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Climate change for Actuaries: an introduction

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26 October 2018

Introduction

About us

About the Climate Change Working Party (CCWP)

About this session

Icons created at http://icons8.com/

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Overview

Science

Past, present and future

Implications

Insurance and capital markets

Communication

The communication challenge

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Science

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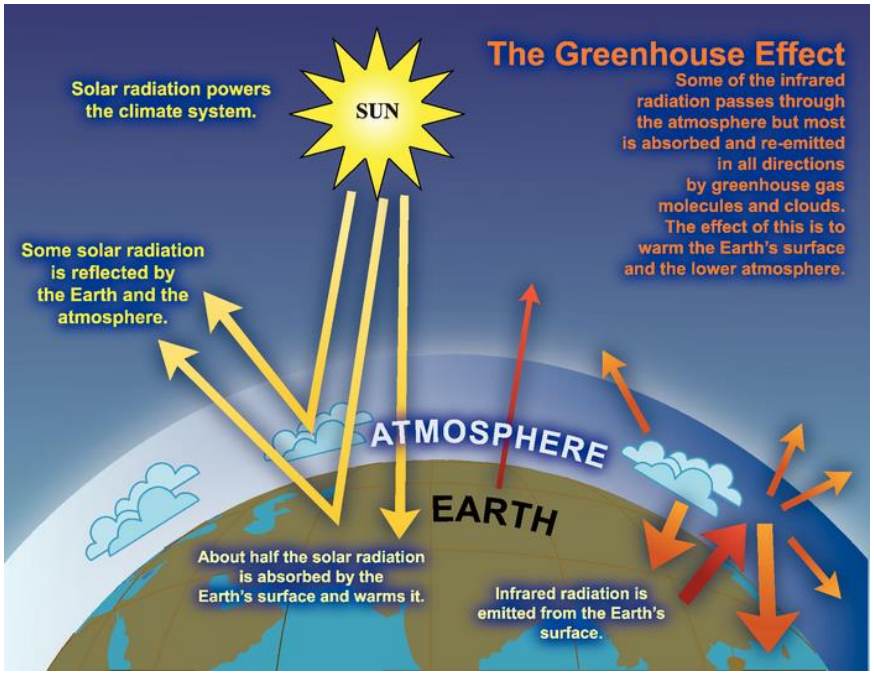
Brief history of climate science 1824 - 1900



"Greenhouse effect" first described almost 200 years ago

- **1824 -** French physicist Joseph Fourier first describes "greenhouse effect"
- **1861 -** Gases linked to "greenhouse effect" identified by Irish physicist John Tyndall
- **End of 19th century -** Discoveries of two Swedish scientists, Svante Arrhenius and Arvid Högbom, link human activities to global warming

Image: IPCC
Other sources: BBC, Wikipedia, Road to Paris, Skeptical Science, OSS Foundation

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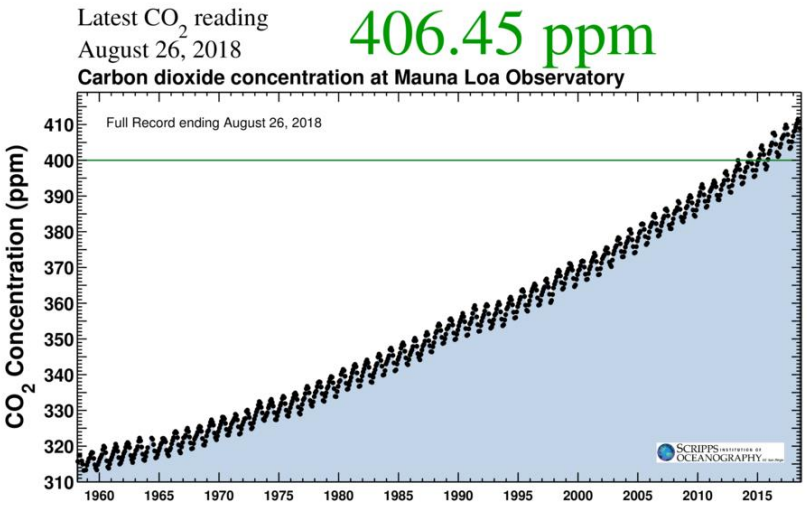
Brief history of climate science 1900 - 1960



Evidence shows increasing temperatures and CO2 levels

1938 - British engineer Guy Callendar shows rise in both temperatures and CO2 over the previous century and suggests link

1957 - Oceanographer Roger Revelle and chemist Hans Suess show oceans will not absorb all additional CO2 entering the atmosphere as previously thought

1958 - Charles David Keeling begins to systematically measure atmospheric CO2, Project continues today - you can even follow the “Keeling Curve” on twitter!

