



ENVIRONMENTAL RISK & PFAS LITIGATION CONFERENCE

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Incorporating Climate Change into Underwriting Evaluations



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Climate Change and Real Estate Due Diligence

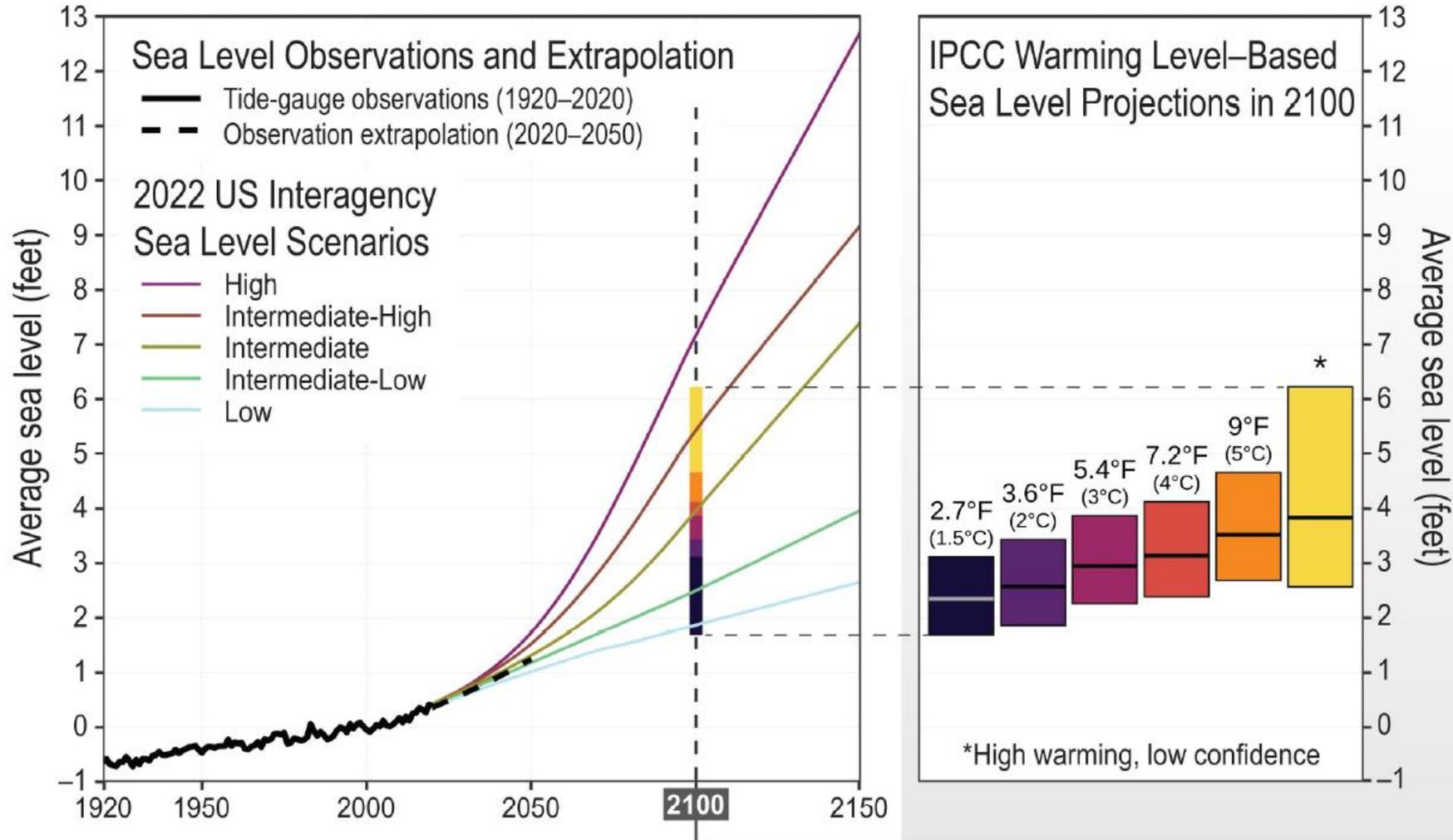
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Fifth National Climate Assessment (U.S. Gov.)

Accelerating Relative Sea Level Rise in the Contiguous US



Flooding Risk

Mean estimate of coastal flooding:

- by 2050 rising sea levels will exacerbate episodic storm surges and inundate an estimated 87,000 square kilometers (21.5 million acres) of coastal areas worldwide, exposing \$1.8 trillion of real estate to catastrophic damage.

