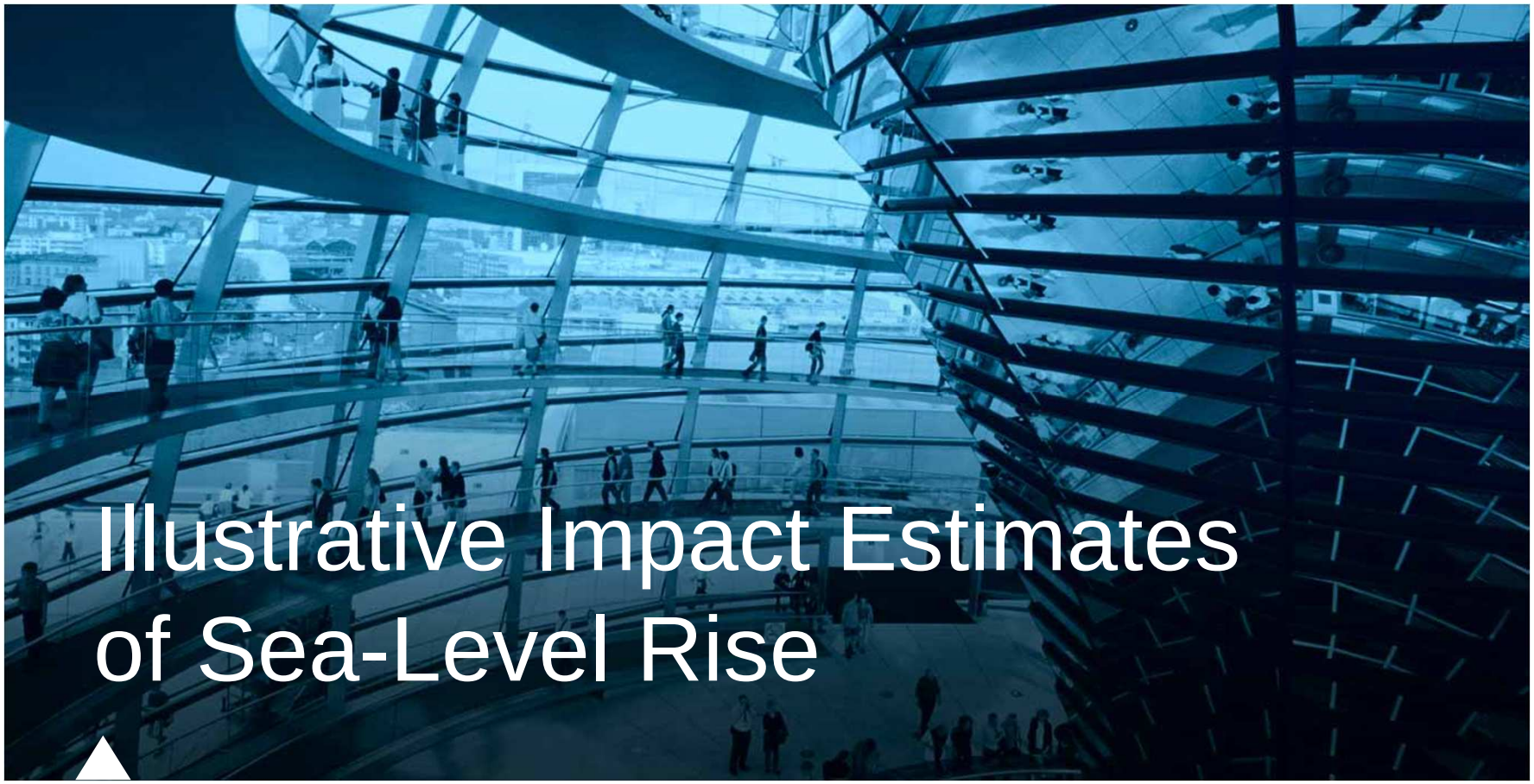

Illustrative Impact Estimates of Sea-Level Rise

Stephen L. Kolk, ACAS
CoreLogic Chief Actuary & Senior Modeler

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TYPES OF CLIMATE MPACTS FROM PHASE I

Find the CCC Phase I Report at:

http://www.casact.org/press/index.cfm?fa=viewArticle&articleID=2094

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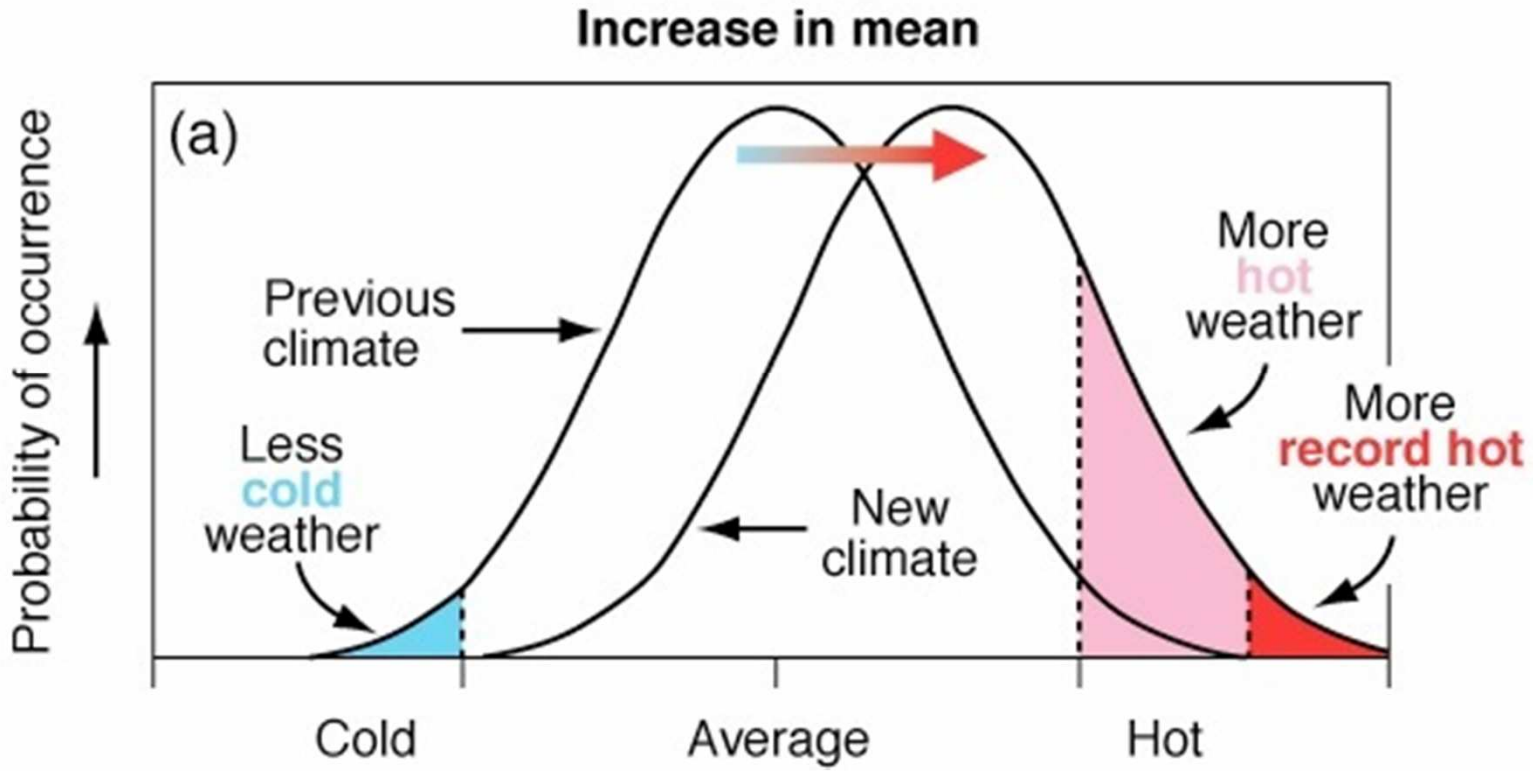
Climate Impact #1: INCREASE IN MEAN



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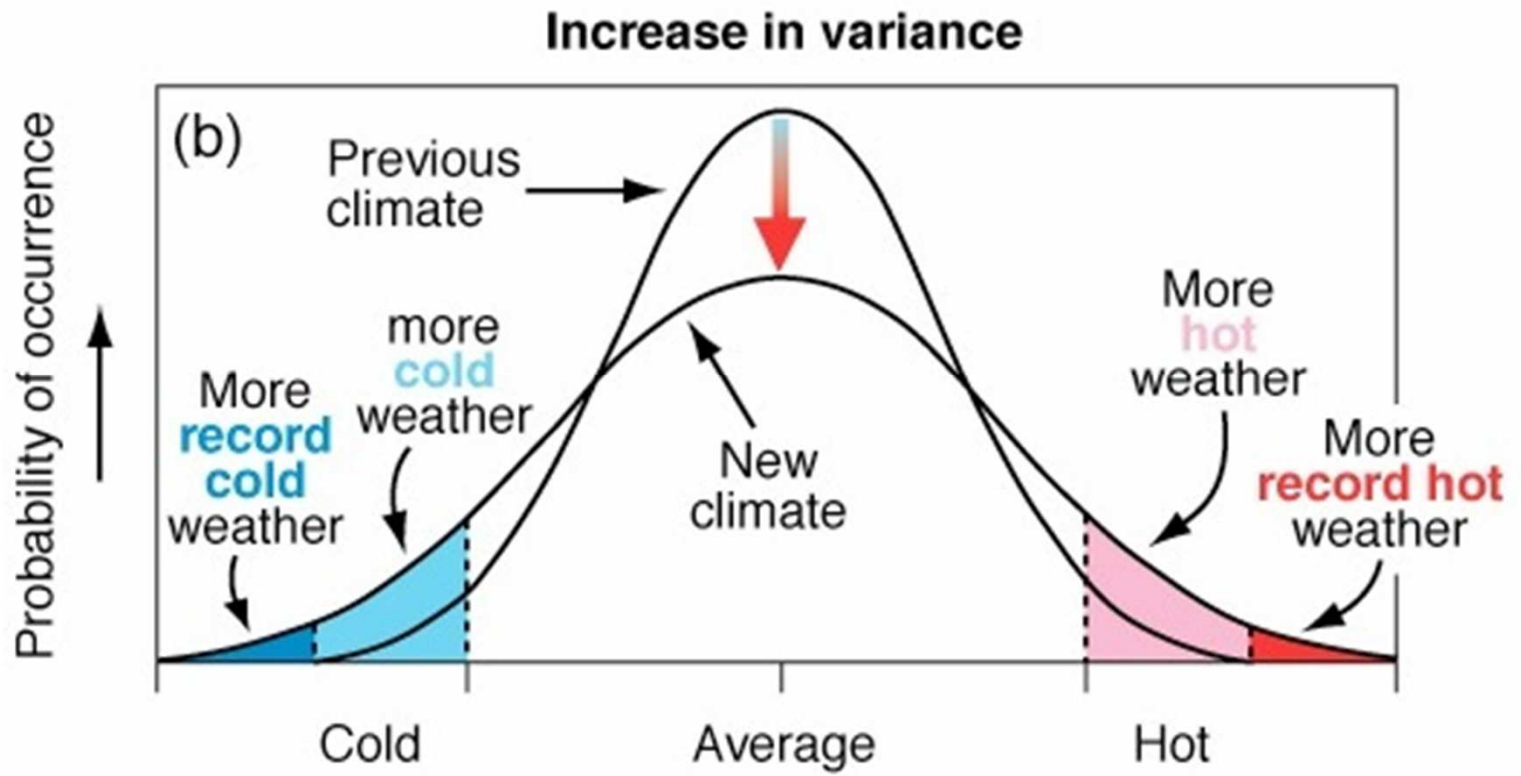
Climate Impact #2: INCREASE IN VARIANCE