Image: Scripps Institution of Oceanography
Other sources: BBC, Wikipedia, Road to Paris, Skeptical Science, OSS Foundation

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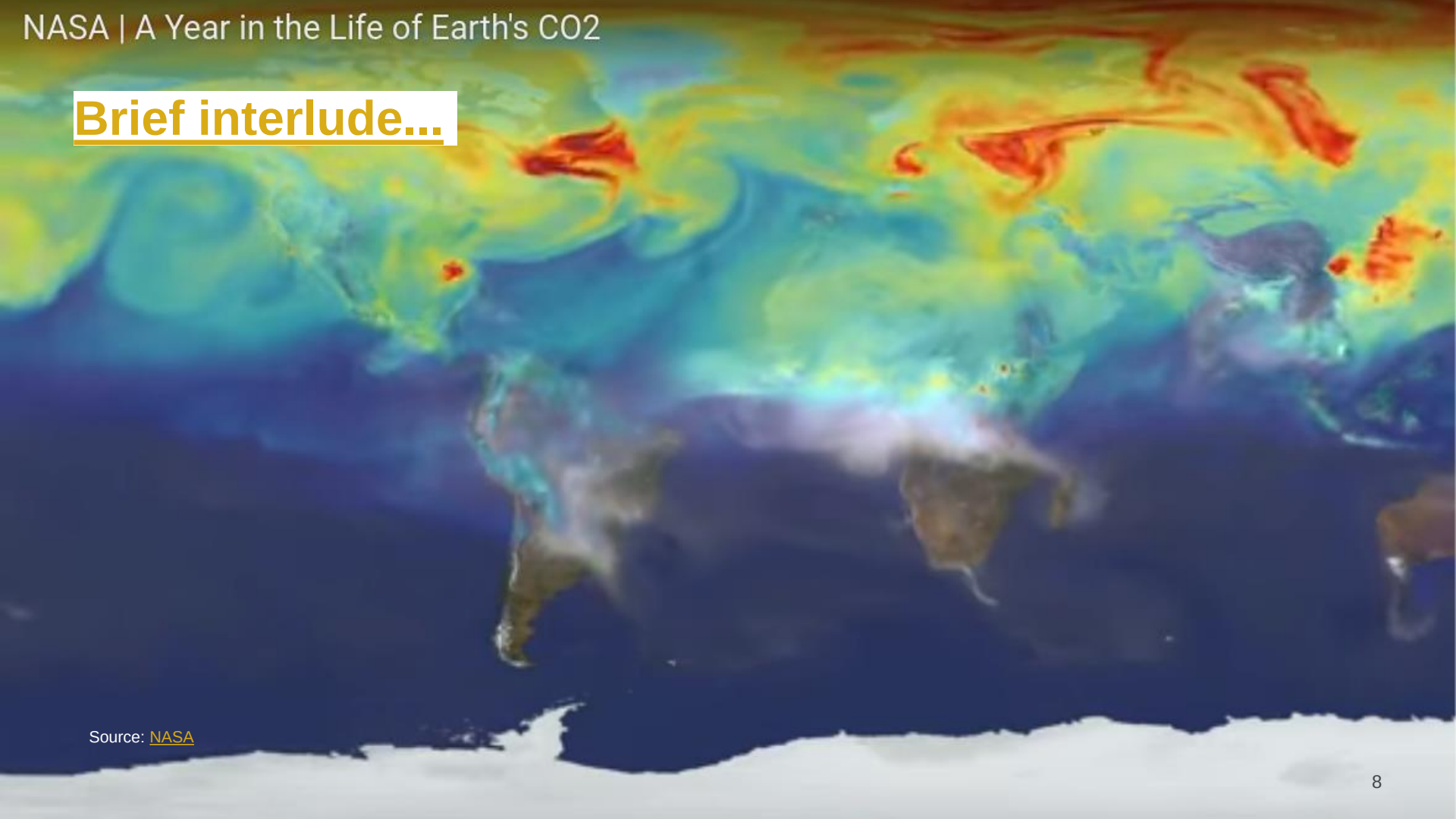

Brief interlude...

