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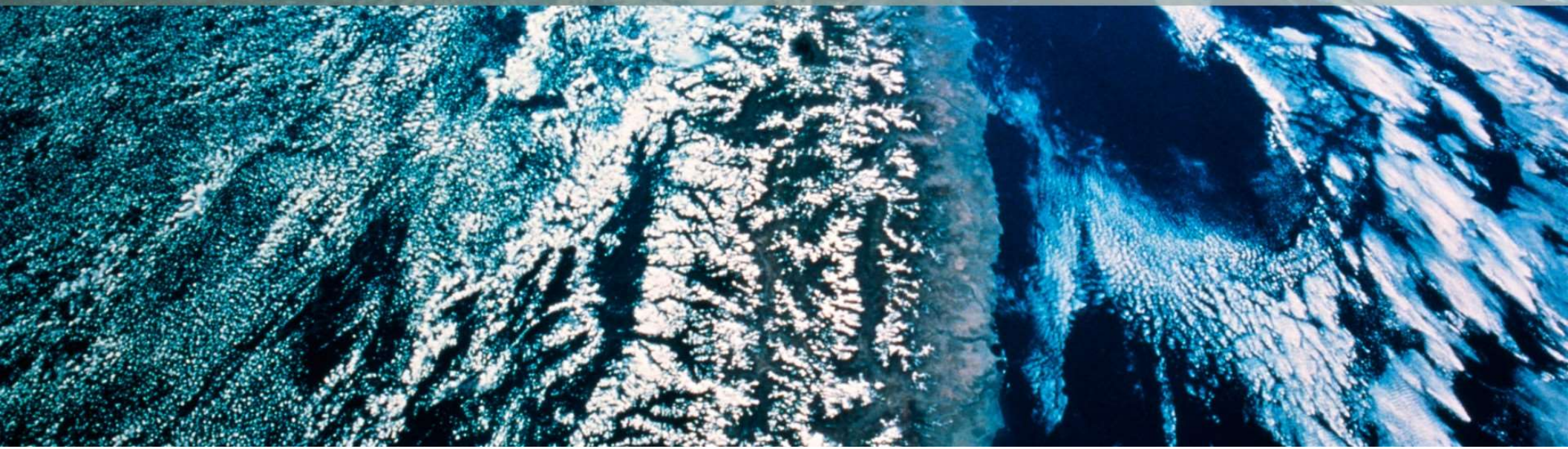
Nat Cats – how can we tame these Cats?

Vancouver – May 23, 2019



Agenda

1. Global experience in Nat Cats in 2018
2. Reinsurance capitalization
3. Lessons learned in Marine
4. How to tame the Cats?

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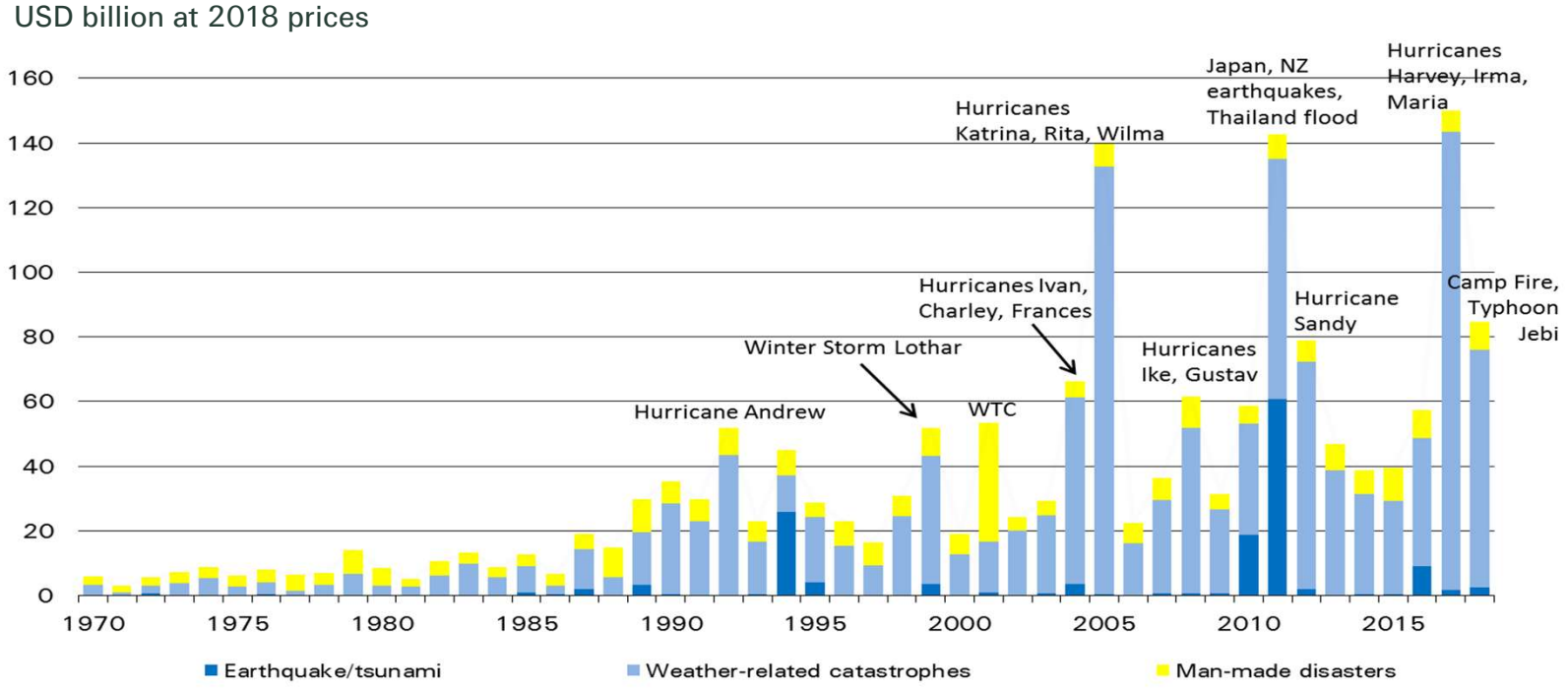
1. Global Experience in Nat Cats in 2018

A number of small- to medium-sized events combined to add up to the 4th highest insured loss on record in 2018



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Source: Sigma No 2/2019

What contributed to 2018 being the 4th costliest Nat Cat loss year on record?