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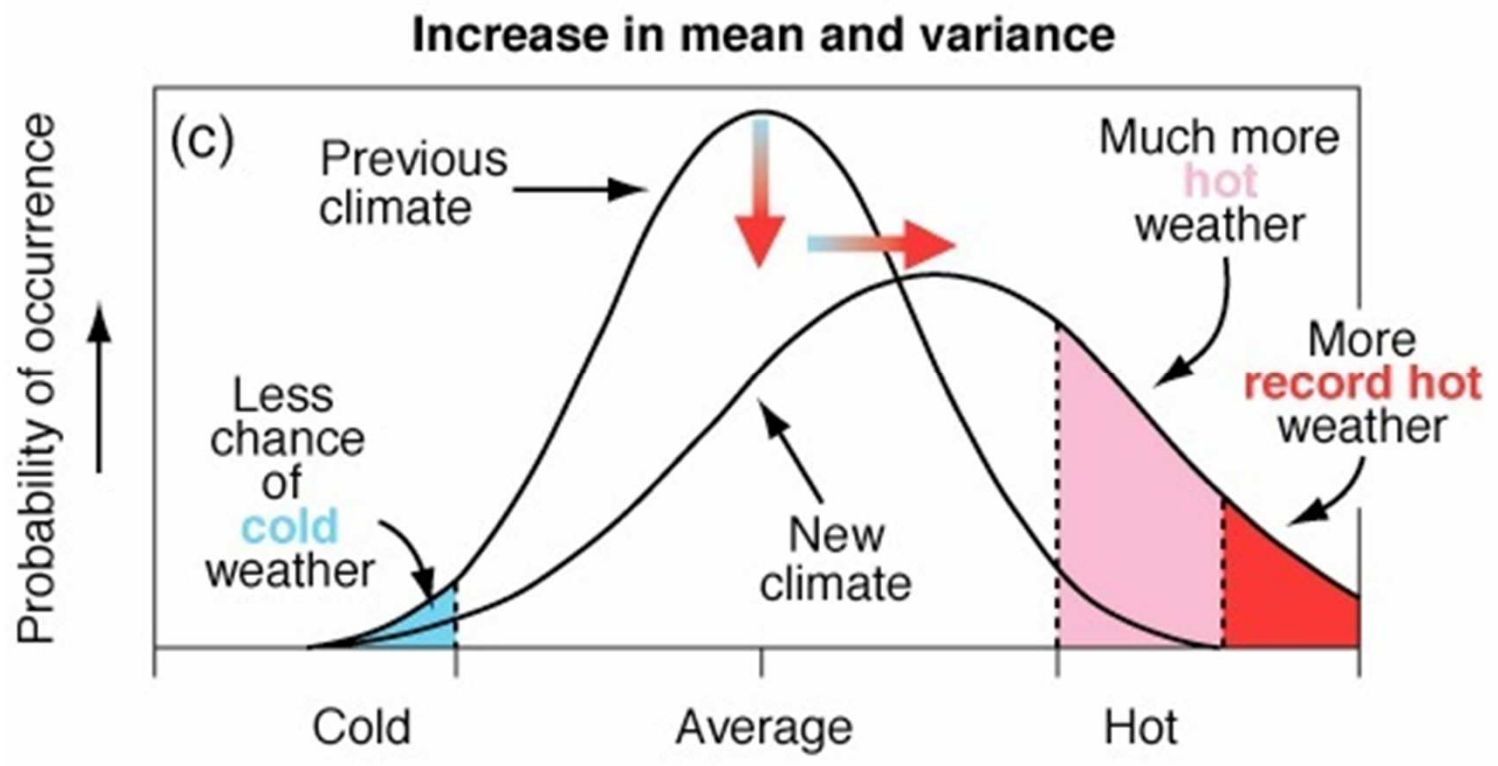
Climate Impact #3: INCREASE IN MEAN AND VARIANCE



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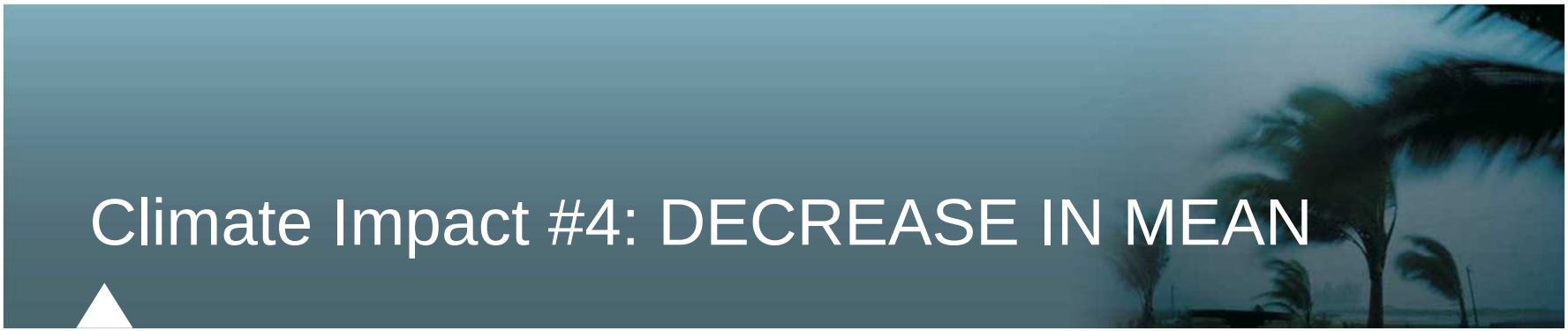

Climate Impact #4: DECREASE IN MEAN

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POSSIBLE CLIMATE CHANGE IMPACTS of SEA LEVEL RISE

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ACI Component – Sea Level

- Key sections in Phase I Report:
  - Sec 2.5 Sea-level rise (Global)
  - Sec 3.3 Sea-level rise (Regional and Seasonal)
  - Sec 5.1 Available climate indices
  - Sec 6.4.5 Sea-level rise and coastal flooding (Future Climate Projections)

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Phase I Report – Section 2.5 Summary
Sea-level rise (Global)

Historical estimates

- Sea level rose by about 120m in the millennia following the last ice age (about 21,000 years ago) before stabilizing 2,000-3,000 years ago (per AR4, but not mentioned in our Phase I report)
- Assuming 120m in 18,000 years implies .667m per century
- Sea level changed “little” between 0 and AD 1900

Current measurements

- Tidal gauges (~150 years) indicate sea level rose on average by 1.7-1.8 mm per year during the 20th century (i.e., a total of .17-.18m)
- Satellites (~20 years) indicate sea level rose an average of about 3.2 mm per year from 1992-2010, or .32m per century at that pace

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From Section 5.1
SEA LEVEL RISE
In Millimeters

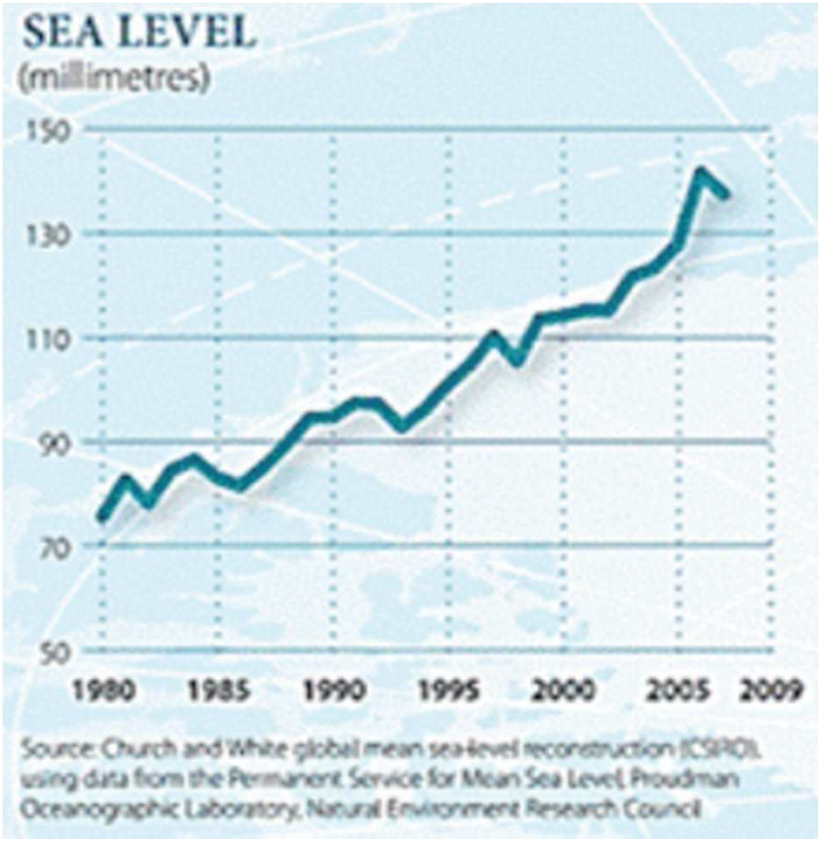
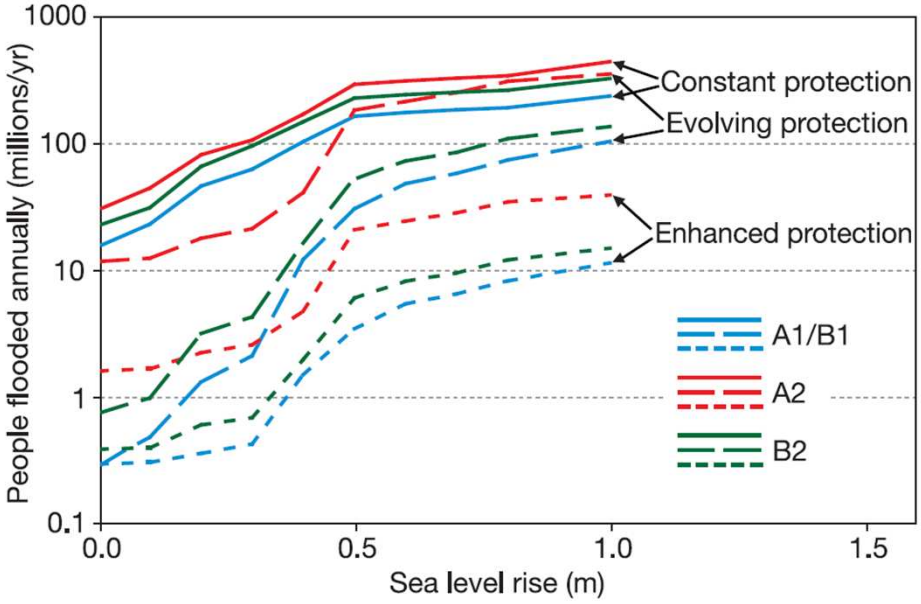


Figure 6.17
Estimates of People Flooded in Coastal Areas due to Sea Level Rise



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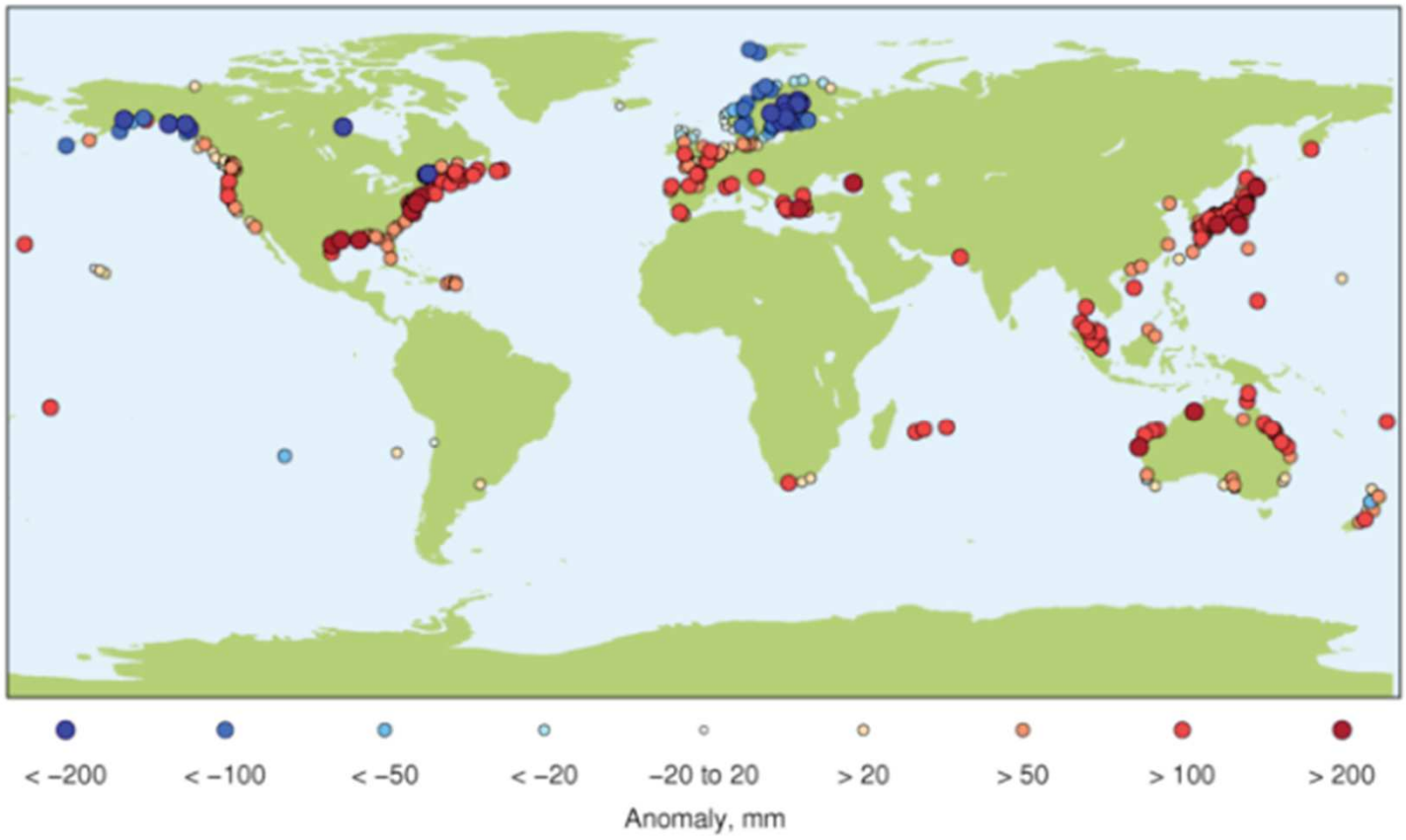
Tide Gauge 2010 Sea Level versus 1960-1990 Average