Source: NASA

Brief history of climate science 1960 - 1988

Growing sophistication of climate modelling

1967 - Sykuro Manabe and Richard Wetherald develop first computer model that simulates Earth's entire climate

1975 - Oceanographer Wallace Broecker coins the term "global warming"

1988 - Climate scientist James Hansen warns US Senate committee of imminent threat from climate change

Intergovernmental Panel on Climate Change (IPCC) established by the UN

Image: New York Times
Other sources: BBC, Wikipedia, Road to Paris, Skeptical Science, OSS Foundation

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What is the IPCC?

- Internationally accepted authority on climate change - provides scientific advice to governments and supports the United Nations Framework Convention on Climate Change (UNFCCC)
- Collects, collates and summarises evidence
- Five synthesis reports in total: 1990, 1995, 2001, 2007 and 2014. Next one due in 2022

For further info see IPCC

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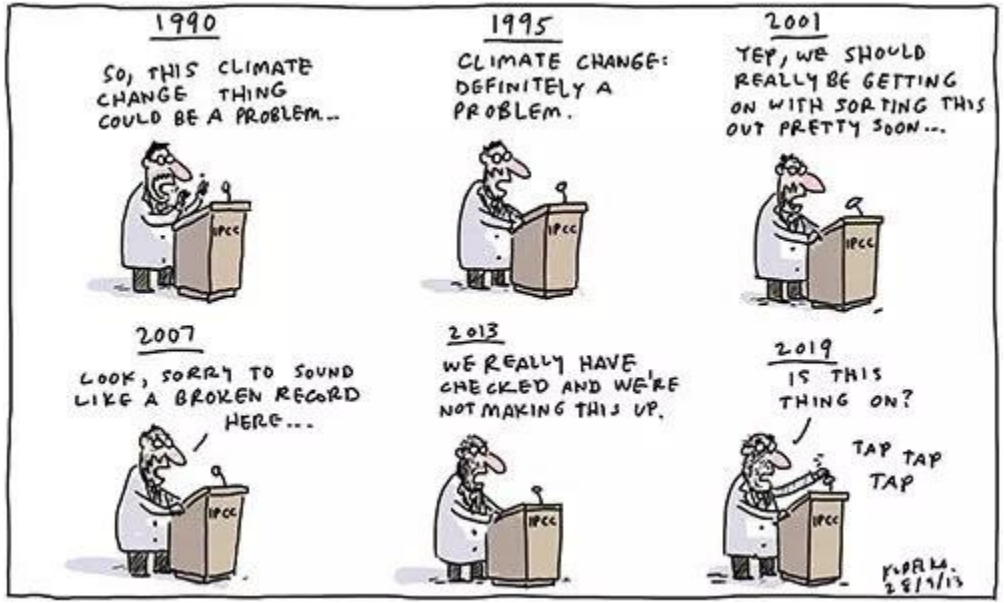
Brief history of climate science 1988 - present day



Scientific consensus

"Multiple studies published in peer-reviewed scientific journals show that 97 percent or more of actively publishing climate scientists agree: Climate-warming trends over the past century are extremely likely due to human activities."

NASA

Image: Kudelka Cartoons
Other sources: NASA

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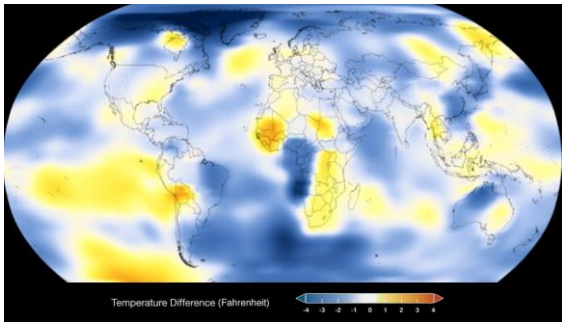
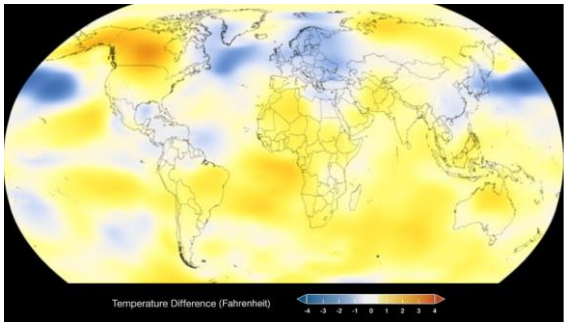
Meanwhile…

