution to overall market functioning where assets are exposed to physical climate risk.**

## Short-term and bounce-back, or sustained value erosion?

- ▶ Substantial evidence that property prices revert to the trend following extreme weather events (Below et al. (2017) and Miller et al. (2019)).
- ▶ CRE prices take longer to revert than residential (Fisher and Rutledge (2021)).
- ▶ Whether this suggests that markets already price the risk, or that investors are taking a myopic, short-term view, is unclear.
- ▶ Some evidence is emerging that sea-level rise alters this dynamic due to its permanence, and that prices may be softening in the most exposed areas.
- ▶ Increase in extreme storm and wildfire event severity and frequency may also create this more sustained value erosion
- ▶ E.g., Addoum et al. (2021) find that prices in Boston have been impacted by Hurricane Sandy.
- ▶ **Institutional investors have a broader geographic and portfolio view.**



# Liquidity

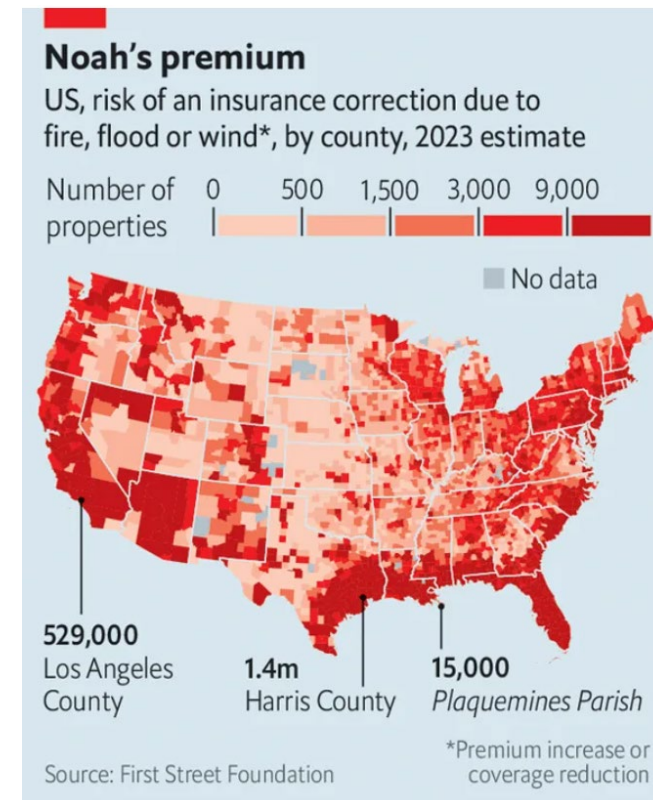
- ▶ Extreme climate events and/or increased awareness of climate risk may affect: which properties are offered for sale, the cohort of interested buyers, and, sale times and sale volumes.
- ▶ Pricing tends to be a lagging of how markets are absorbing physical climate risk.
- ▶ Trading volumes or time on market may be better leading signals of how markets are reacting to climate events and risks.
- ▶ The availability and cost of lender financing and re-financing, and insurance, are key determinants of investor behavior and liquidity.

## Lending behavior and securitization

- ▶ Lack of research on real estate debt markets focused on physical climate risk.
- ▶ This is surprising given the size of the debt markets; their role in the CRE liquidity equation; and, the level of residential and commercial mortgage securitization.
- ▶ Evidence that residential real estate with higher levels of physical hazard exposure are being securitized as a method to transfer risk from lenders to investors.
- ▶ **Surge in research and analytic activity amongst investor, rating agency and mortgage analytics firms that suggests growing awareness of the seriousness of climate risk.**
- ▶ E.g., Moody's acquired a major stake in climate risk analytics provider Four Twenty Seven; Blackrock started to systematically assess climate risk exposure of their portfolio; Trepp started to provide climate risk scores for properties in commercial mortgage backed securities (CMBS) pools.

# Insurability

- ▶ More losses borne by insurers from a combination of increasing frequency and intensity of extreme weather, and the relatively high value of assets exposed to hazards.
- ▶ Little evidence for effects of insurance availability or pricing on asset values (Keys and Mulder (2020)).
- ▶ The varying nature of insurance markets and regulation cloud the conclusions.
- ▶ Owners benefit from resilience expenditure ordered by mandatory mitigation requirements through insurance market regulation.
- ▶ Households in lower-risk states are disproportionately bearing the risks of households in high-risk states (Oh et al. (2022)).



# Asset level investment in resilience and green certification

- ▶ Costs to improve asset resilience may be high and will be compared against the potential benefits.
- ▶ Little quantitative evidence of benefits to guide such planning at present.
- ▶ If climate risk is not properly reflected in asset values, the value of risk mitigation expenditure is unlikely to be reflected either.
- ▶ Little evidence of a owners achieving a resilience premium.
- ▶ However, properties with features that heighten the risks of loss from a climate event may experience a price discount.
- ▶ Some evidence of “green premium” on sales (5-35%) and rents (2-25%) (<https://www.avivainvestors.com/en-gb/views/aiq-investment-thinking/2021/07/green-premium-real-estate/>).