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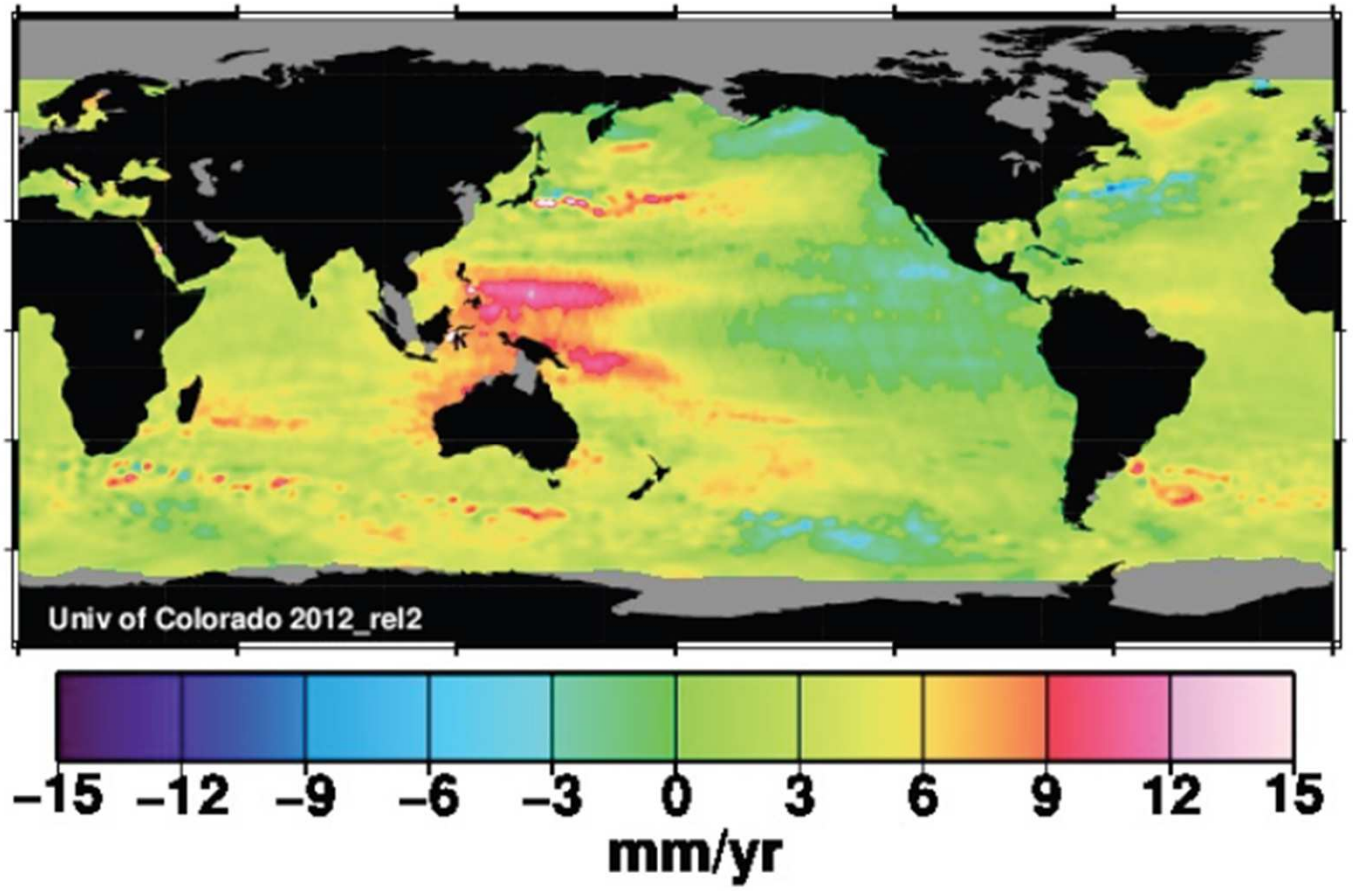
Satellite Sea Level Rise – 1993 to 2012



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SEA-LEVEL RISE MEASUREMENTS

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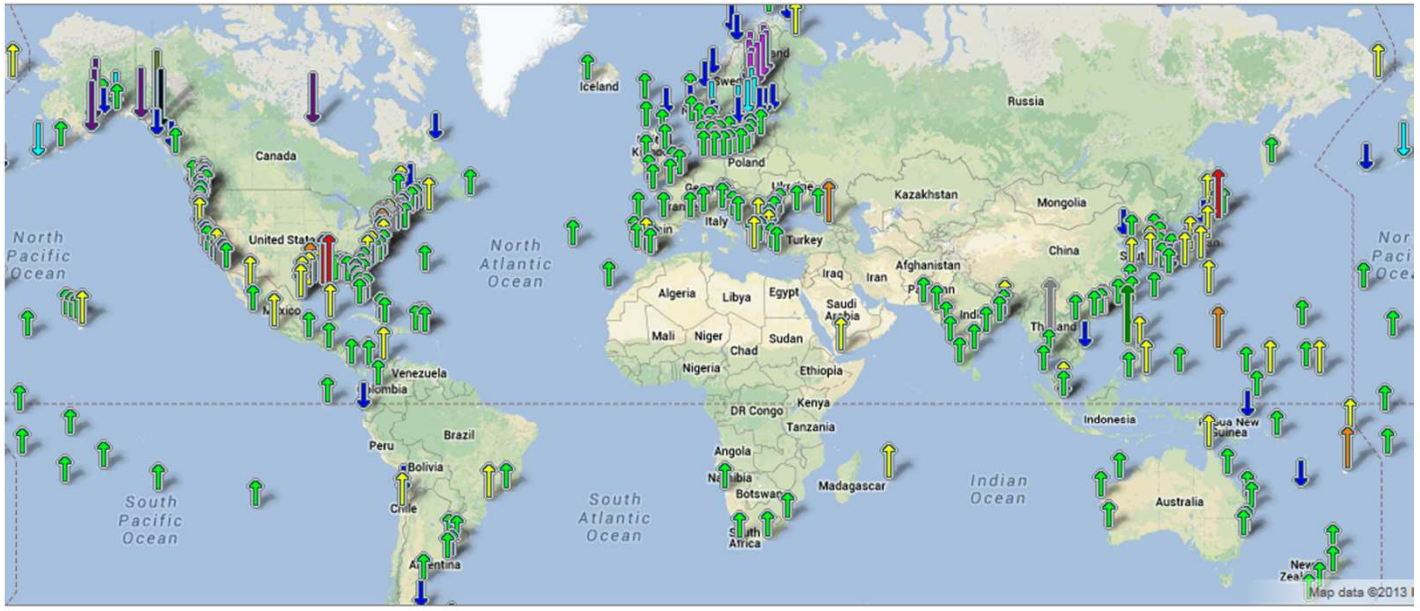
Sea Level Trends - Wolrdwide



Sea Level Trends
mm/yr (feet/century)

15 to 21 (5 to 7)	6 to 9 (2 to 3)	-3 to 0 (-1 to 0)	-12 to -9 (-4 to -3)
12 to 15 (4 to 5)	3 to 6 (1 to 2)	-6 to -3 (-2 to -1)	-15 to -12 (-5 to -4)
9 to 12 (3 to 4)	0 to 3 (0 to 1)	-9 to -6 (-3 to -2)	-18 to -15 (-6 to -5)

Source: http://www.tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

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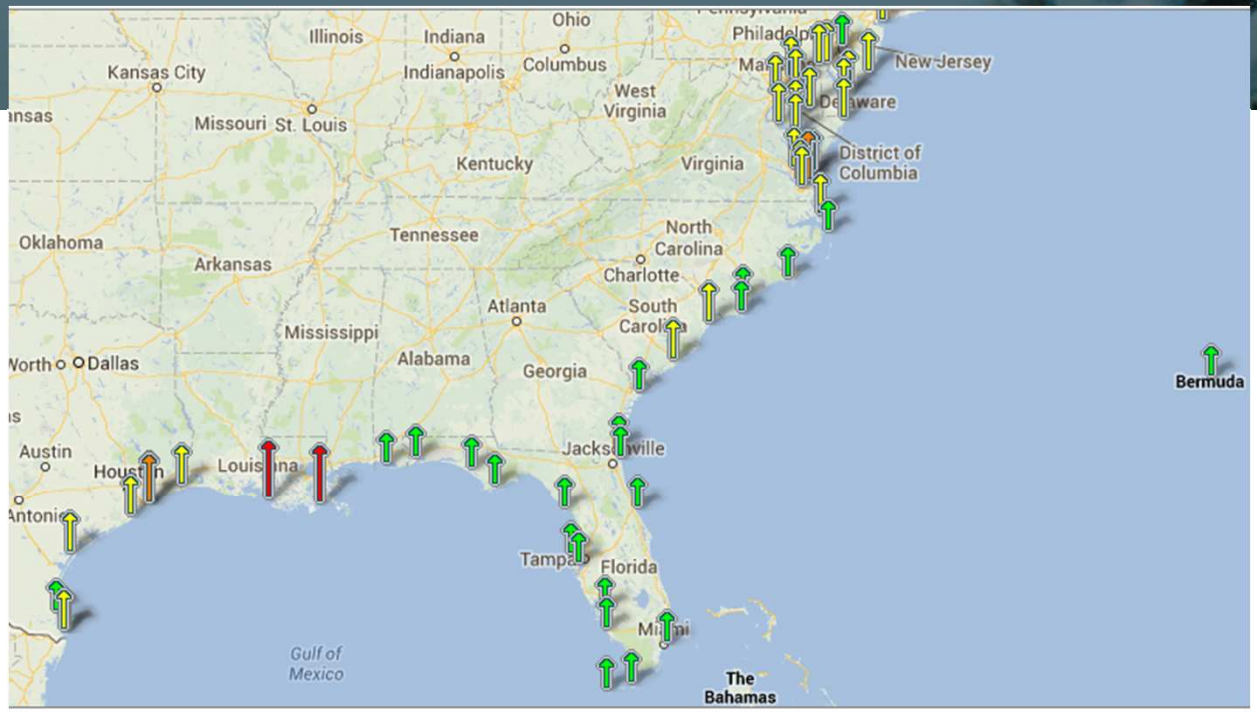
Sea Level Trends – USA Gulf & Atlantic Coasts



ds in sea level, with arrows representing the direction and magnitude of change. Click on an arrow to access additiona

Sea Level Trends
mm/yr (feet/century)

15 to 21 (5 to 7)	6 to 9 (2 to 3)	-3 to 0 (-1 to 0)	-12 to -9 (-4 to -3)
12 to 15 (4 to 5)	3 to 6 (1 to 2)	-6 to -3 (-2 to -1)	-15 to -12 (-5 to -4)
9 to 12 (3 to 4)	0 to 3 (0 to 1)	-9 to -6 (-3 to -2)	-18 to -15 (-6 to -5)

Source: http://www.tidesandcurrents.noaa.gov/sltrends/sltrends.shtml

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POSSIBLE SEA-LEVEL RISE IMPACTS

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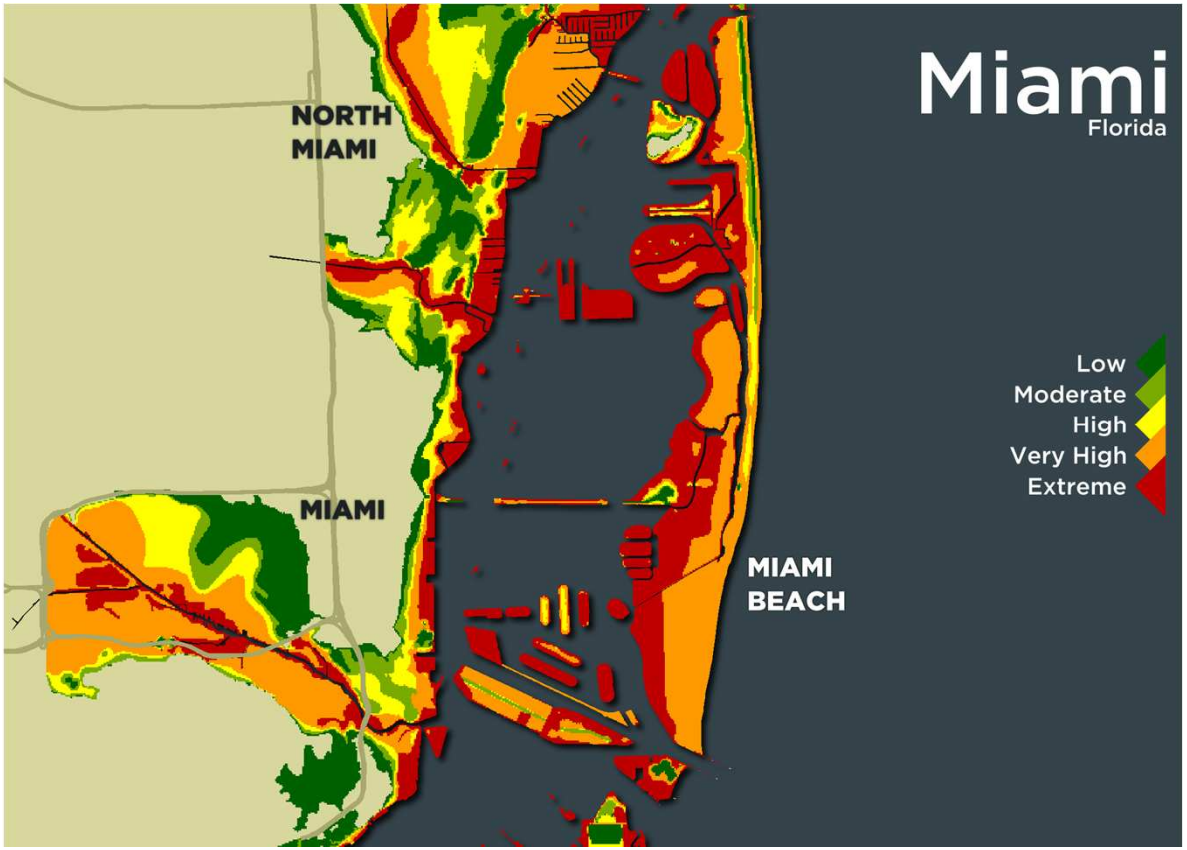
Current Estimated Storm Surge Extent – by risk level



