Adaptation is not a new concern. Three Committee of the Congress requested a report on how to adapt to climate change... in 1992.
Early Reports done for the UN & World Bank on the importance of Adaptation:

- Most impacts will be negative
- Water resources, coastal infrastructure, health, agriculture, and ecosystems will be challenged in virtually every region of the globe.
- Enhanced preparedness/response strategies are a global priority.
- Both mitigation and adaptation are needed because:
  - It’s already too late to avoid substantial climate change.
  - Most adaptation measures more costly and less effective as magnitude increases.

http://worldbank.org/wdr/2010
THE GLOBAL COMMISSION

MANAGING PARTNERS:

Kristalina Georgieva

Ban Ki-moon

Bill Gates
Based on current commitments, global average temperatures will exceed 3°C, compared to preindustrial levels.
Risk levels and potential for risk reduction

K. Mach, et al., 2016 and IPCC AR5 WG II
Physical Changes are causing societal impacts today

• Ideal ranges for **crops, forests, & pests** are shifting
• Timing, quantity and quality of **water** less predictable
• **Extreme weather events** are increasing costs:
  ❖ crop losses from floods and droughts; forest die-offs
  ❖ health problems from heat, smog & increased pest ranges
  ❖ coastal erosion and infrastructure loss
  ❖ increased energy disruption
  ❖ global supply chain interruptions
Worldwide Extreme Weather Catastrophes
1980 – 2018

Data: Munich Re, January 2018

Extreme temperatures, droughts, fires
Floods, mudslides
Storms
Current impacts on people and ecosystems

**Hurricanes / typhoons getting stronger**

- 10/12: Sandy, *largest* ever in Atlantic
- 10/15: Patricia, *strongest* ever worldwide
- 02/16: Winston, *strongest* ever in S Pacific
- 04/16: Fantala, *strongest* ever in Indian Ocean
- 10/17: Ophelia, *strongest* ever in E Atlantic
- 09/19: Dorian, *strongest* ever in N Atlantic

Their energy comes from the warming surface layer of the ocean.
NAS Report:

"In the past, a typical climate scientist’s response to questions about climate change’s role in any given extreme weather event was ‘we cannot attribute any single event to climate change.’ The science has advanced to the point that this is no longer true as an unqualified blanket statement."

- National Academies, March, 2016
Louisiana Heavy Rainfall

• Heaviest rains August 11-13th. As much as 2 feet of rain fell on parts of Baton Rouge.

• Worst U.S. natural disaster since Superstorm Sandy.

• Attribution analysis with NOAA and World Weather Attribution

• Changed climate made that event 40% more likely
Recent Events Illustrate Energy Sector Vulnerabilities to Extreme Weather and Climate

- **Lower water levels**: Reduced hydropower
- **Wildfires**: Damaged transmission lines
- **Flooding**: Impacts on inland power plants
- **Water restrictions due to drought**: Limiting power, oil and gas production
- **Lower river levels**: Restricted barge transportation of coal and petroleum products
- **Cooling water intake or discharge too hot**: Power plants shutdown or power down
- **Water restrictions due to drought**: Power plants shutdown or power down
- **Intense storms**: Disrupted generation, transmission/distribution, & oil and gas operations
- **Flooding**: Impacts on inland power plants

DOE, 2016
Pentagon warns of threat to bases from climate change

BY ELLEN MITCHELL - 01/18/19 02:39 PM EST

A Pentagon report reveals that more than two-thirds of operationally critical military installations are threatened by the effects of climate change over the next 20 years, including repeated flooding and wildfires.
Higher sea levels/storm surge increase the annual cost of coastal storms along the Eastern Seaboard & the Gulf by $2 billion to $3.5 billion in another decade.

By 2050, between $66 billion and $106 billion worth of property will likely be below sea level nationwide.

By 2100, that figure could be $238 billion to $507 billion.
Investors with $32 trillion at stake sound the alarm on climate change

415 investors, including HSBC (HSBC), Nomura Asset Management and UBS Asset Management.

PG&E, utility tied to wildfires, will file for bankruptcy

PG&E: The First S&P 500 Climate Change Casualty

Erik Kobayashi-Solomon Contributor Markets

Climate is the biggest risk to business (and the world)

By Ivana Kottasova, CNN Business

January 17, 2019 DAVOS