Small to mid-sized events contributed to majority of insured losses (e.g. California Wildfires, Severe Thunderstorms, Japan Flood and Typhoons, US Hurricanes)

Perils not earlier known for severity created surprises (e.g. Camp Wildfire with USD 12bn loss, Western Japan Flood with USD 2.5bn loss)

Water and wind-related perils dominated losses, adding to the discussion on the role of climate change


Hurricane Michael (NOAA)


Camp Fire (NASA)

Hurricane Florence (NWS)

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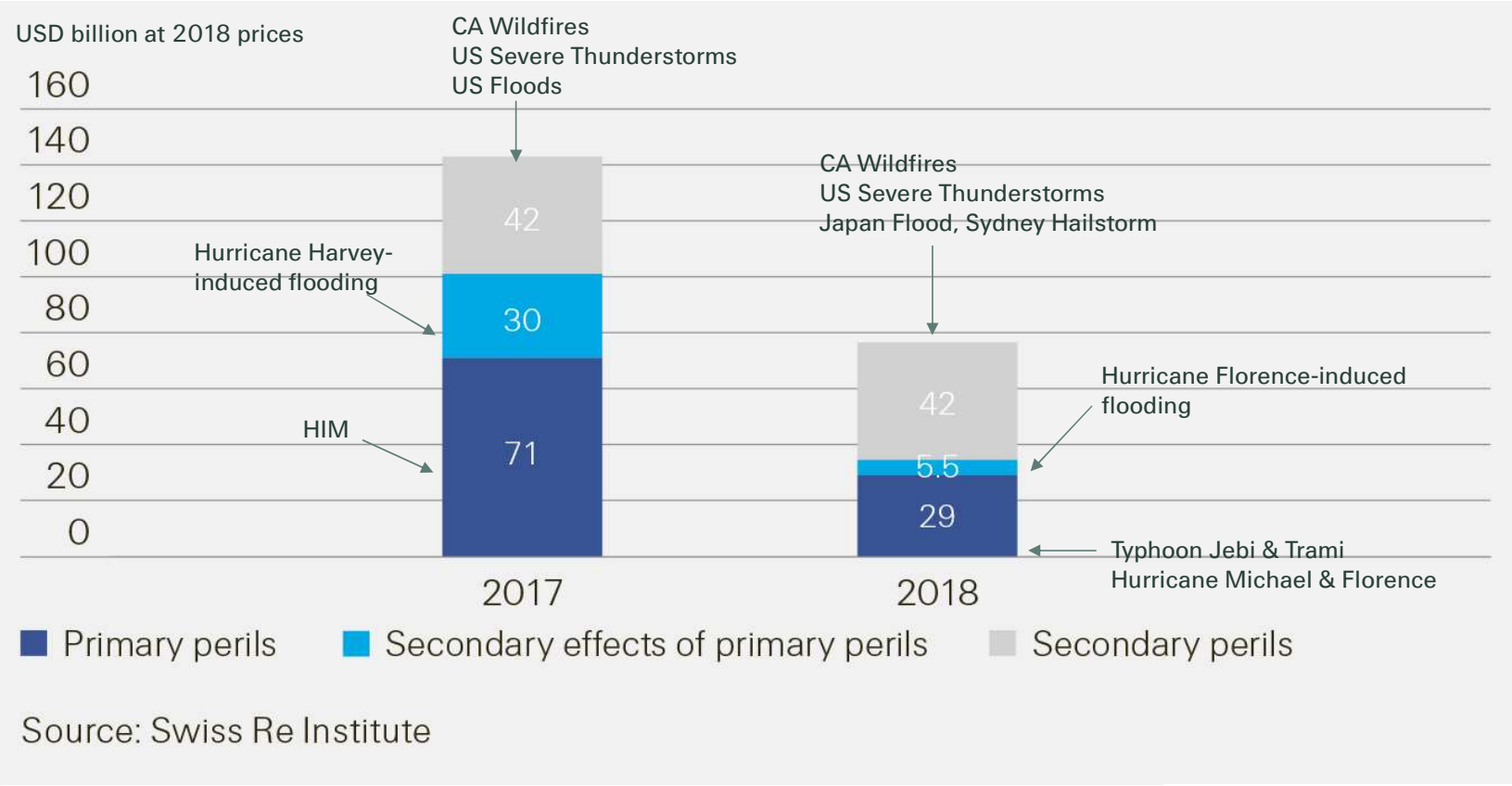
Source: Lunch @ Sigma, May 2019

Secondary perils come in two forms, many times in unpredictable ways

Primary Perils (i.e., Peak Perils)	Secondary Perils as	
	Secondary effects of Primary Perils	Independent High-frequency Perils
		
• Tropical Cyclones, Earthquakes, and EU Winter storms • Known for their severity of loss potential and well-modelled	• Hurricane-induced precipitation, Storm surge, Liquefaction, Tsunami, Fire Following Earthquake • Not always well captured in Primary Perils modelling	• Low to medium severity perils e.g., Severe Thunderstorms, Floods, Wildfire, Droughts, Snow and Ice storms • Lack of robust and efficient tools; gap in model coverage worldwide

Source: Lunch @ Sigma, May 2019

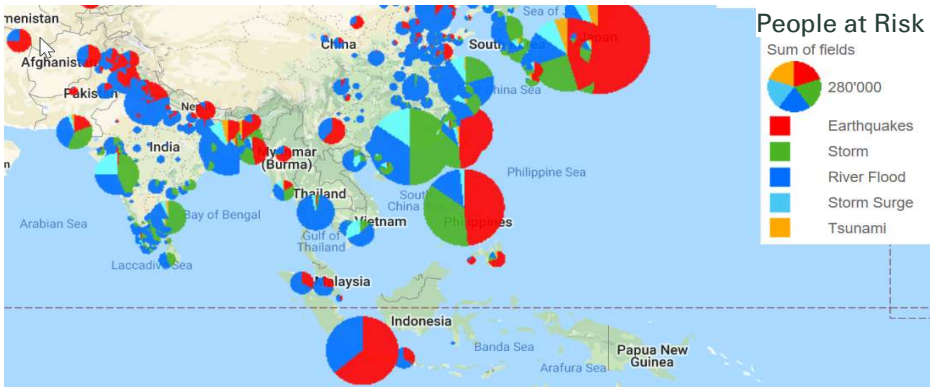
Nearly 2/3 of insured losses in 2018 were due to secondary perils



Source: Sigma No 2/2019

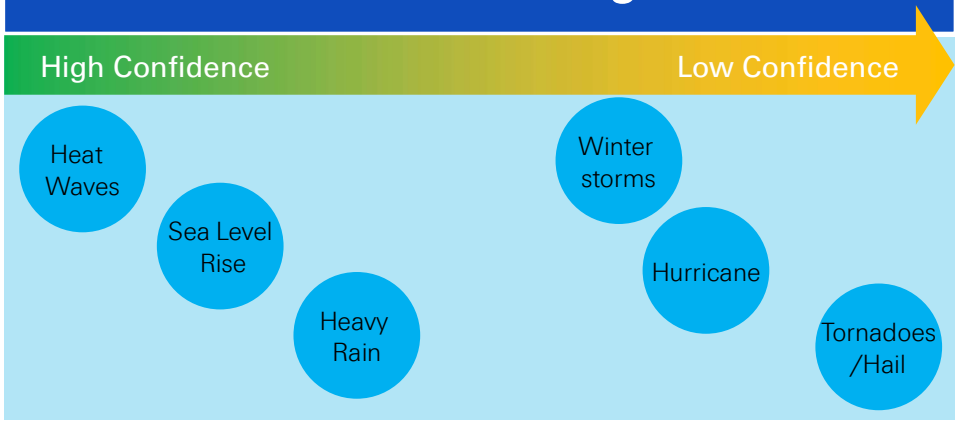
Urbanization and climate change are the two key drivers for increasing secondary peril losses ahead