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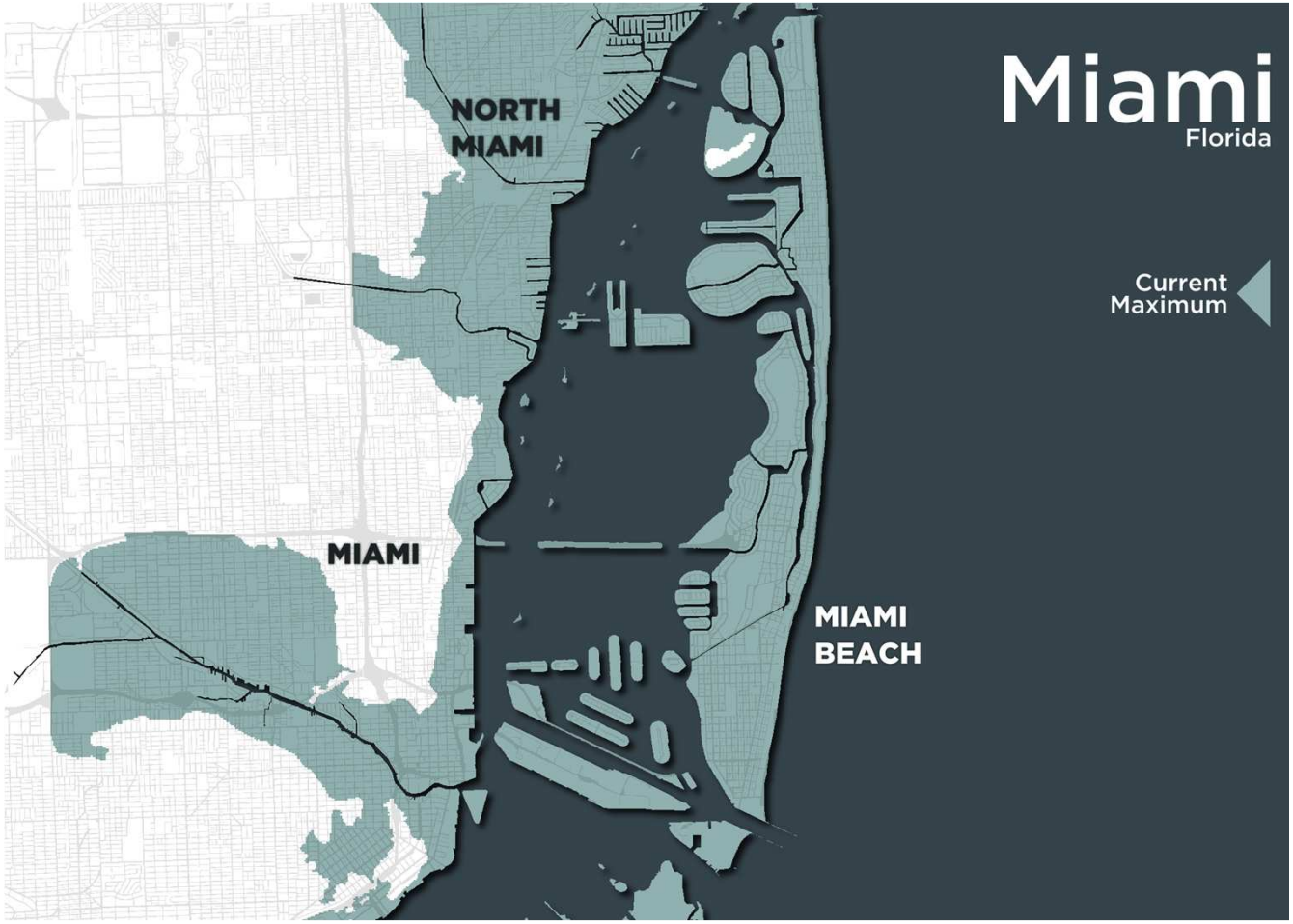
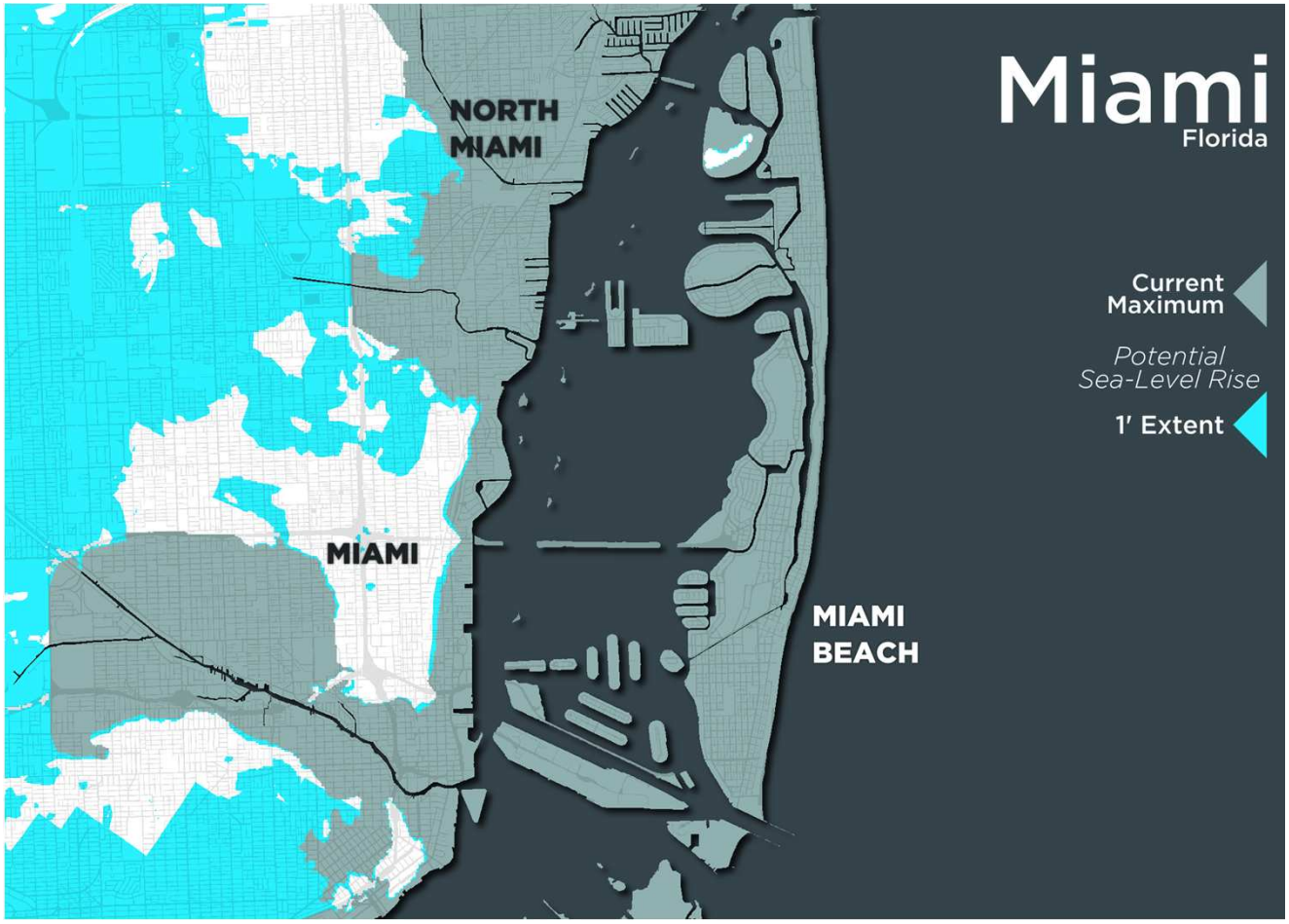
Current estimated MAXIMUM Storm Surge Risk Extent



Source: CoreLogic Storm Surge Report, 2013

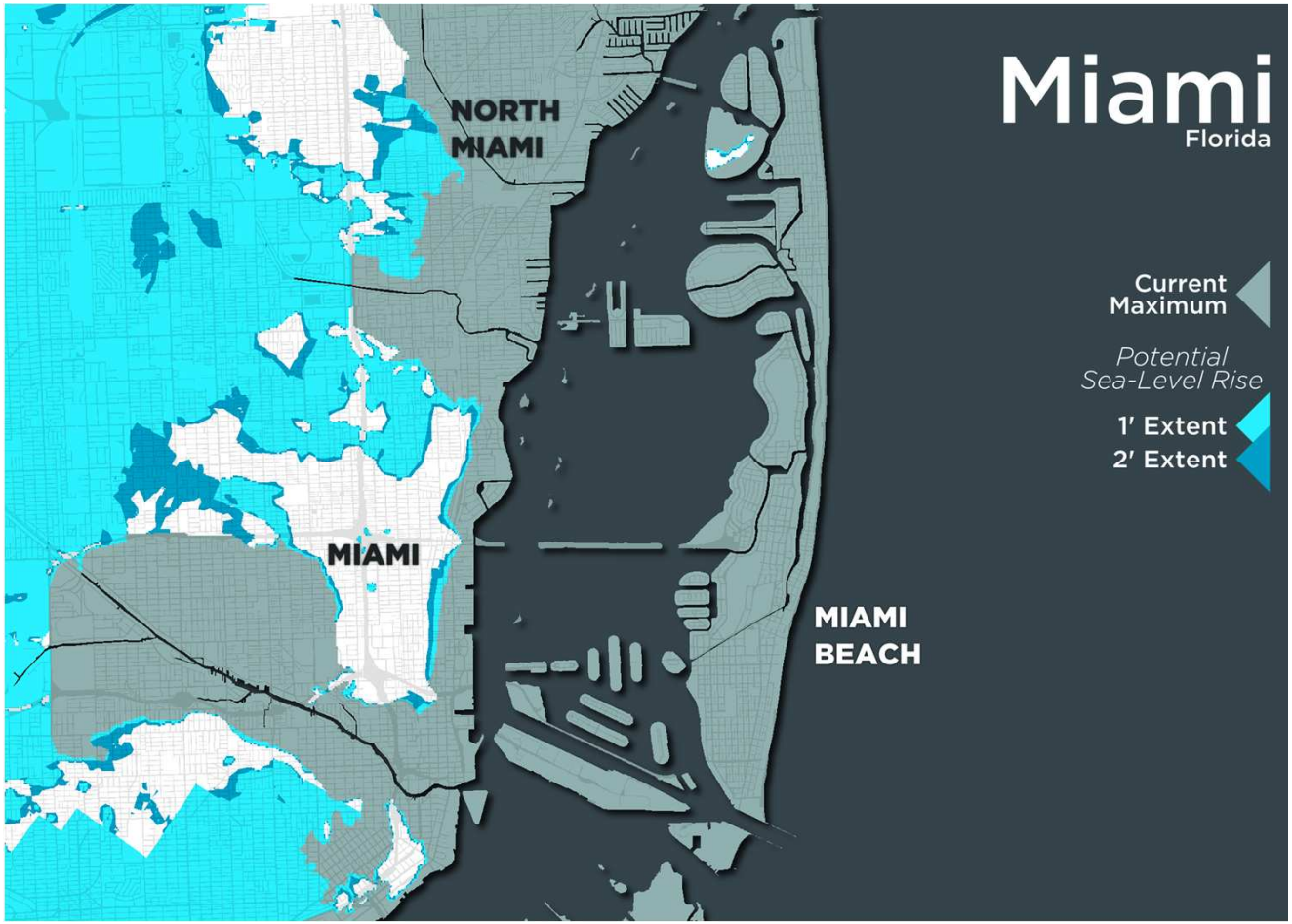
Estimated maximum surge risk extent after 1 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

CoreLogic

Estimated maximum surge risk extent after 2 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