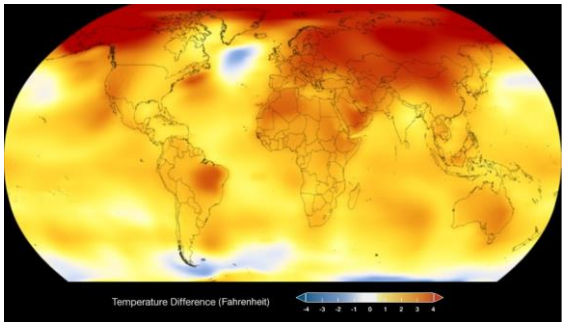
1901



1988



2017



NASA / Climate time machine

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Where we are today

Global average temperatures increased by 1°C since 1901

Record breaking temperatures for last 3 years (2015, 2016, 2017 are warmest on record)

Early attribution analysis suggests climate change driven by humans made this year's European heatwave twice as likely

Sources: US Global Change Research Program, World Meteorological Organisation, World Weather Attribution

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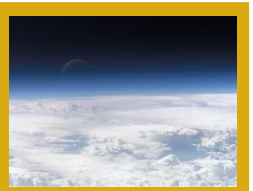
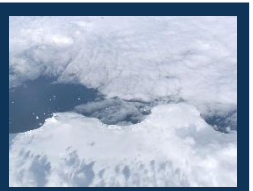
Effects of climate change

Warming of atmosphere



Ocean warming and acidification

Reduction in land ice



Reduction in sea ice

Rising sea levels

Changes to precipitation patterns and season

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Impact on natural and human systems

Extreme weather	Droughts	Wildfires	Water scarcity	Disruption to economy and livelihoods
Damage to ecosystems and loss of biodiversity	Floods	Heatwaves	Food insecurity	Increased mortality and morbidity

For further info about the effects and impact of climate change see IPCC and NASA

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A closer look at…extreme weather (hurricanes)

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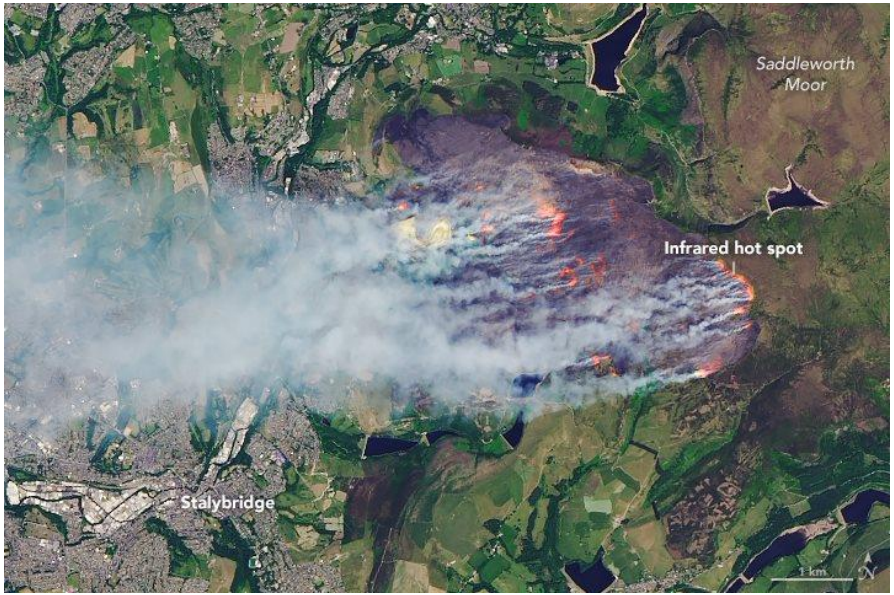
A closer look at…wildfires