Rapid Urbanization



- Concentration of risks (hot spots), e.g., 2011 Thailand Flood, 2017 Hurricane Harvey flooding in Houston
- 55% to 68% of urban populations by 2050 (i.e., another 2.5bn people)

Climate Change



- Relatively a strong and direct link between sea level rise/precipitation and temperature rise
- Example, every 1°C change leads to 7% increase in moisture holding capacity in atmosphere

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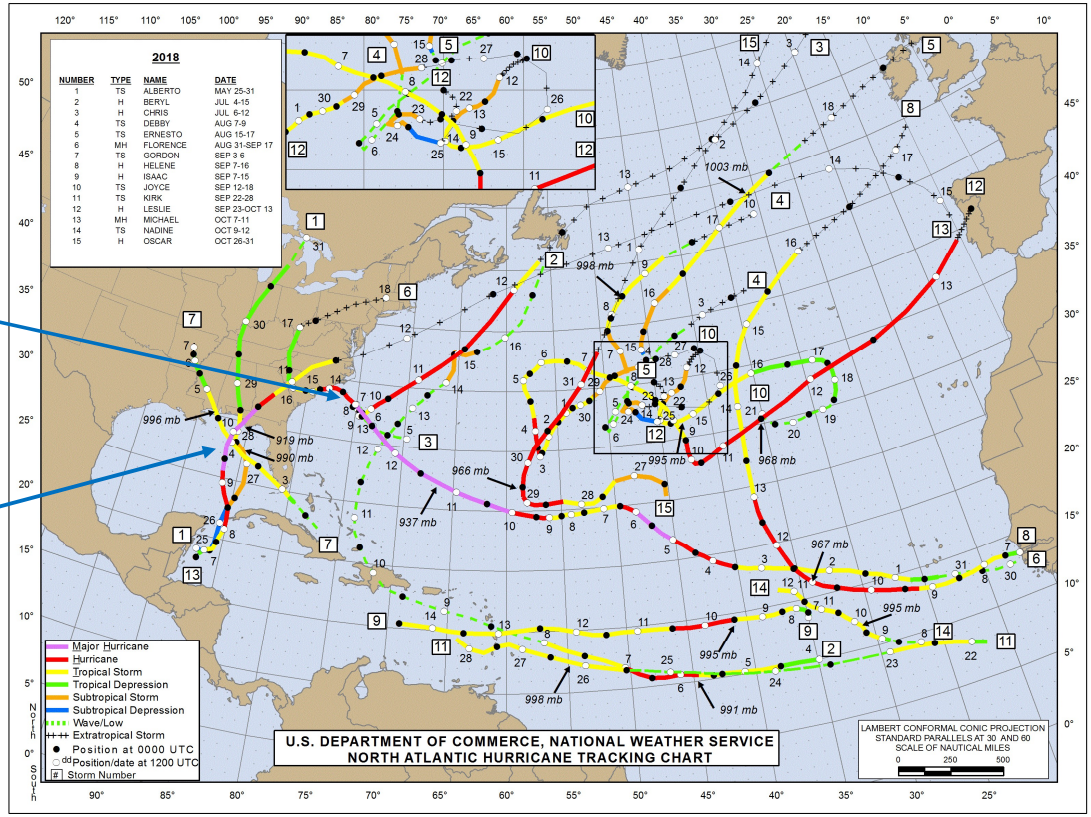
Source: Lunch @ Sigma, May 2019

2018 North Atlantic Hurricanes
15 Storms, 8 Hurricanes, 2 Major Hurricanes

Hurricane Florence
(Cat 1 at landfall)

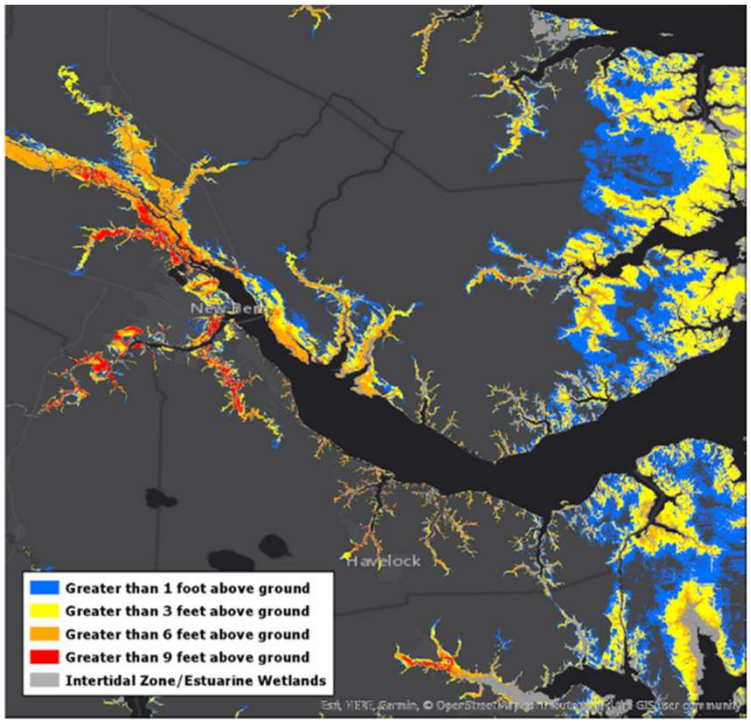
Hurricane Michael
(Cat 5 at landfall)