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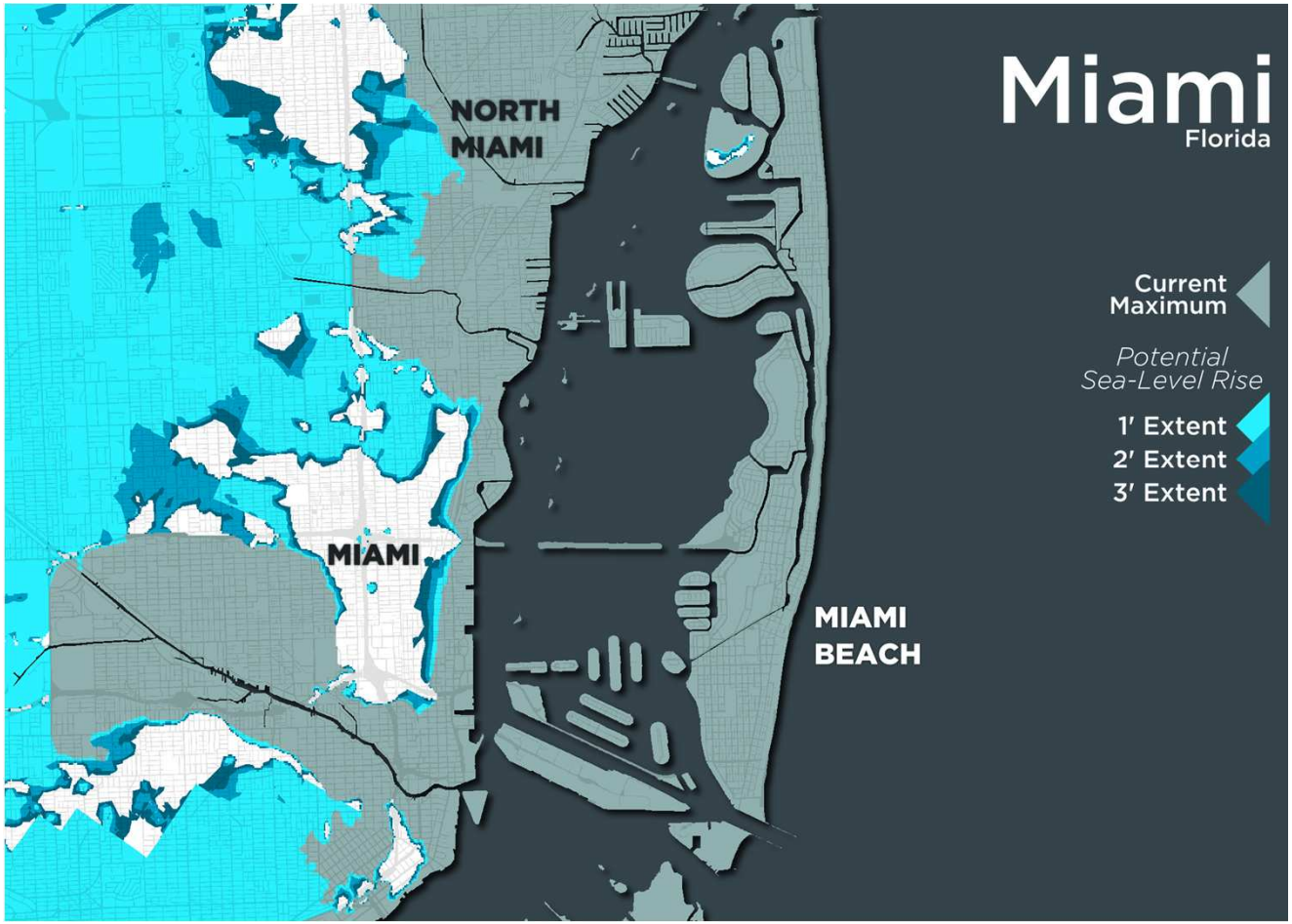
Estimated maximum surge risk extent after 3 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

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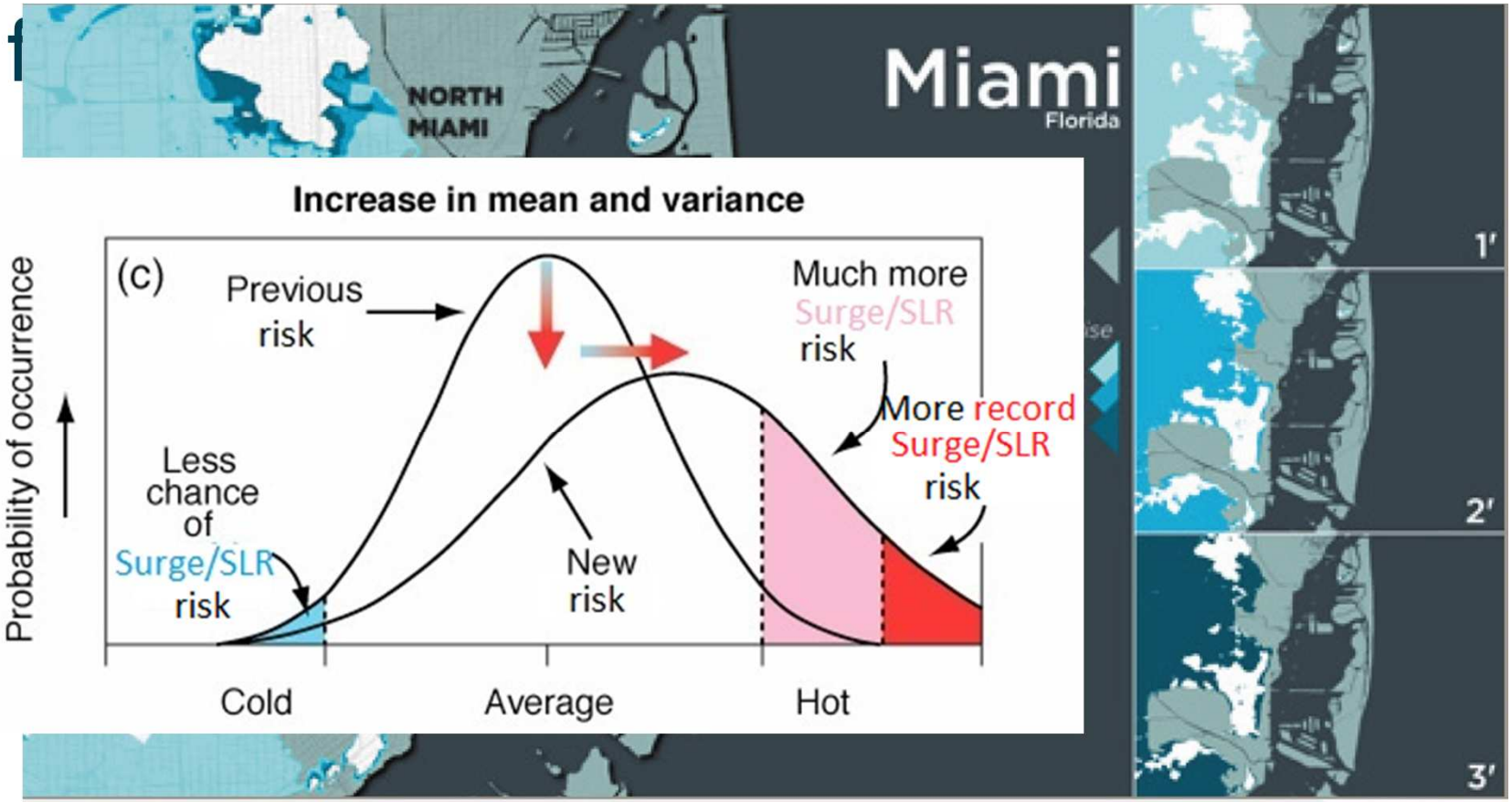
Storm Surge Risk extension

by Sea-Level Rise of 1 foot, 2 feet & 3 f



Miami Regional Storm Surge Risk with Sea-Level Rise. Source: CoreLogic, 2013.

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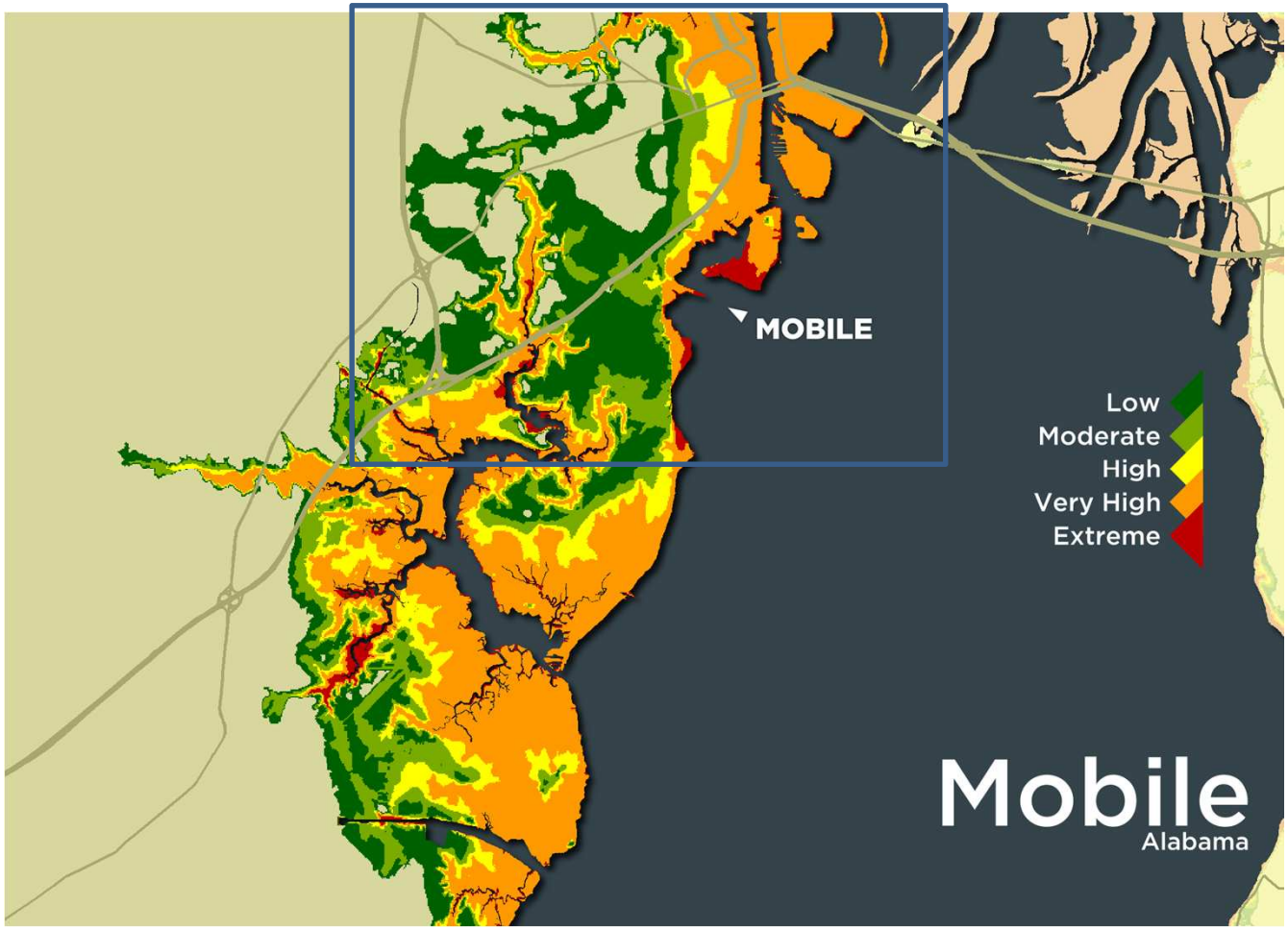
Current Estimated Storm Surge Extent – by risk level