# Conclusions

- ▶ Limited literature on CRE.
- ▶ Property prices decline after climate events short-lived.
- ▶ Either climate risk is already capitalized into property values or pricing is myopic in nature.
- ▶ Proactive public investment and strong governance as risk mitigating factors contribute to the modest and short-term nature of pricing reductions.
- ▶ Long-term effects depend on frequency and awareness.
- ▶ Investors are placing a higher risk premium on all properties in areas affected by climate events.
- ▶ Better information leads to greater awareness, belief acceptance and integration of climate impacts on prices.

# Conclusions

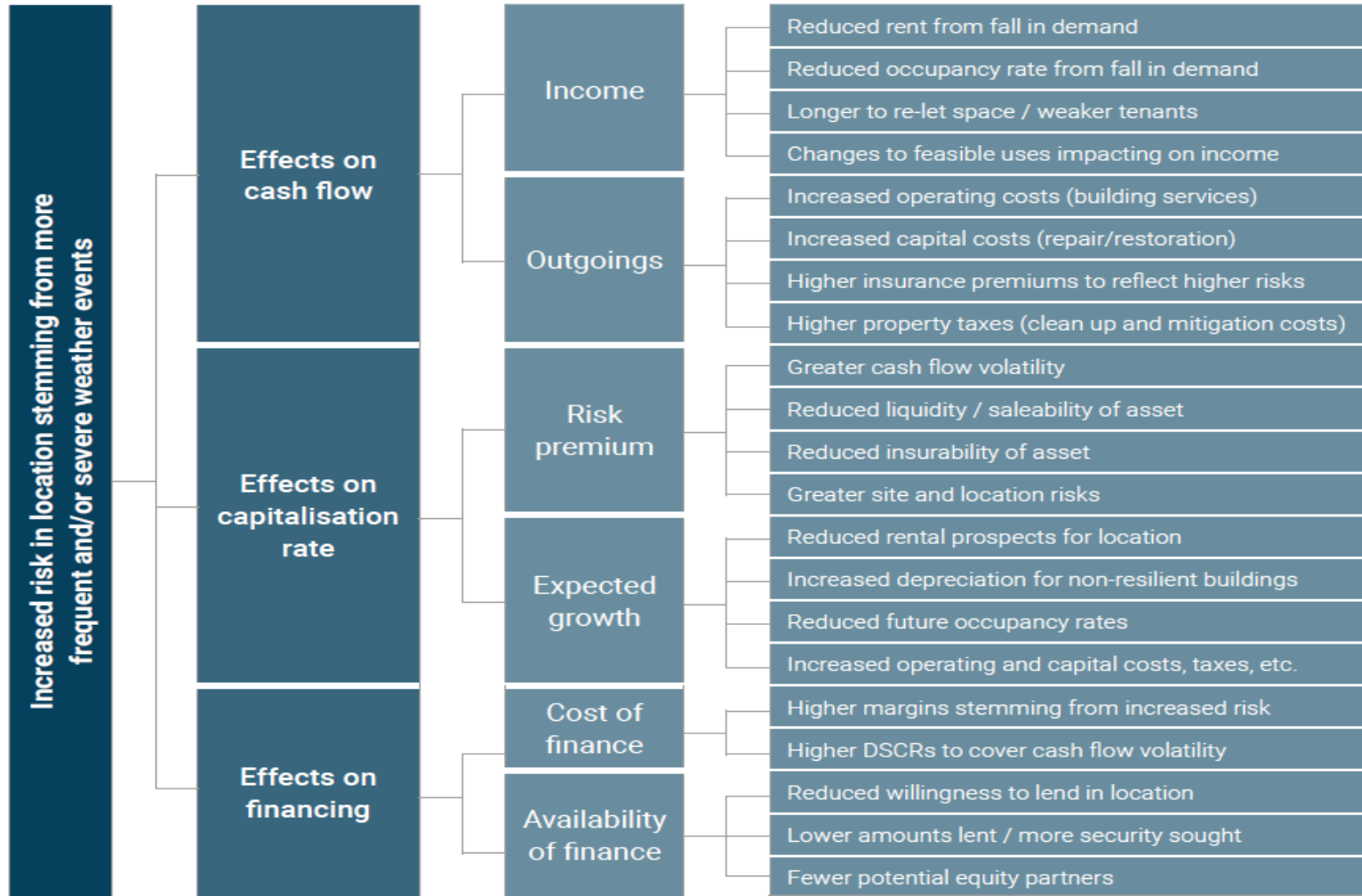


Figure by Clayton et al. (2021).



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