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## Management of Climate Change Adaptation in Oil & Gas Exploration and Production

Dr Paul van der Beeke  
Principal Environmental Scientist  
[pvanderbeeke@golder.com.au](mailto:pvanderbeeke@golder.com.au)



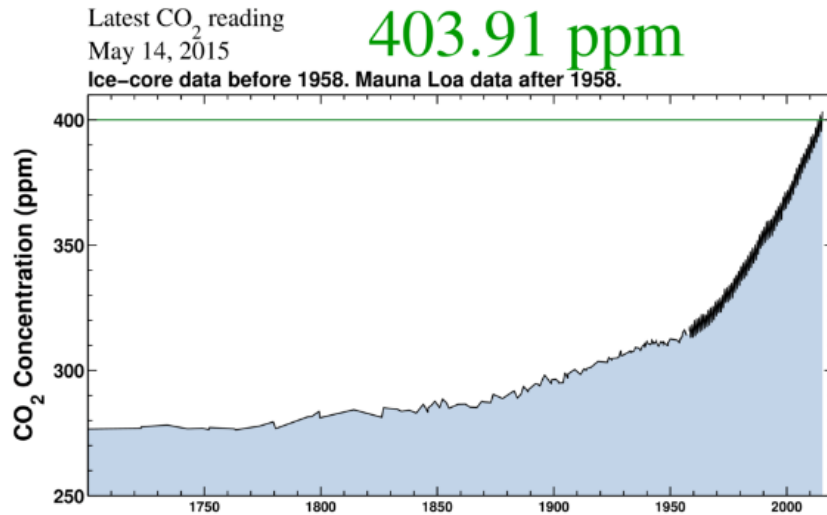


## Overview

- Salient points in climate change
- Snap shot of climate changes and potential risks
- Investor expectations
- Approach to managing the risks
- Climate change adaptation due diligence in M&A
- Summary of key messages

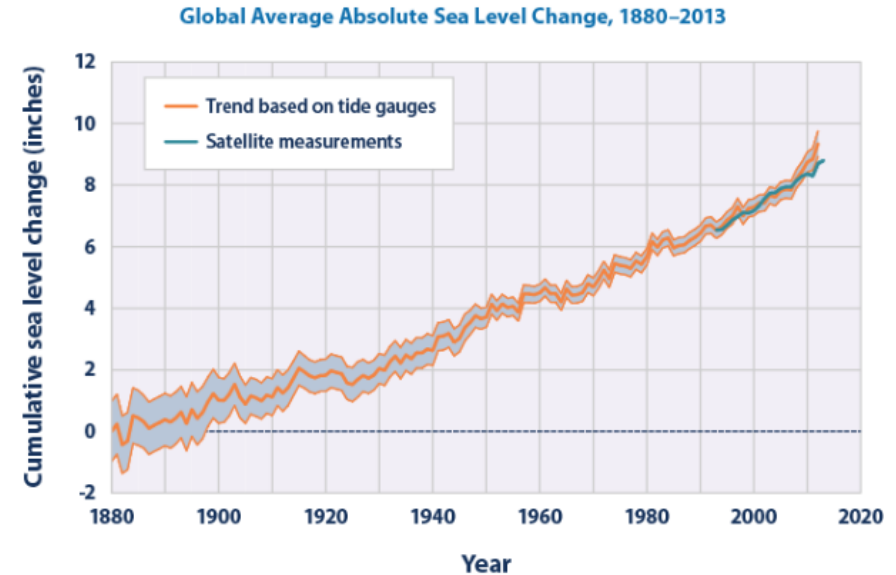


# Atmospheric CO<sub>2</sub> and Sea Level Rise



Source: Scripps Institute of Oceanography UCSD

CO<sub>2</sub> levels continue to increase despite global installed carbon-free energy capacity and energy efficiencies achieved to date.