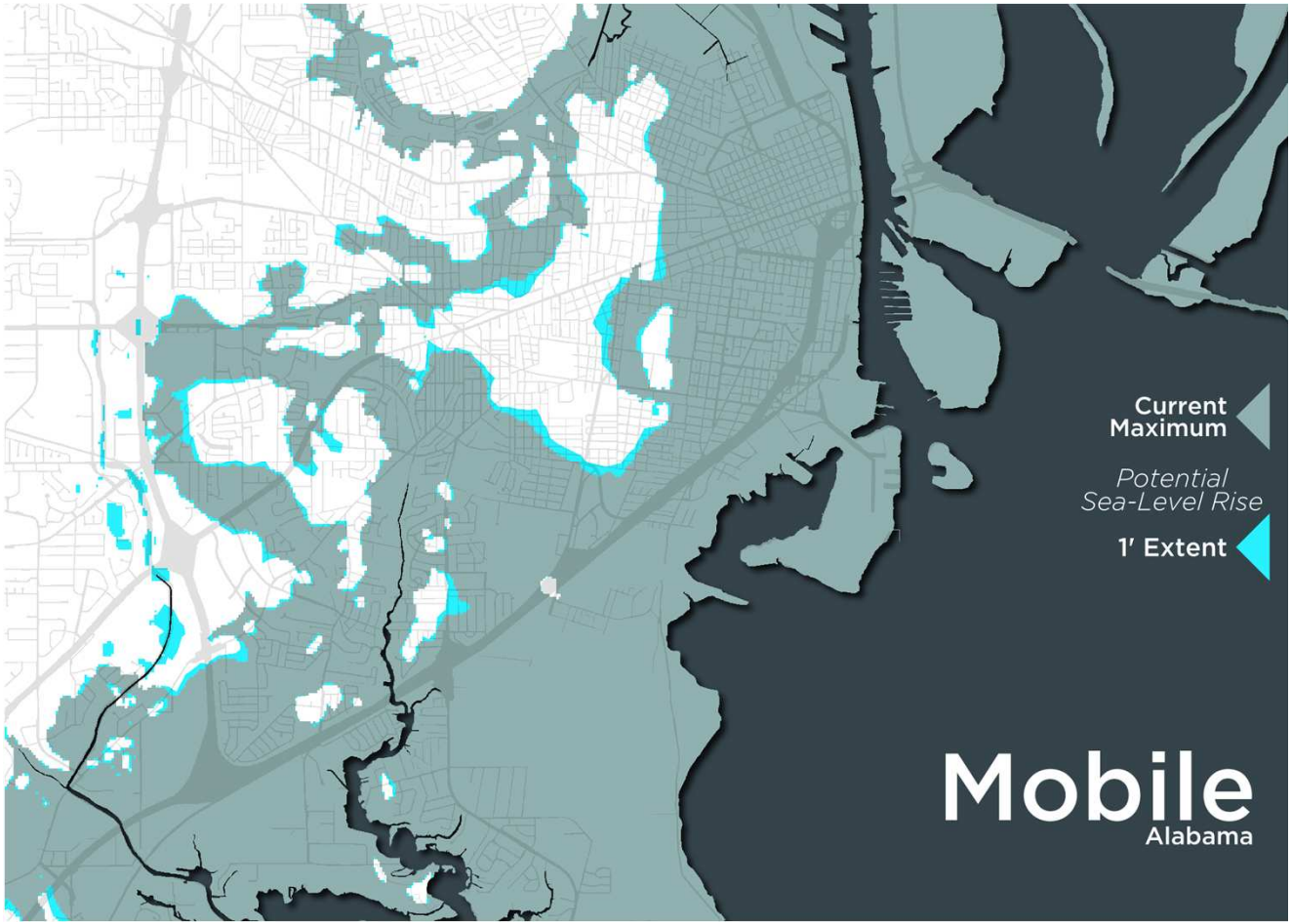
Source: CoreLogic Storm Surge Report, 2013

Current estimated MAXIMUM Storm Surge Risk Extent

Source: CoreLogic Storm Surge Report, 2013

CoreLogic

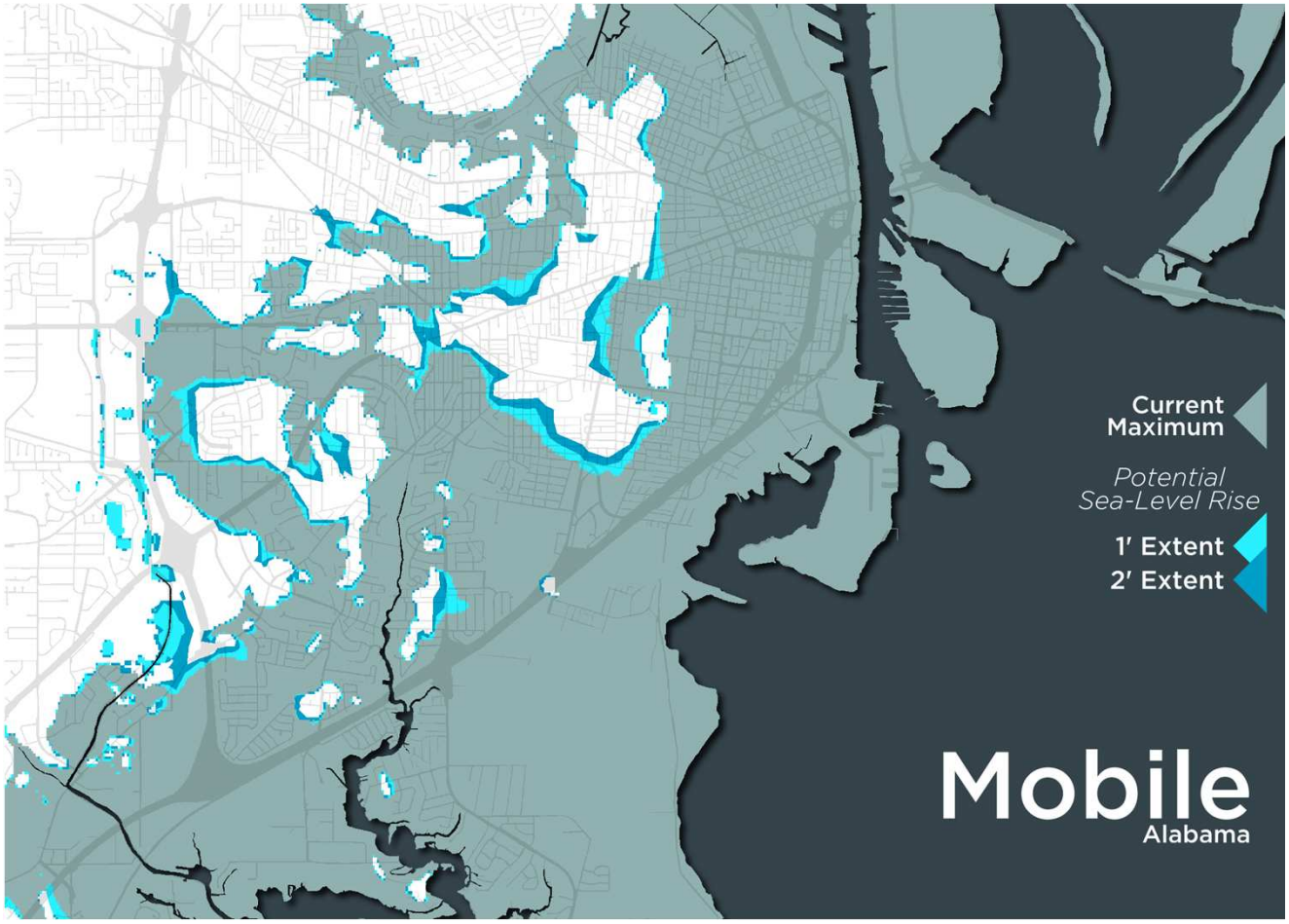
Estimated maximum surge risk extent after 1 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

CoreLogic

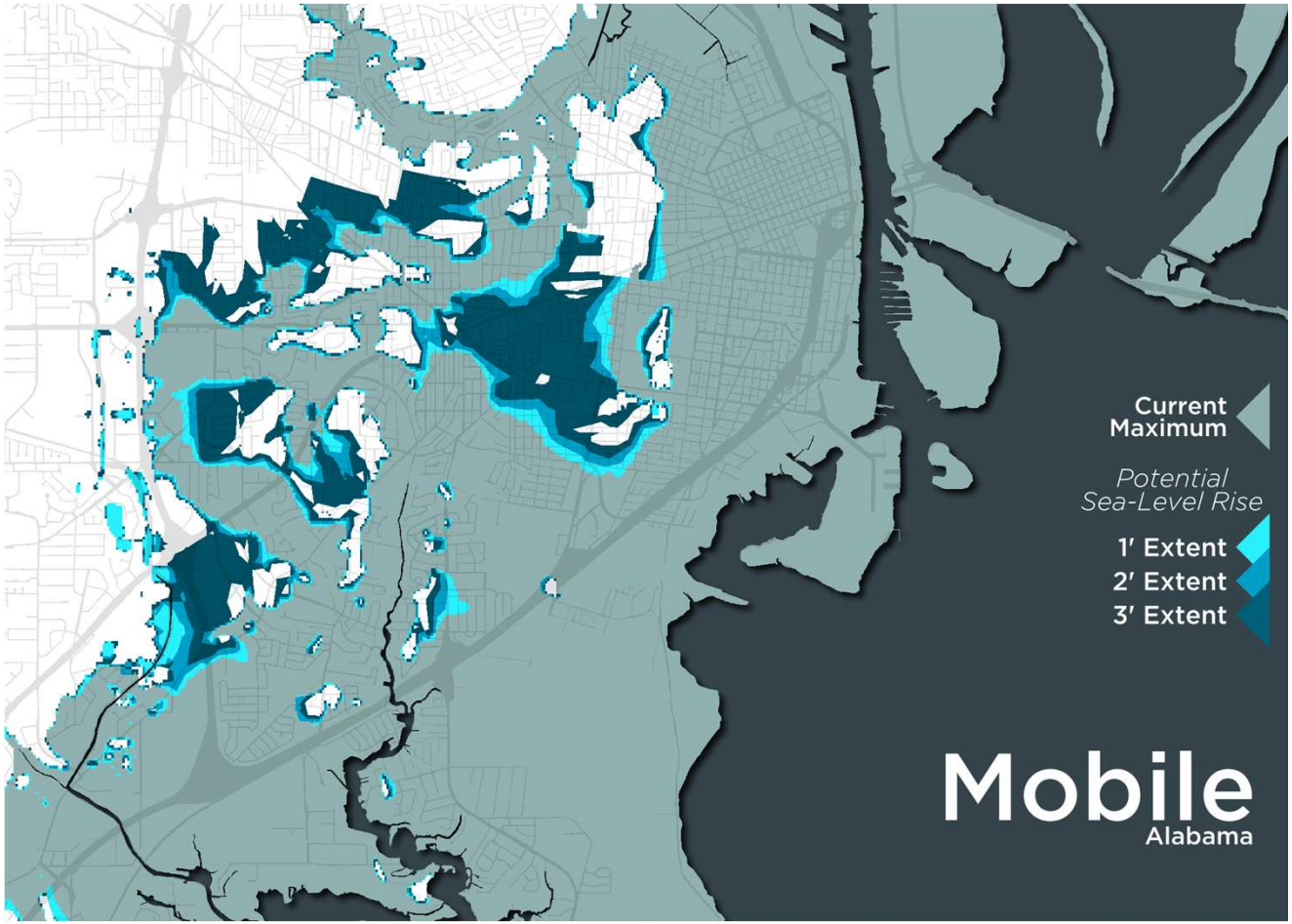
Estimated maximum surge risk extent after 2 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

CoreLogic

Estimated maximum surge risk extent after 3 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

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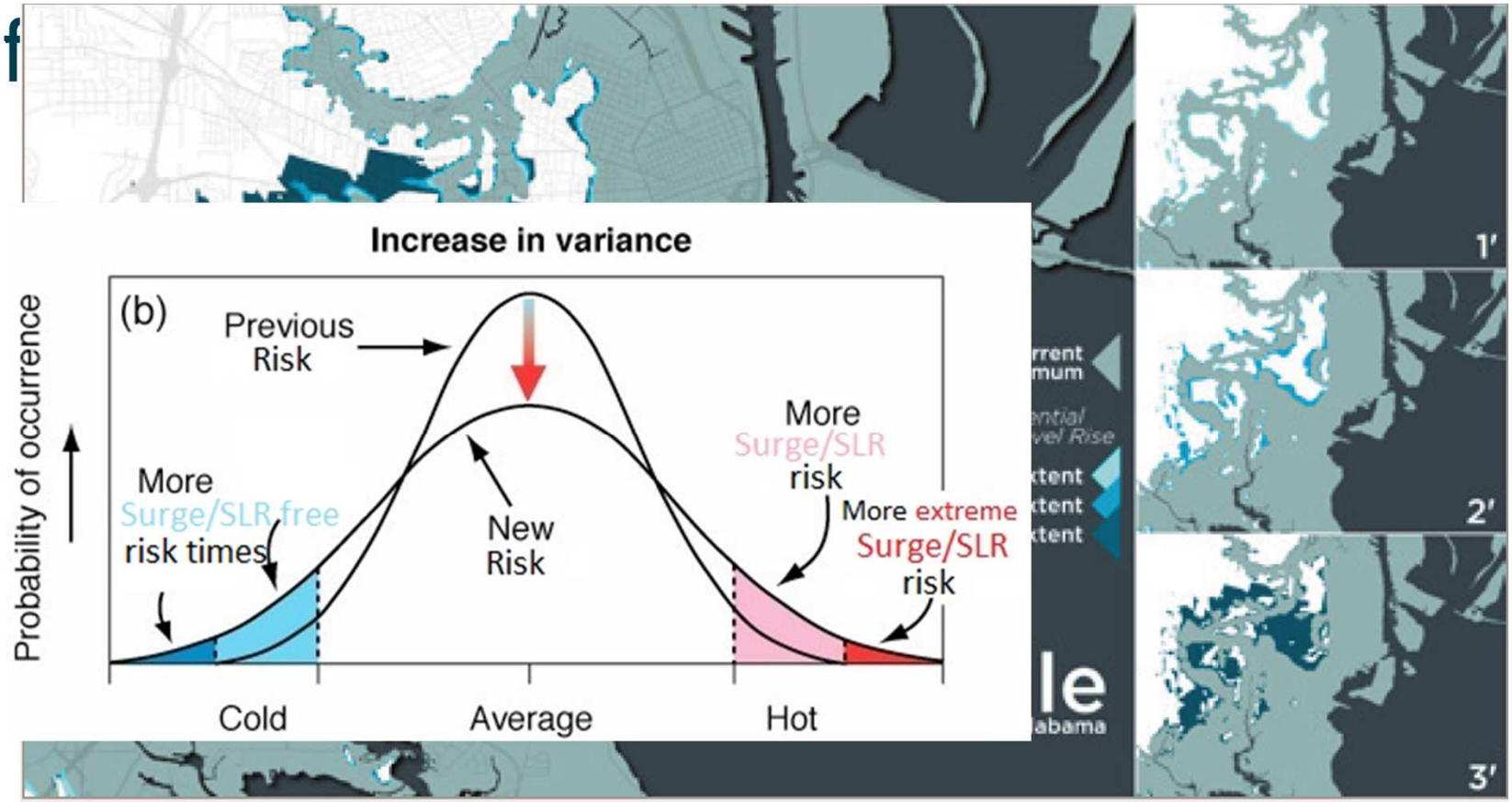
Storm Surge Risk extension

by Sea-Level Rise of 1 foot, 2 feet & 3



Mobile Regional Storm Surge Risk with Sea-Level Rise. Source: CoreLogic, 2013.