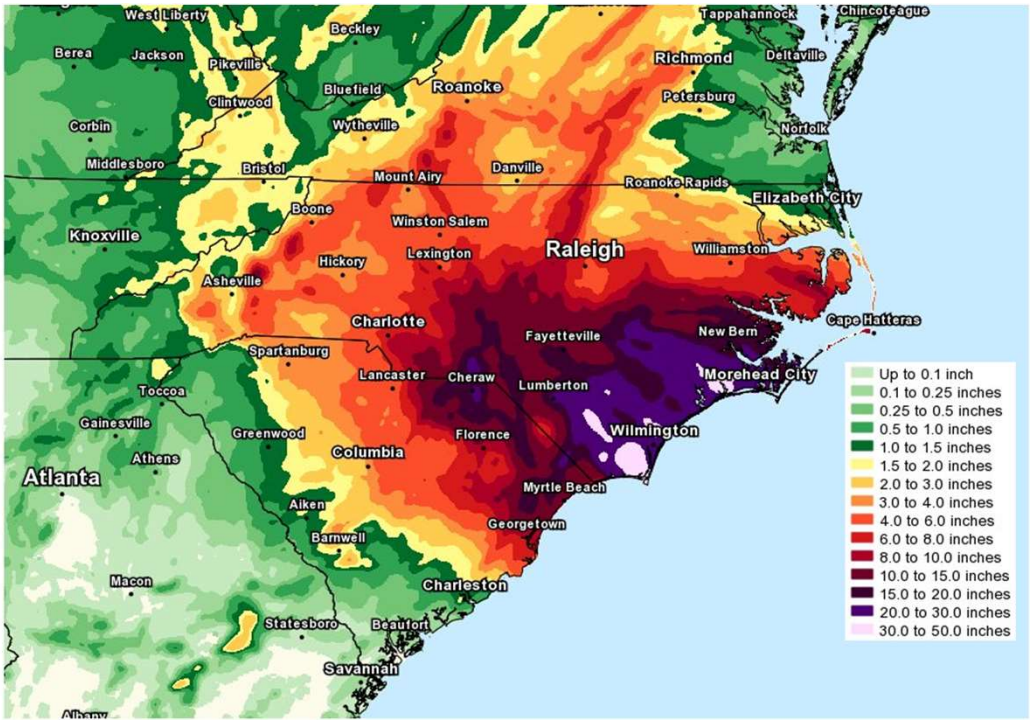
Source: Lunch @ Sigma, May 2019

Hurricane Florence – Only(!) Category 1
Significant impact from secondary perils

Storm Surge Inundation

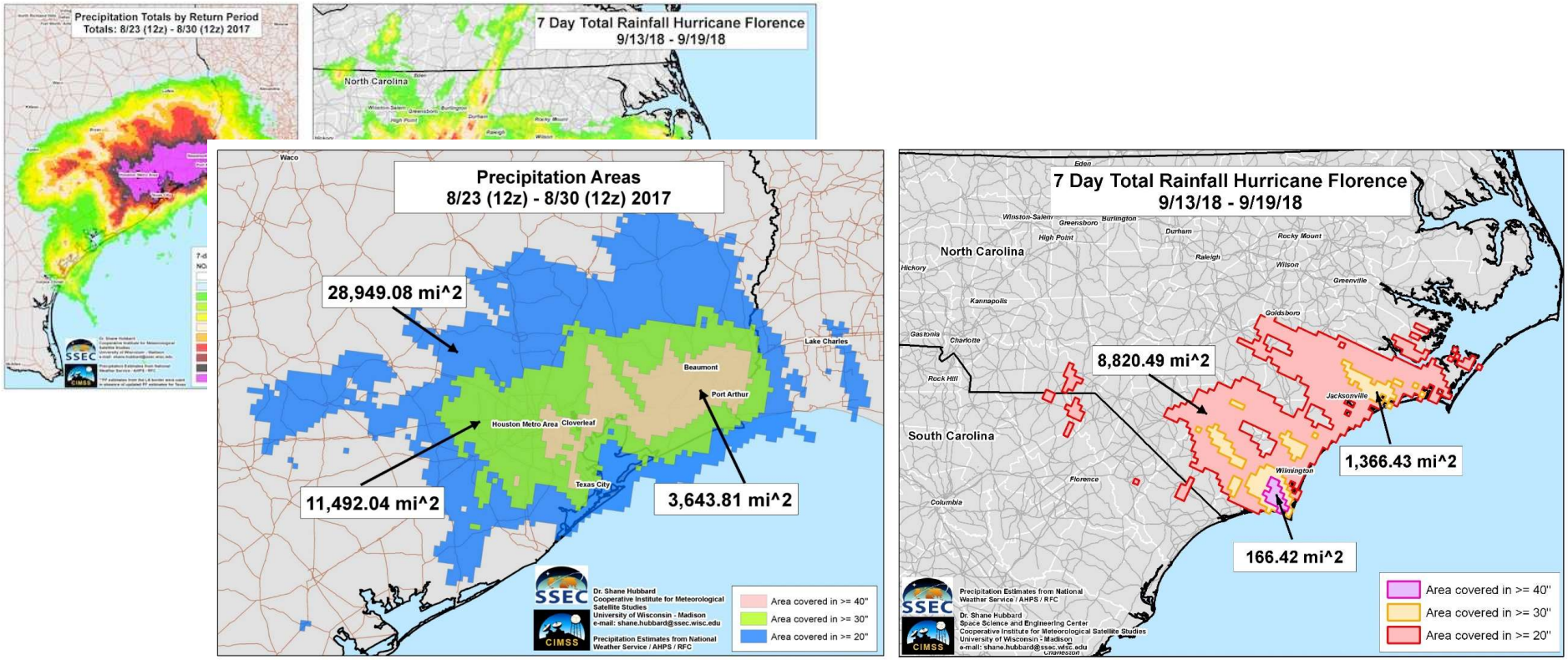


Total (7 Day) Rainfall



Source: Lunch @ Sigma, May 2019

Hurricanes Florence vs Hurricane Harvey (2017)
Similar local precipitation intensities but very different areas of impact



Source: Dr. Shane Hubbard/CIMSS/UW-Madison

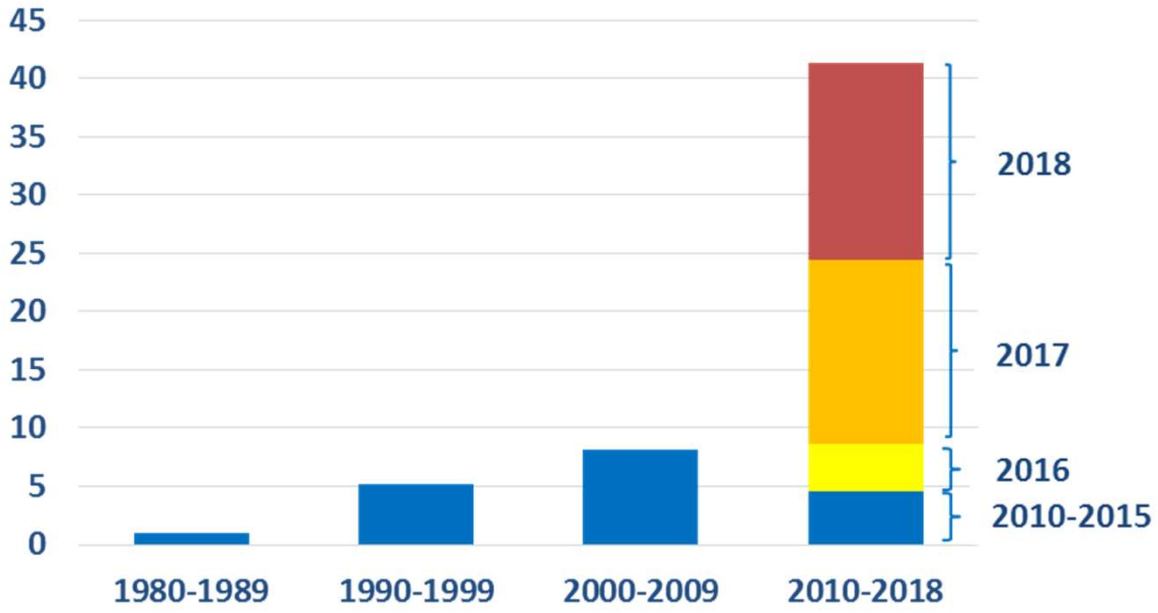
Source: Lunch @ Sigma, May 2019

Record high wildfire losses, yet again

1980-2009

2%*

Global insured losses from wildfires (USD billion, in 2018 prices)