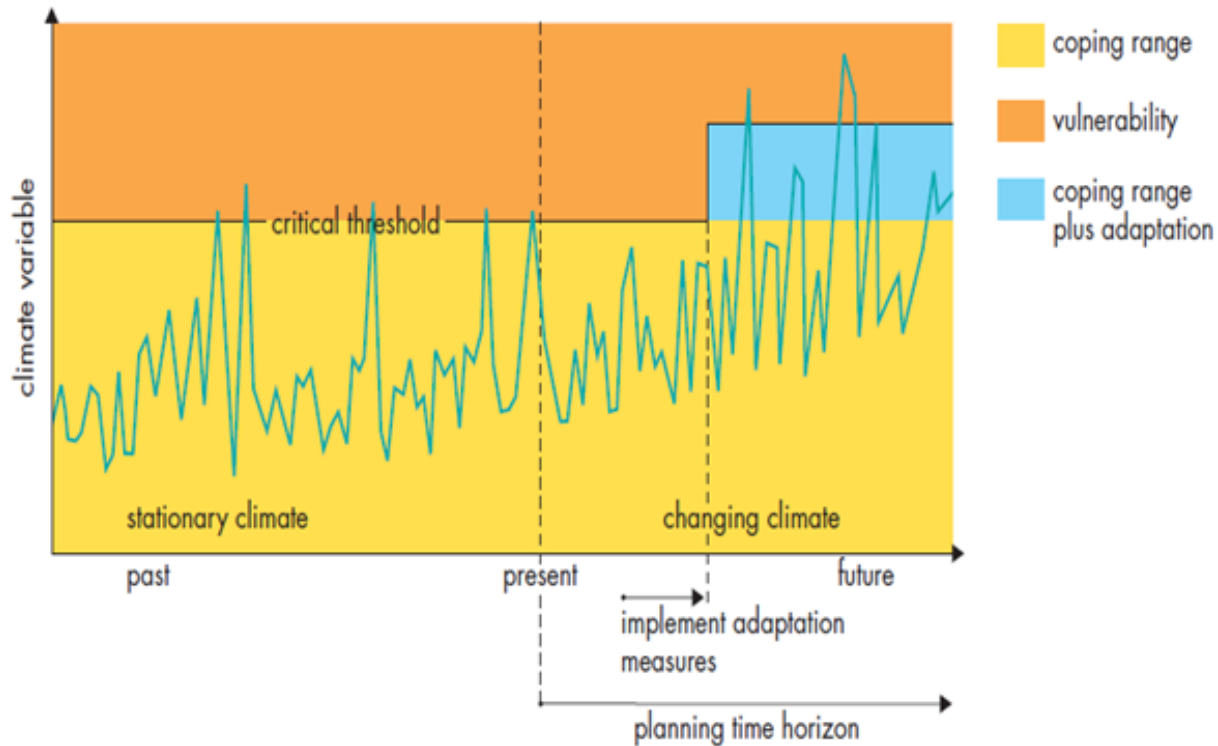
Source: CSIRO / NOAA, 2013 / 2014

Previous long term average global rate accelerated from about 1.7mm/yr to 3.2mm/yr in past 20 years. Further acceleration expected in coming decades.

**KEY MESSAGES:** Global atmospheric CO<sub>2</sub> concentration increase and climate change are continuing despite global mitigation efforts achieved to date. Some changes are expected to accelerate in the coming decades.



## Changing Trend in Climate Variability



Historical variability is shifting outside the 'normal' range that has been the basis for infrastructure planning and design.

'Climate departure' occurs when the lowest point of variability in the future exceeds the current highest point of variability.