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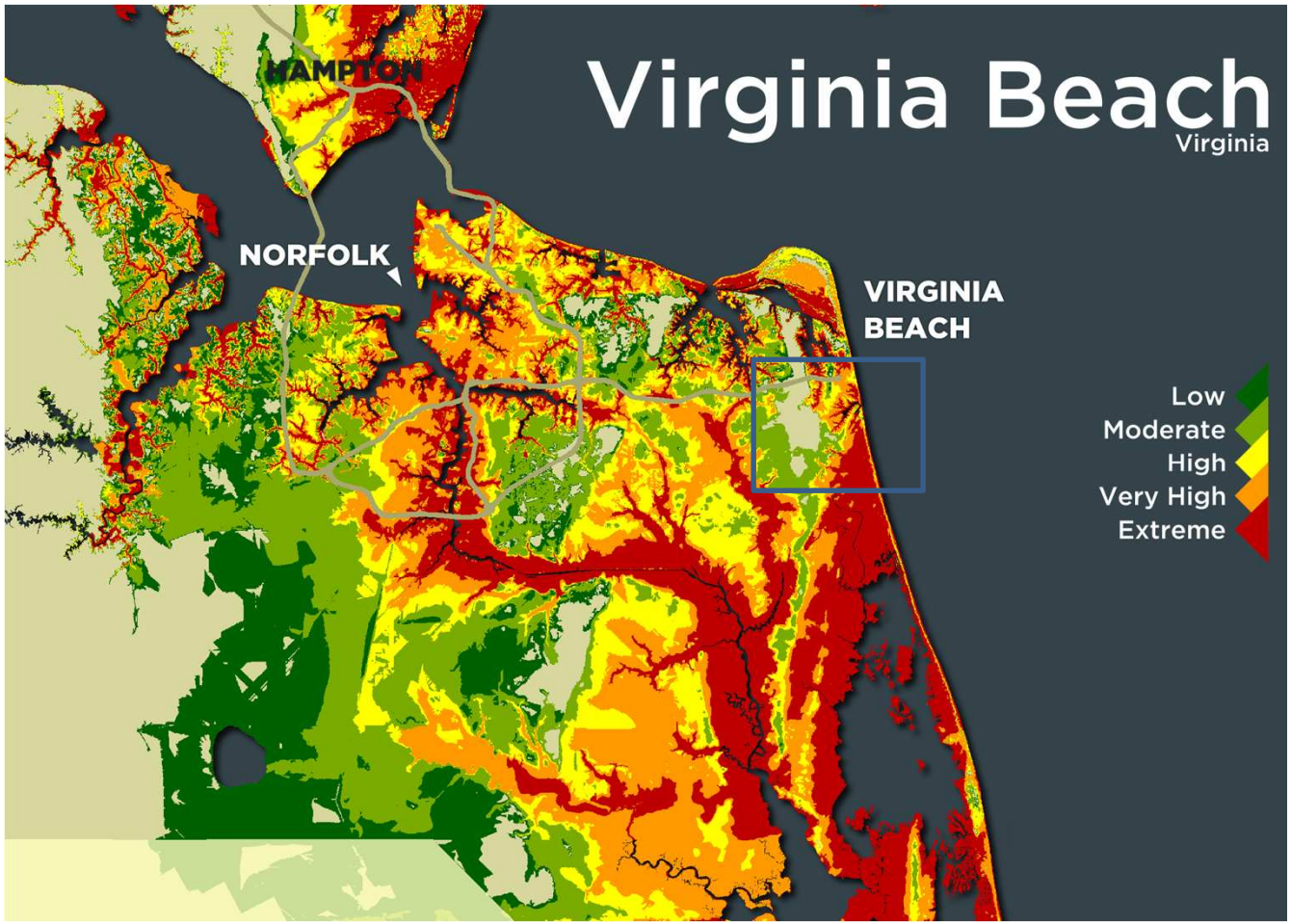
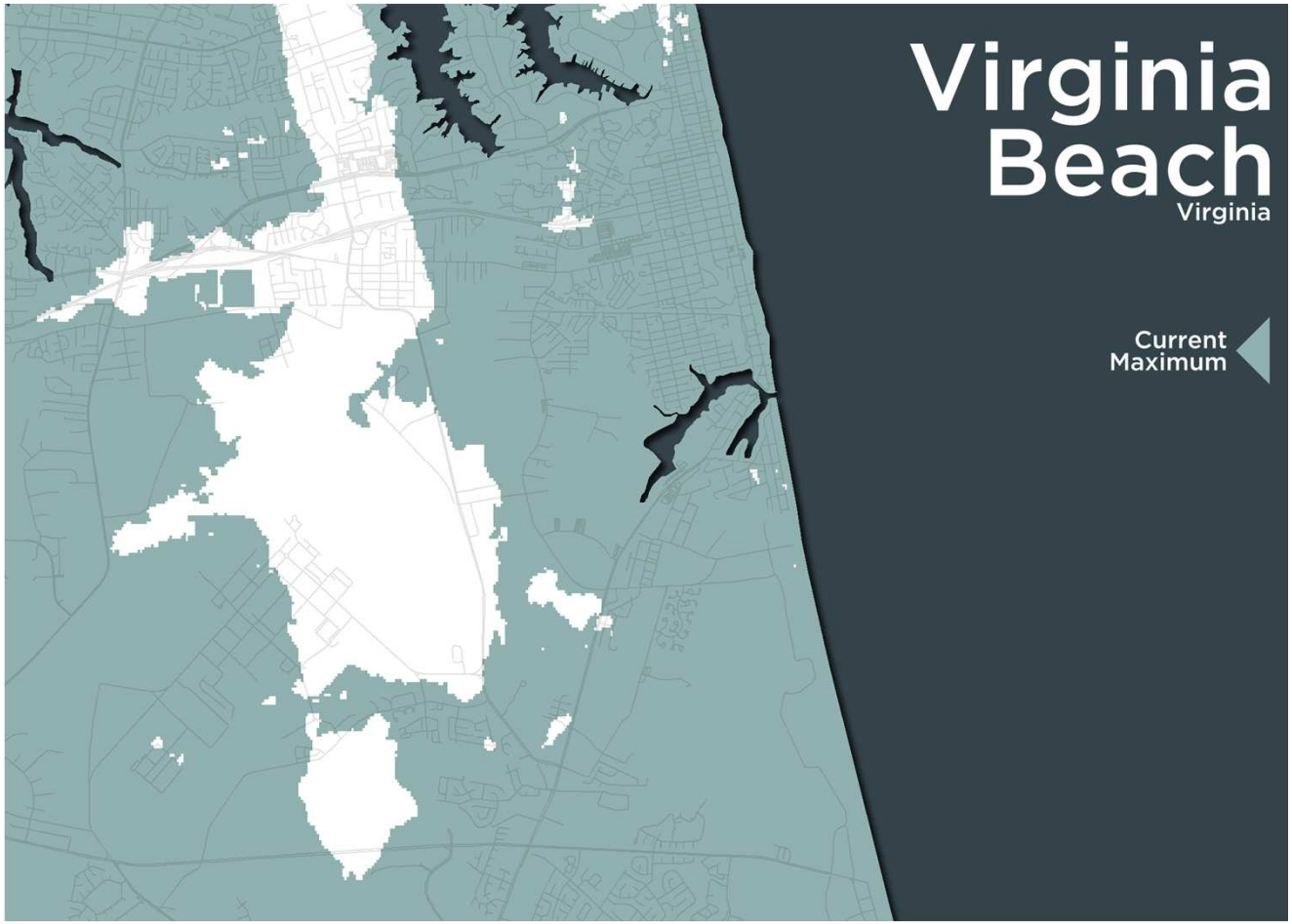
Current Estimated Storm Surge Extent – by risk level



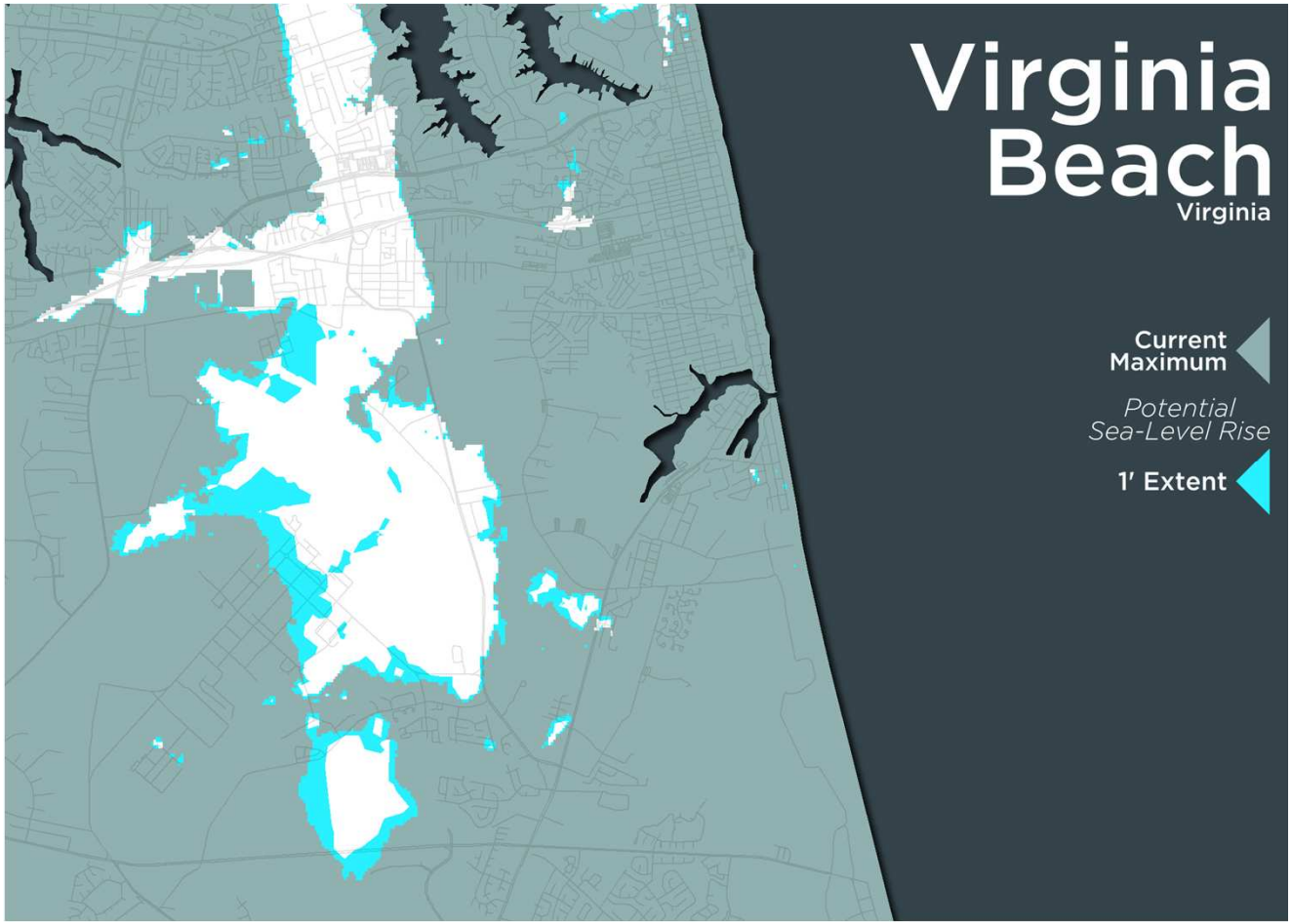
Source: CoreLogic Storm Surge Report, 2013

Current estimated MAXIMUM Storm Surge Risk Extent



Source: CoreLogic Storm Surge Report, 2013

Estimated maximum surge risk extent after 1 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