since 2010

7%*

*of the total insured losses from natural catastrophes

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Source: Sigma No 2/2019

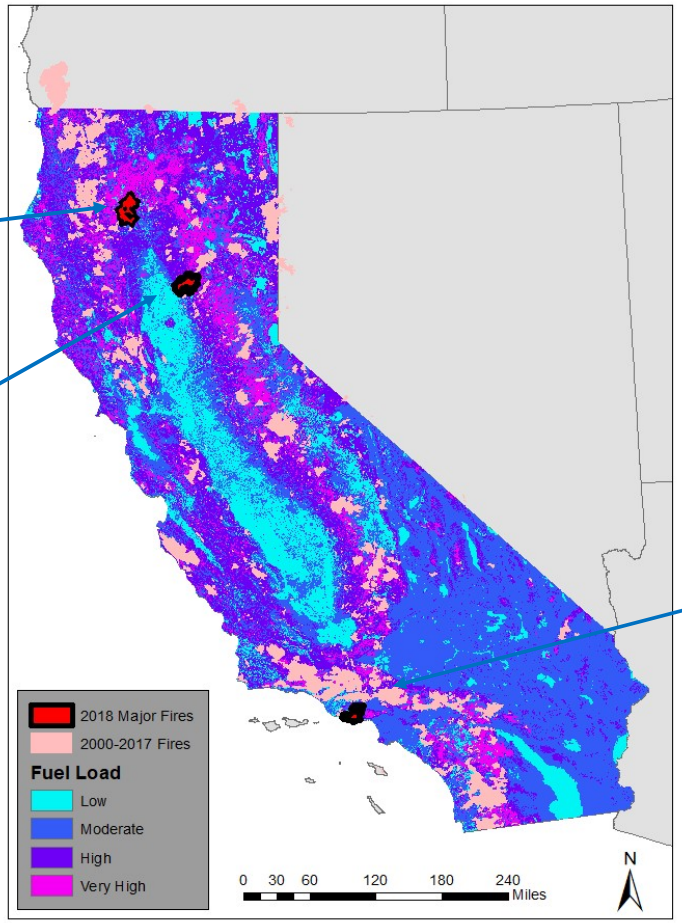
Major wildfire events/losses in California, yet again

Carr Fire

1.6K structures destroyed
230K acres

Camp Fire

18.8K structures destroyed
153K acres



Woolsey Fire

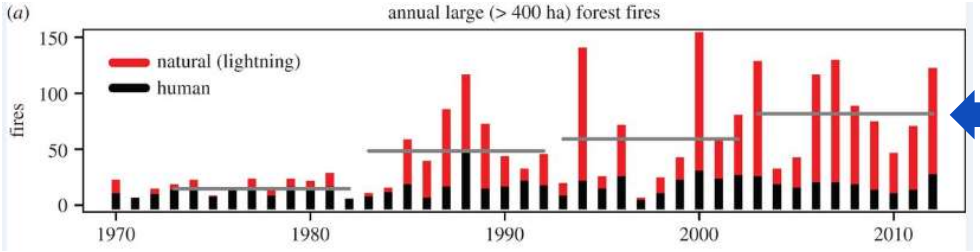
1.6K structures destroyed
97K acres

(1 square mile = 640 acres)

Source: Lunch @ Sigma, May 2019

Wildfires are increasing in frequency and size

- Large wildfire (>400 ha) events have become more frequent in the western US:



Approximately 20 additional large wildfires occurred each decade from 1973 to 2012

(Excludes prescribed burns and other land management)

- 1980-Present: Positive trend in area burned by wildfires each year (~3 million acres in 1980s, 10+ million acres in 2010s)
- Extension of wildfire season length in the western US:

Decade	1973–1982	1983–1992	1993–2002	2003–2012
Wildfire season length, days	138	166	202	222

(Source: Westerling et al. 2016)

What is driving the trends in wildfire activity?

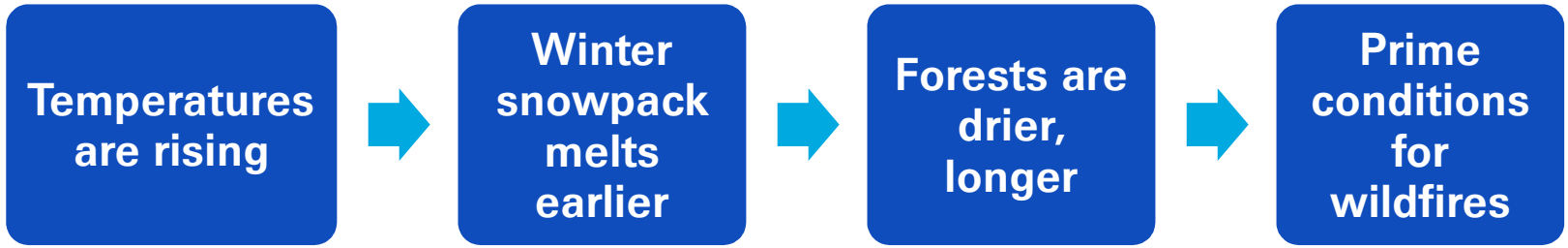
- Changing exposure
  - Growth of the wildland-urban interface (WUI)
  - Accumulation of fuels due to changes in timber harvesting, infestation, etc.
  - Population growth and ignitions (84% of ignitions are from humans)

US Wildland Urban Interface by decade

	WUI Area (sq. km)	Housing units (millions)	Population (millions)
1990	580,000	30.8	73
2000	690,000	37.0	86
2010	770,000	43.8	99

Source: USDA/US Forest Service

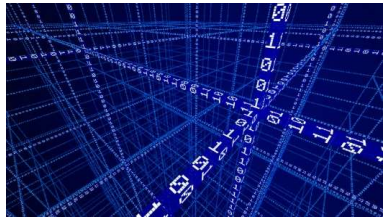
- Changing climate conditions



Source: Lunch @ Sigma, May 2019

A need for better wildfire risk assessment tools

- Efforts to develop wildfire risk assessment tools increased in the industry following recent large loss events



- Some factors influencing wildfire risk are well-understood and modelled:
  - Land use, soil type, vegetation (type, density and health)
  - Topography (slope and aspect)
  - Lightning climatology

- Other factors are equally (if not more) important, but difficult to model:
  - Emission, dispersion and accumulation of embers and smoke
  - Vulnerability modifiers: skylights, dormers, siding type, defensible space, attic vents, roof cover, cladding
  - Influence of human behavior: ignitions and suppression
  - Fire breaks (roads, highways, rivers) and locations of fire stations or water resources
  - Climate-weather interactions; extreme wind events (Santa Anas)