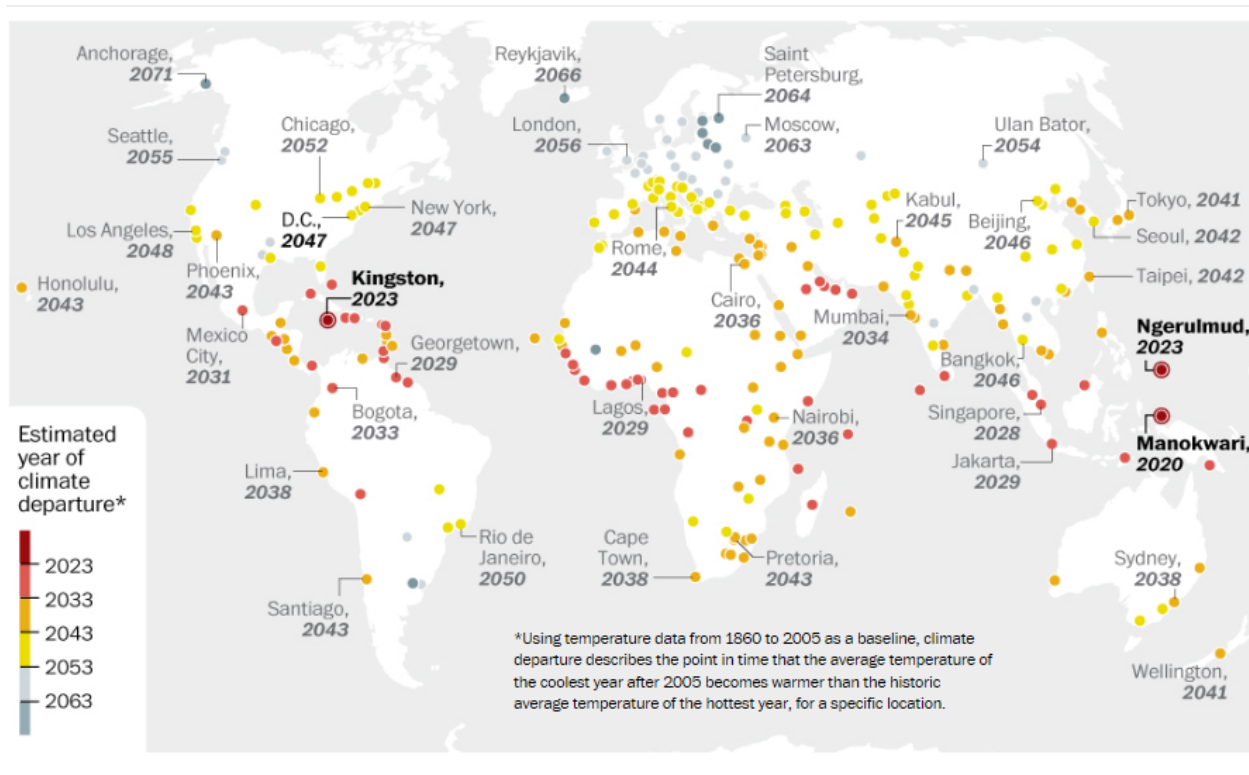
This is significant for the design of future infrastructure, replacement or modification of existing infrastructure and longer term coping and adaptation measures / costs.

Source: Willows and Connell, 2003

**KEY MESSAGE:** Climate changes are shifting beyond the historical natural variability ranges that have been used as the basis of engineering specifications and the selection of asset locations.



# Climate Departure – Temperature Rise



SOURCE: Nature. GRAPHIC: Gene Thorp - The Washington Post. Published Oct. 9, 2013.

2050's – 2060's

2030's – 2040's

2020's – 2030's

2030's – 2040's

**Without CO2 mitigation:**  
On average global temperatures will exceed historical norms as soon as 2047 and no later than 2069.

Dates are generally sooner in the tropics.

**With rapid CO2 mitigation:**  
Projected dates shift out several decades.

Source:  
Research from University of Hawaii, 2013.

**KEY MESSAGES:** The timing of specific climate change effects is critical for adaptation planning and business strategic planning. Some are reaching departure from historical variability sooner than previously projected.



# Climate Changes / Potential Risks

More intense cyclones or storms

More intense rainfall events - flooding

Sea level rise and storm surge

More intense extreme or unprecedented weather events and temperatures

More intense bush fires

Changes in ice / snow / permafrost

## POTENTIAL RISKS

Operational / production interruption  
Damage to, or destruction of, infrastructure  
Supply chain disruption  
Major spills and environmental contamination  
Increased contamination remediation costs at decommissioning  
More frequent flooding events  
Permanent inundation of coastal assets from sea level rise



**KEY MESSAGES:** There are multiple changes to the climate system that present potential material risks that need to be assessed for individual assets and operations. Changes are unfolding and need constant review.