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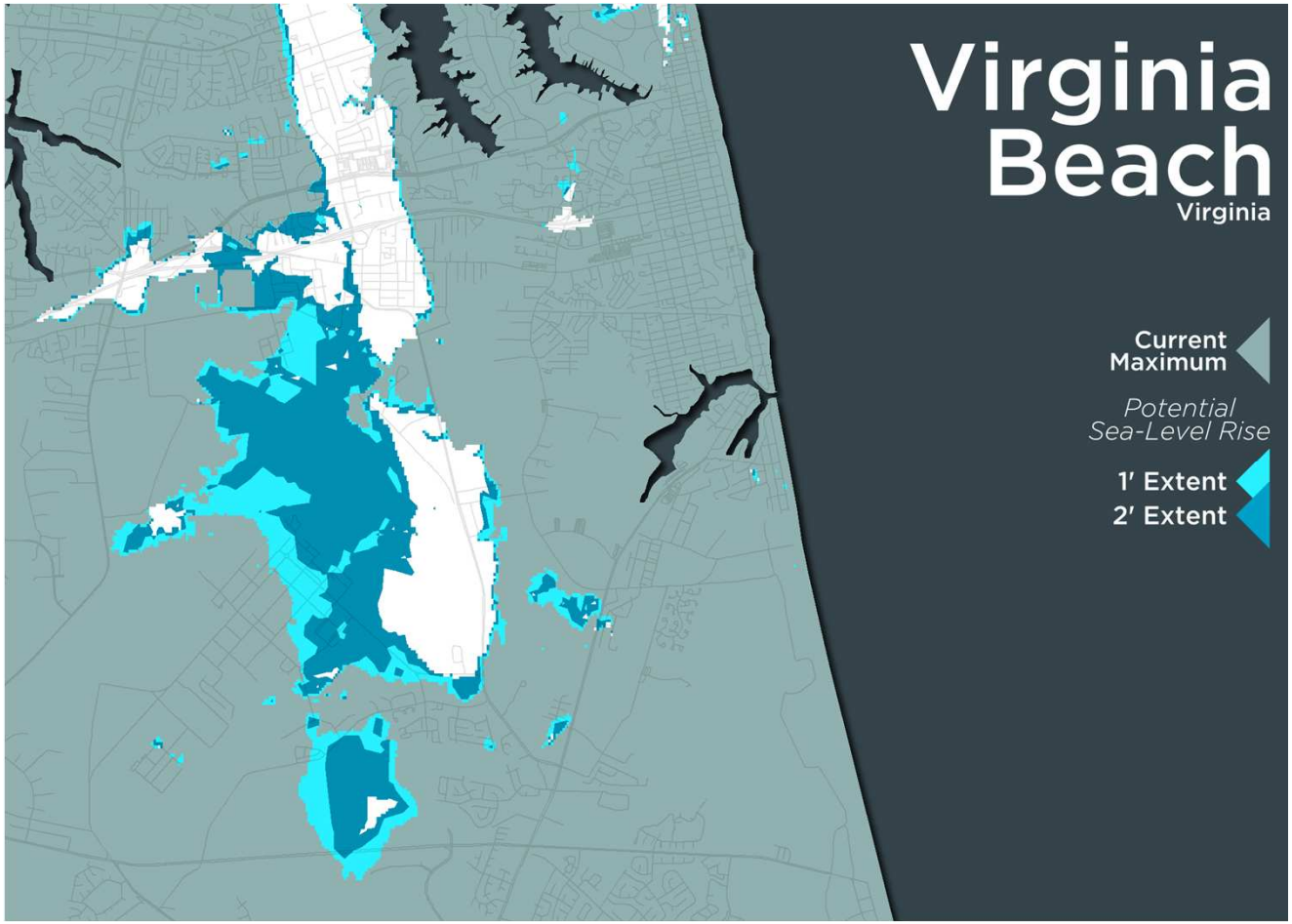
Estimate maximum surge risk extent after 2 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

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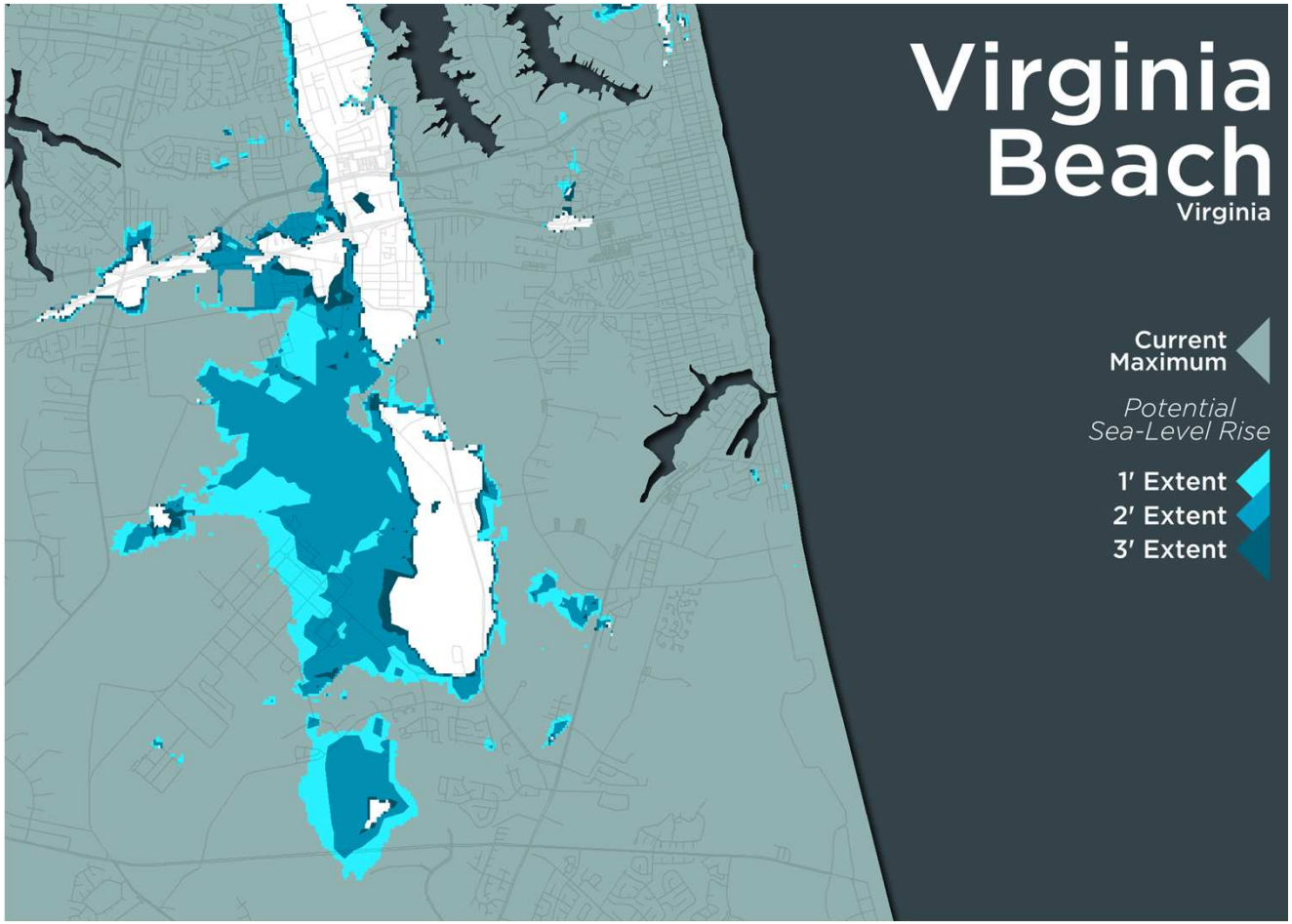
Estimated maximum surge risk extent after 3 foot Sea-Level Rise



Source: CoreLogic Storm Surge Report, 2013

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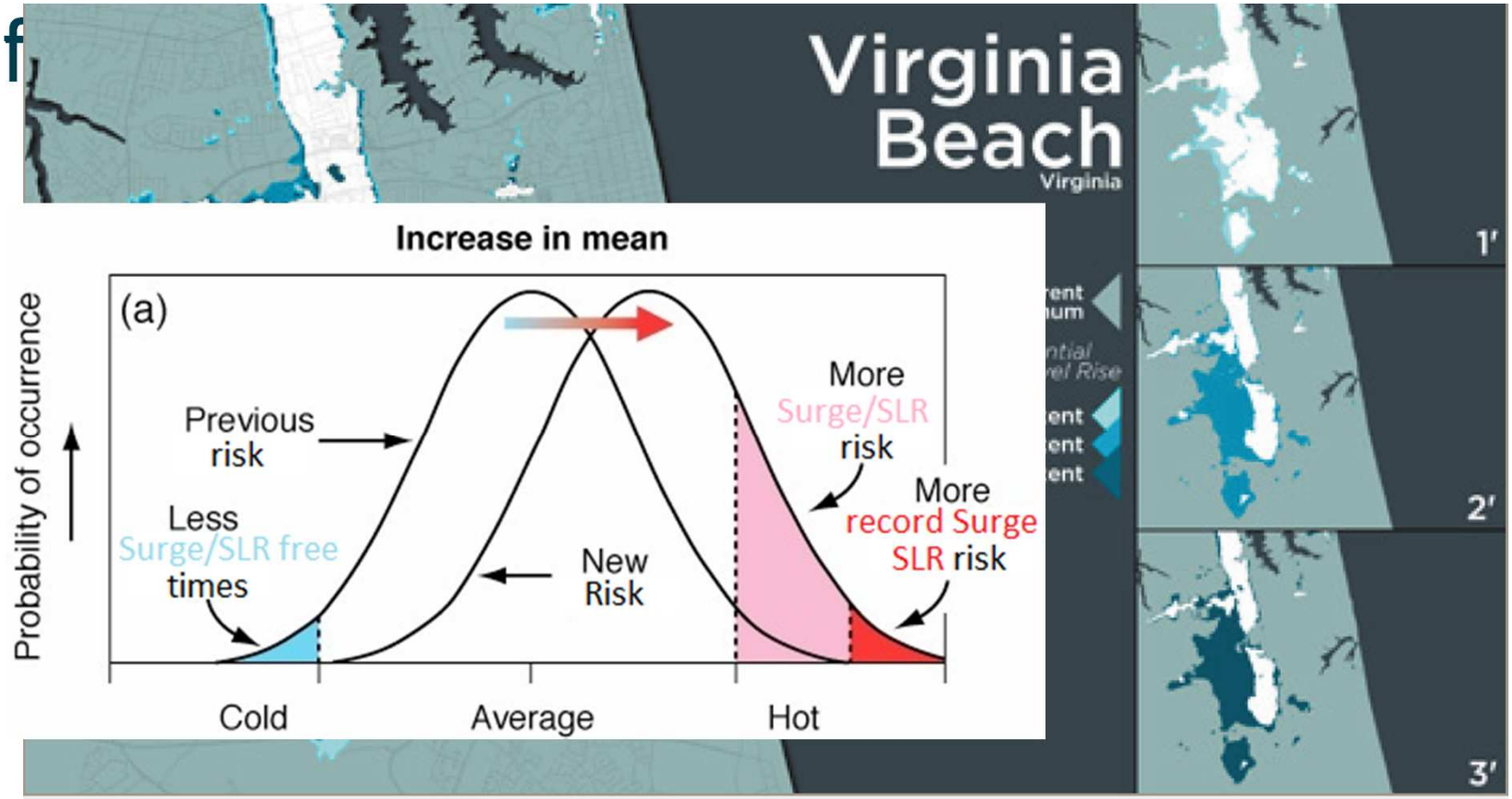
Storm Surge Risk extension

by Sea-Level Rise of 1 foot, 2 feet & 3 f



Virginia Beach Regional Storm Surge Risk with Sea-Level Rise. Source: CoreLogic, 2013.

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Residential Property Counts & Values at risk of Storm Surge

Rank	Area Name	Properties Affected	Total Structure Value	Property distribution by Surge Risk Level
1	New York	447,428	$205,712,837,261	
2	Miami	239,910	$100,132,133,476	
3	Virginia Beach	305,943	$73,033,753,064	
4	Tampa	301,045	$55,073,950,288	
5	New Orleans	238,919	$43,728,316,068	
12	Houston	187,560	$29,032,620,030	
42	Mobile	27,515	$3,231,380,600	

Source: CoreLogic Storm Surge Report, 2013

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Potential additional Residences at risk of Sea-Level Rise

		Additional Properties at risk with Sea-Level Rise of		
Area Name	**Properties Affected**	**1 foot**	**2 feet**	**3 feet**
New York	447,428	16,487	32,238	49,023
Miami	239,910	207,986	218,109	223,485
Virginia Beach	305,943	3,457	7,925	11,075
Tampa	301,045	2,992	4,105	8,794
New Orleans	238,919	2,026	2,864	3,592
Houston	187,560	11,666	19,686	28,434
Mobile	27,515	1,527	3,043	6,718

Source: CoreLogic Storm Surge Report, 2013

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Potential Residential Exposure Increase in % from Sea-Level Rise

		Percent increase in at-risk properties with Sea-Level rise of		
Area Name	**Properties Affected**	**1 foot**	**2 feet**	**3 feet**
New York	447,428	4%	7%	11%
Miami	239,910	87%	91%	93%
Virginia Beach	305,943	1.1%	2.6%	3.6%
Tampa	301,045	1.0%	1.4%	2.9%
New Orleans	238,919	0.8%	1.2%	1.5%
Houston	187,560	6%	10%	15%
Mobile	27,515	6%	11%	24%

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Can I help you understand Climate Change Risk?

Steve@Kolkulations.com

Do you want to know more
about Sea Level Rise impacts and the like?

SLKOLK@CoreLogic.com

Read the 2013 CoreLogic Storm Surge Report

http://www.corelogic.com/about-us/
/researchtrends/storm-surge-report.aspx

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