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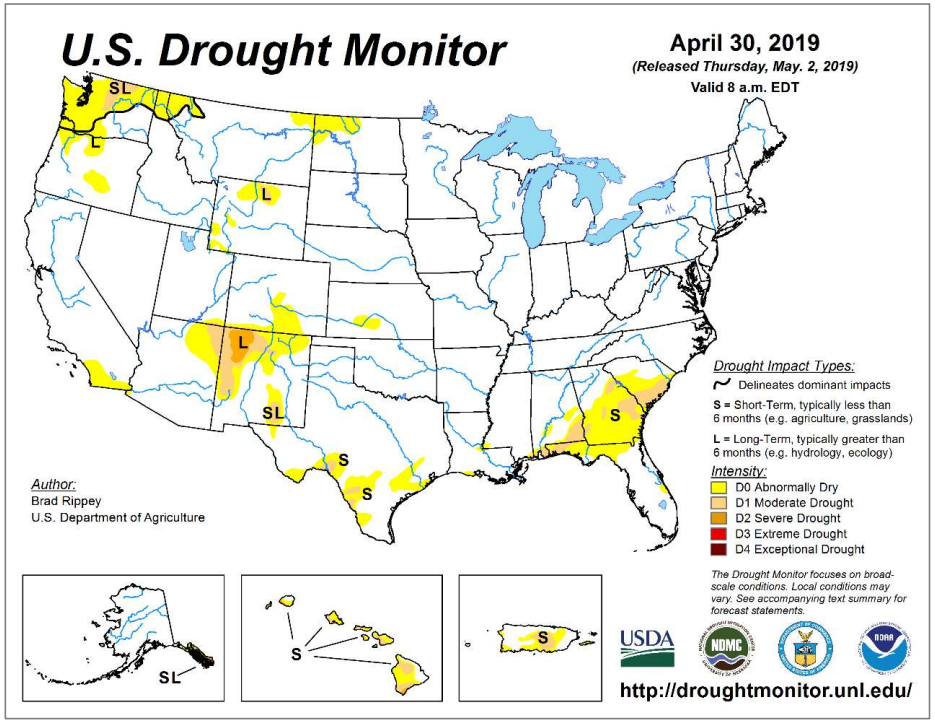
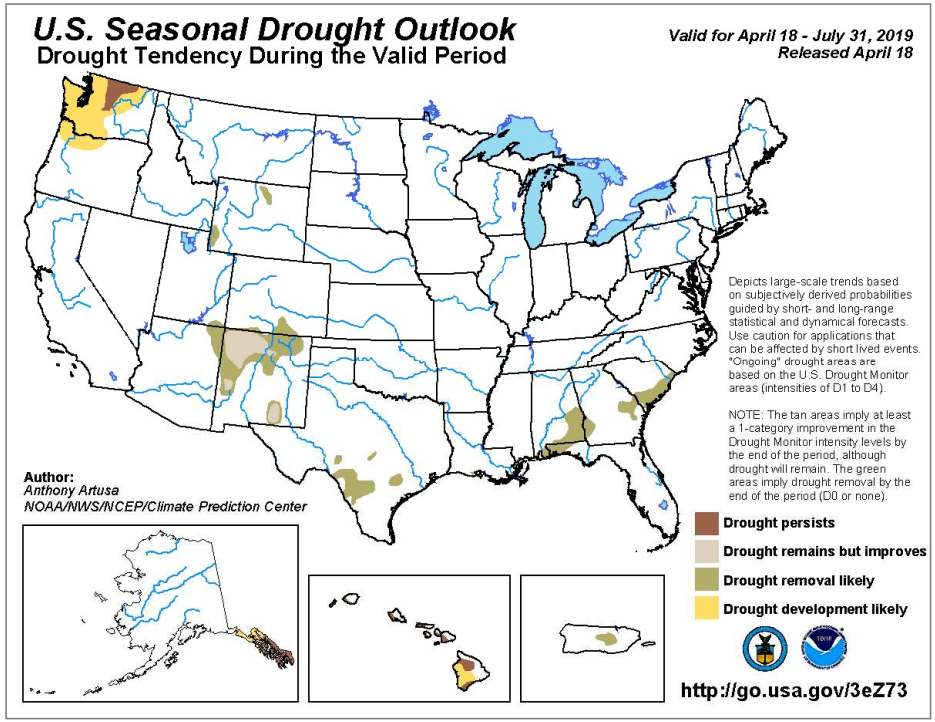
Source: Lunch @ Sigma, May 2019