Source: Kirezci, et al., Projections of global-scale extreme sea levels and resulting episodic coast flooding over the 21stCentury, NATURE RESEARCH 10:11629 (2020) (with inflation adjustment from US\$2011 figures).

Top 20 metro areas at risk by exposed assets

Rank	Country	Urban Agglomeration	Exposed Assets Current (\$Billion)	Exposed Assets Future (\$Billion)
1	USA	Miami	416.29	3,513.04
2	CHINA	Guangzhou	84.17	3,357.72
3	USA	New York-Newark	320.20	2,147.35
4	INDIA	Kolkata (Calcutta)	31.99	1,961.44
5	CHINA	Shanghai	72.86	1,771.17
6	INDIA	Mumbai	46.20	1,598.05
7	CHINA	Tianjin	29.62	1,231.48
8	JAPAN	Tokyo	174.29	1,207.07
9	CHINA,	Hong Kong	35.94	1,163.89
10	THAILAND	Bangkok	38.72	1,117.54
11	CHINA	Ningbo	9.26	1,073.93
12	USA	New Orleans	233.69	1,013.45
13	JAPAN	Osaka-Kobe	215.62	968.96
14	NETHERLANDS	Amsterdam	128.33	843.70
15	NETHERLANDS	Rotterdam	114.89	825.68
16	VIETNAM	Ho Chi Minh City	26.86	652.82
17	JAPAN	Nagoya	109.22	623.42
18	CHINA	Qingdao	2.72	601.59
19	USA	Virginia Beach	84.64	581.69
20	EGYPT	Alexandria	28.46	563.28

s2005 dollars

Source: <https://climate-adapt.eea.europa.eu/en/metadata/publications/ranking-of-the-worlds-cities-to-coastal-flooding/11240357/@@download/file>

Due Diligence: Flooding

- Traditional real estate due diligence in the United States involves checking FEMA flood maps
- FEMA maps identify areas within the 100-year and 500-year flood plains based on statistical models from limited past data.
- According to these maps, over the course of a 30-year mortgage, there is a cumulative 26% probability of flooding in the 100-year flood plain ($1.00 - 0.99^{30} = 26\%$) and a cumulative 6% probability of flooding in the 500-year flood plain ($1.00 - 0.998^{30} = 6\%$).

Due Diligence: Flooding

FEMA maps:

- do not reflect sea level rise, notwithstanding Biggert-Waters Flood Insurance Reform Act of 2012 (42 U.S.C. 4101b(b)(3)(D));
- are based on complex projections founded on limited historical data; and
- are often wrong (Houston's Memorial City, mapped outside 500-year flood zone, was flooded 3x in the last 10 years [2009, 2015 & 2016]).

Storm surge inundation areas are depicted on the National Hurricane Center's Storm Surge Risk Maps and NOAA's Coastal Flood Exposure Mapper. Consultants have proprietary models.

Due Diligence: GHG Regulations

- States and cities are considering regulatory programs to reduce GHG emissions from existing buildings.
- Compliance with these regulations may require millions of dollars of capital improvements to older buildings. E.g., NYC L.L. 97, enacted May 19, 2019 (NYC Admin. Code, Tit. 28, Chap. 3, Art. 320)
- Due diligence for a major real estate transaction should consider the energy efficiency and GHG emissions of the real estate asset and the capital improvements that may be required under current and future laws.

Due Diligence: Too Hot to Handle?

- In 2023, Phoenix hit 110° F on 54 days, and the city's summer highs are expected to rise by 7.2° F on average by 2100.
- By 2100 temperatures in Dallas are projected to be above 95° F 133 days per year.
- Metropolitan areas in the American southwest are likely to experience megadrought conditions, ensuing shortages of water in the years ahead.
- Farm crop yields will decline in many areas.
- Very large wildfires will become more common place, clouding the skies in some areas with smoke.



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Underwriting to Climate Change

Eric Paglieri – Head of Environmental, AXIS Capital

June 17, 2025



Specialty Solutions, Elevated



Potential Risks Associated with Climate Change

Sea Level Rising and Flooding

- Groundwater contamination
- Soil contamination
- Reopeners
- Contingent Business Interruption
- Capital Improvements
- Spread of waterborne illnesses



Thank you