## Investor Expectations

- Increasing attention by major investors and investor groups on climate change risks
- Present emphasis on competing lower carbon energy systems, energy efficiency, GHG emissions and changes to policy and regulations - mitigation
- Expectations of greater disclosure of governance and business strategy to address the risks
- Expectations of flexibility in company strategies to adjust for future changes
- Same applies to physical climate changes climate change risks and adaptation measures

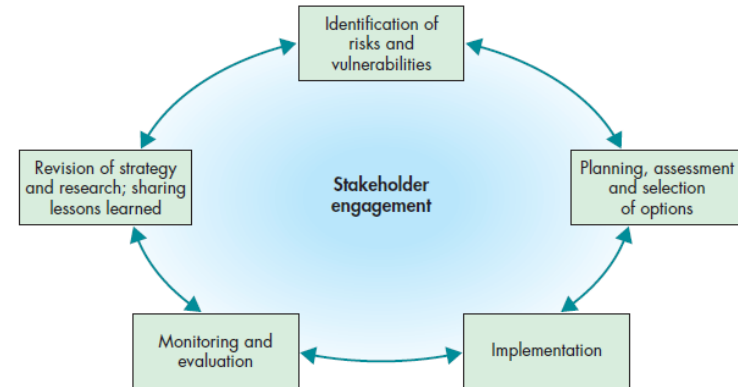


**KEY MESSAGE:** Investors are paying increasing attention to climate change risks to their portfolios and are expecting greater disclosure of how these risks are being managed.

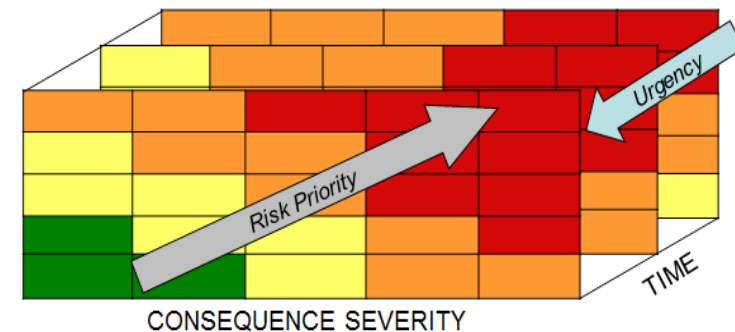


## Managing Climate Change Adaptation Risks

- Risk assessment (RA):
  - Integrate with strategic business plan
  - Asset life vs climate time frame
  - Vulnerability assessment
  - Similar to HSE RA methodology
  - Tiered approach
- Targeted modeling
- Economic analysis
  - Do nothing
  - Coping and adaptive costs
  - Cost benefit analysis
- Business case analysis



Source: Addressing Adaptation in the Oil and Gas Industry, IPIECA 2013



**KEY MESSAGE:** Adaptation can be managed using accepted risk management methodology and economic analysis. Close collaboration with strategic business planners will expedite the process and focus the effort.





## CCA Due Diligence in M&A

- Due diligence focussed on physical climate change risks to the business should be part of the due diligence suite
- Risks should be assessed out to the expected asset life
  - Opportunities still in early feasibility stages may need projections to +2060
- Start this early in the M&A process
  - Climate change adaptation risks are likely to be less well documented than climate mitigation, regulatory and other environmental risks



KEY MESSAGES: Climate change adaptation risks should be part of the due diligence suite in M&A especially for long life assets and opportunities.



## Summary of Key Messages

1. Global atmospheric CO2 concentration increase and climate change are continuing despite global mitigation efforts achieved to date. Some changes are expected to accelerate in the coming decades.

2. Climate changes are shifting beyond the historical natural variability ranges that have been used as the basis of engineering specifications and the selection of asset locations.

3. The timing of specific climate change effects is critical for adaptation planning and business strategic planning. Some are reaching departure from historical variability sooner than previously projected.

4. There are multiple changes to the climate system that present potential material risks that need to be assessed for individual assets and operations. Changes are unfolding and need constant review.

5. Investors are paying increasing attention to climate change risks to their portfolios and are expecting greater disclosure of how these risks are being managed.

6. Adaptation can be managed using accepted risk management methodology and economic analysis. Close collaboration with strategic business planners will expedite the process and focus the effort.

7. Climate change adaptation risks should be part of the due diligence suite in M&A especially for long life assets and opportunities.



## Summary of Key Messages