Looking ahead





Source: Lunch @ Sigma, May 2019

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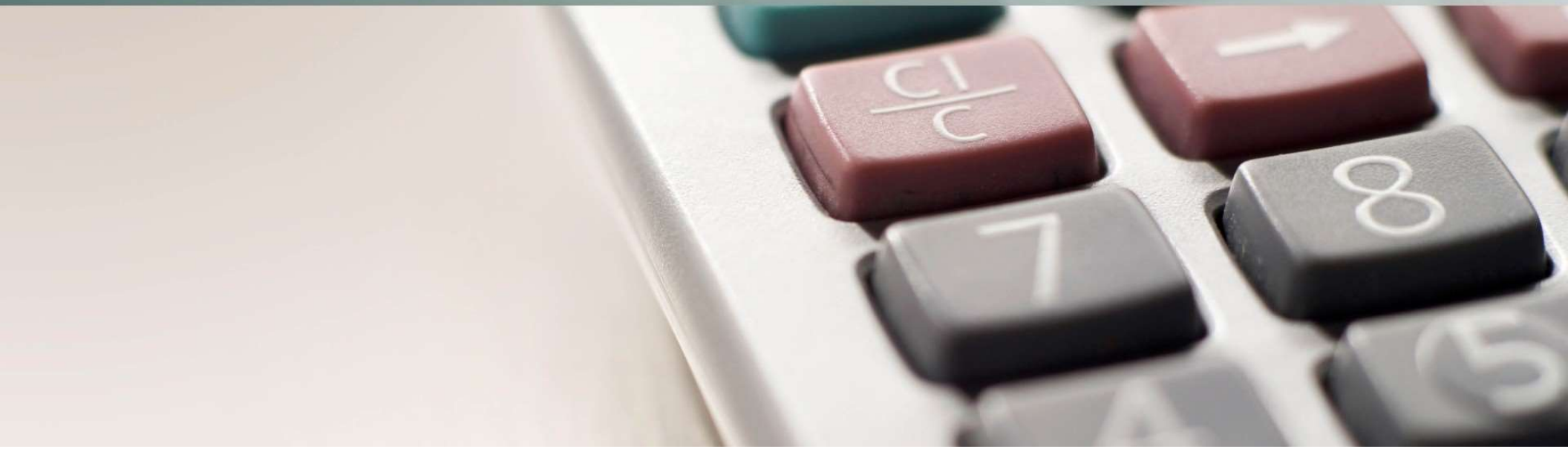
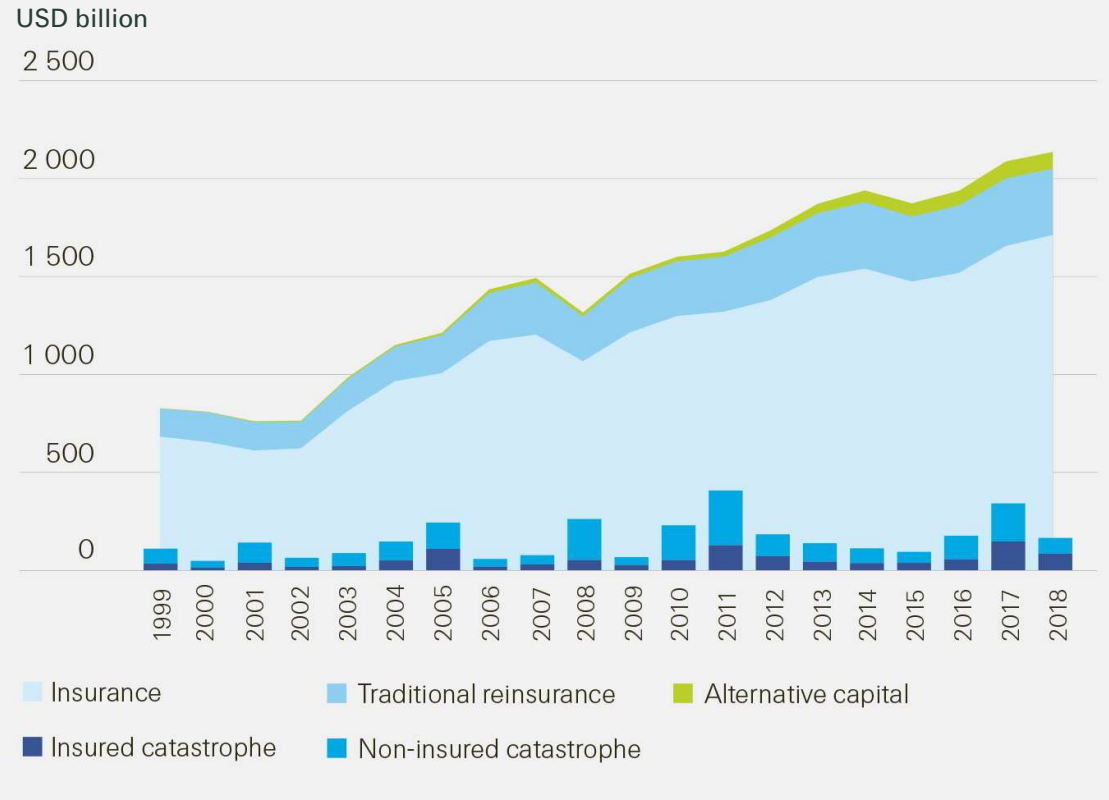
2. Reinsurance Capitalization



The re/insurance industry is well capitalized to cope with the losses arising from extreme events



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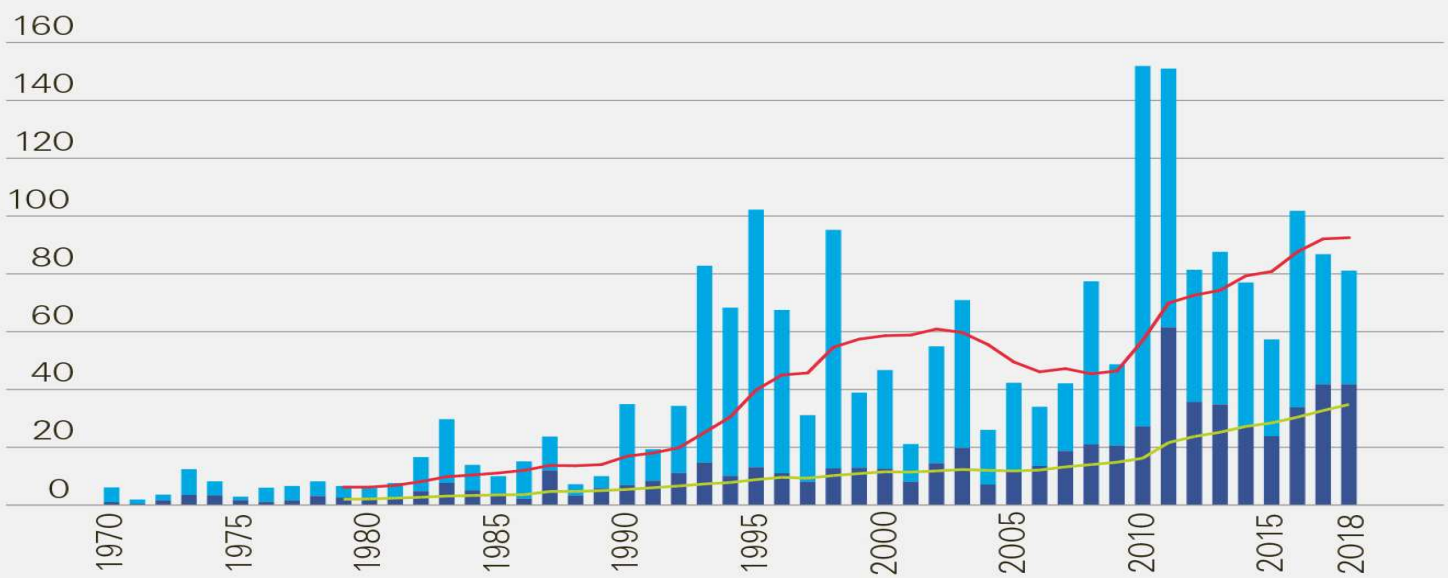
Source: Sigma No 2/2019

Secondary perils are an important risk pool for the industry to access

USD billion at 2018 prices



Source: Swiss Re Institute

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Source: Sigma No 2/2019

Key themes from *sigma* 2/2019:

- Secondary perils on the frontline in 2018
- Trend likely to continue in the years ahead
- Solid level of industry capitalization a good backdrop to dive into these risk pools

Source: Lunch @ Sigma, May 2019

3. Lessons learned in Marine

Per Event Exposures: Nat Cat, Accumulation and Clash

- Marine reinsurers typically provide coverage on a Per Risk/Per Event basis

- Event losses may be due to Nat Cats or other causes (e.g. collision, explosions, etc.) Some examples:
  - Cargo: Collision of vessels ("Clash"); Port/Warehouse accumulations
  - Hull / Yacht: Vessels under construction; Boatyard accumulations
  - Marinas: Accumulation of Yachts moored or stored
  - Offshore Energy: Oil rigs in exposed Cat regions; Large Explosion, e.g. Transocean
  - IGPIA: Large industry P&I loss

- Re/insurers need to ensure that they have sufficient loadings in their pricing to cover Nat Cat, Clash, and other large event losses

Marine Cargo Event Loss Scenarios

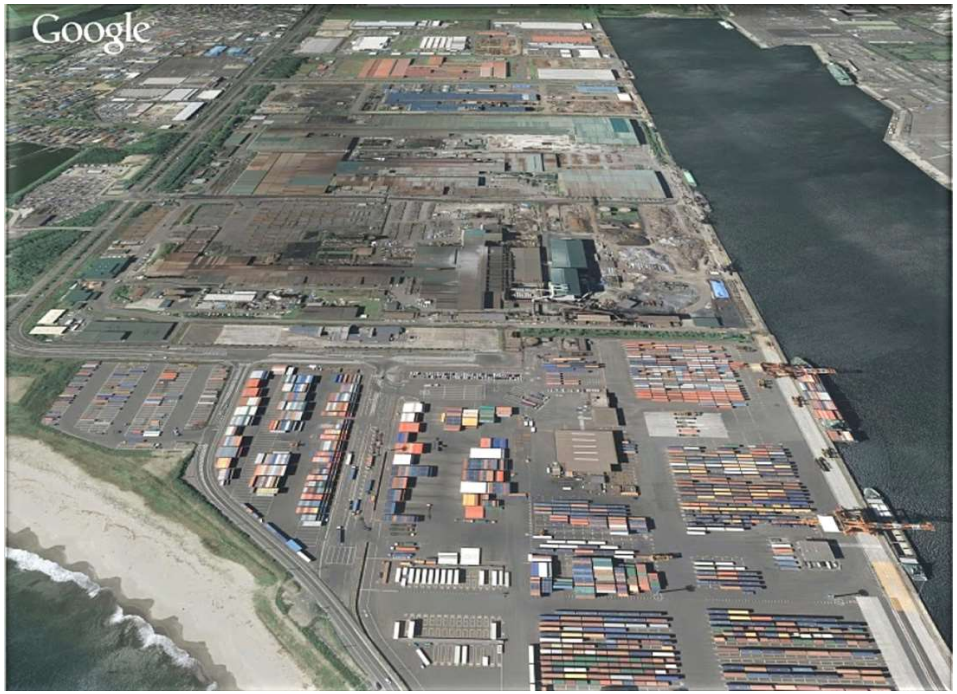
Cargo Event Losses can arise from the following exposures:

1. Unknown accumulation:
   - Port accumulation exposure ("Transit") arising from Nat Cat events.
   - Port accumulation exposure arising from Man-Made events.
   - Event loss scenarios arising out of the clash of policies and/or lines of business.

2. Known accumulation:
   - Static cargo risks (warehouses) and their exposure to Nat Cat events

What can go wrong in a port?

Aerial shot of very small seaport with 100,000 TEU annual container throughput:



Source: Google Earth

Quite a bit...

Japanese port of **Sendai** on 11 March 2011
after being hit by the tsunami:

Source: Google Earth

But...
with **100,000** TEU Sendai
is a very small port,
Tokyo's annual throughput
is **4.5 million** TEU (2011).

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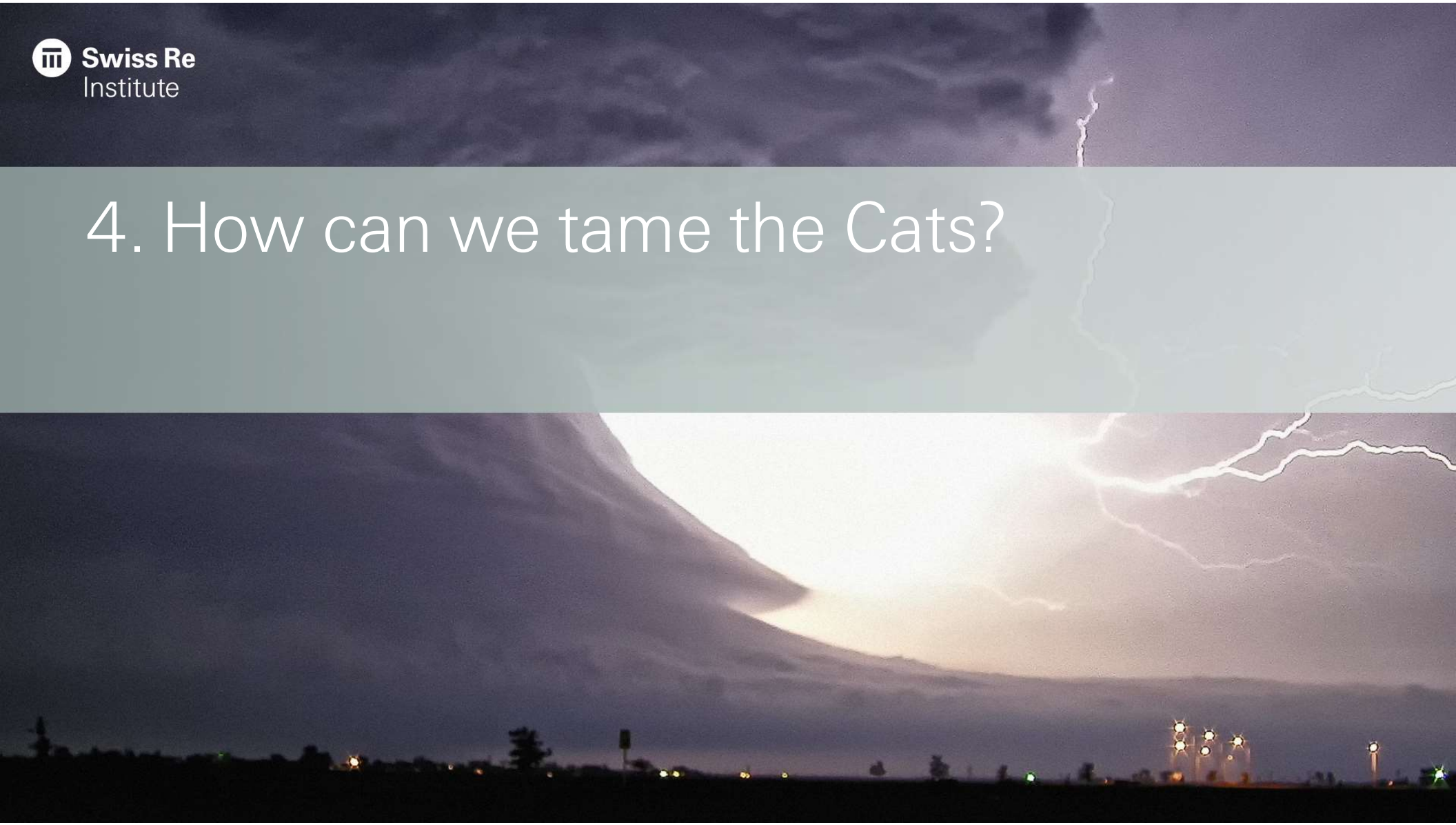
4. How can we tame the Cats?



We can't!

- We must further our understanding of exposures:
  1. Enhance methods of measuring risks
     - Risk details, location, values
  2. Monitor accumulations
  3. Model perils exposing our portfolios
     - Primary *and* secondary perils
     - Improve our tool and modelling capabilities (CatNet)
       - E.g. including urbanization as a factor
- This will help us achieve rate adequacy

Let's understand the risk landscape

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