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A closer look at…floods

Buttons0603 / CC BY-SA 4.0

DI Wyman / Flood Damage / CC BY-SA 2.0

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A closer look at…disruption to economy and livelihoods

Neil Palmer / International Center for Tropical Agriculture / CC BY-SA 2.0

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Future of climate change

IPCC 1.5°C Special Report

Representative Concentration Pathways

Hothouse Earth

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Implications for the insurance industry

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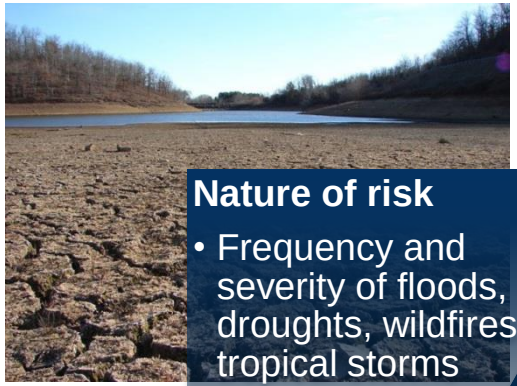
Several key dimensions of risk are evolving…



Nature of risk

- Frequency and severity of floods, droughts, wildfires, tropical storms

Accumulation of risk

- Regional concentrations of risk arising from extreme weather

Correlation of risk

- Eg political risk arising from drought or floods
- Difficult to quantify dependencies

Model risk

Breakdown in empirical justification

Images sourced from Wikicommons

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… with direct consequences for short-term insurance

Adverse selection	• Based on failure of pricing to accurately reflect risks
Affordability	• Uninsurable business risks • Lower insurance penetration
Shrinking markets	• Withdrawal from certain markets, eg fossil fuels
Capital requirements	• Reflecting increased uncertainty (fatter tails)

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… and life insurance

Mortality / morbidity

- Infectious diseases (eg malaria)
- Non-infectious diseases (eg asthma)
- Higher incidence of starvation, malnutrition

Changing population profiles

- Mass migration
- Socio-economic changes

Difficulties in pricing and hence offering cover

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Insurance industry responses

New approaches: systems thinking

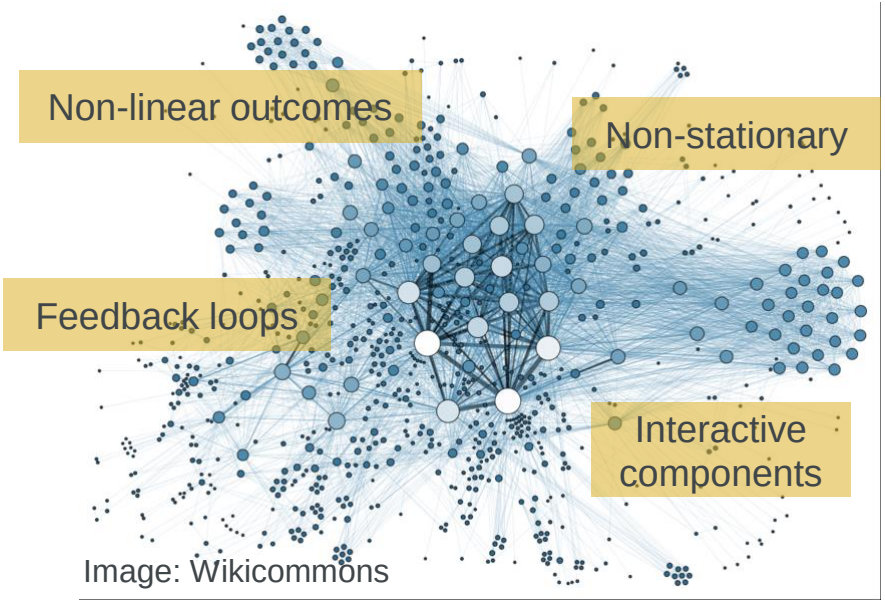

Image: Wikicommons

New products/modalities

- Micro-insurance
- Weather-based index insurance
- Government-backed insurance and international risk

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Implications for capital markets

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Implications for capital markets

Stranded assets

Business model redundancy

Market volatility and economic shocks

Changing savings patterns

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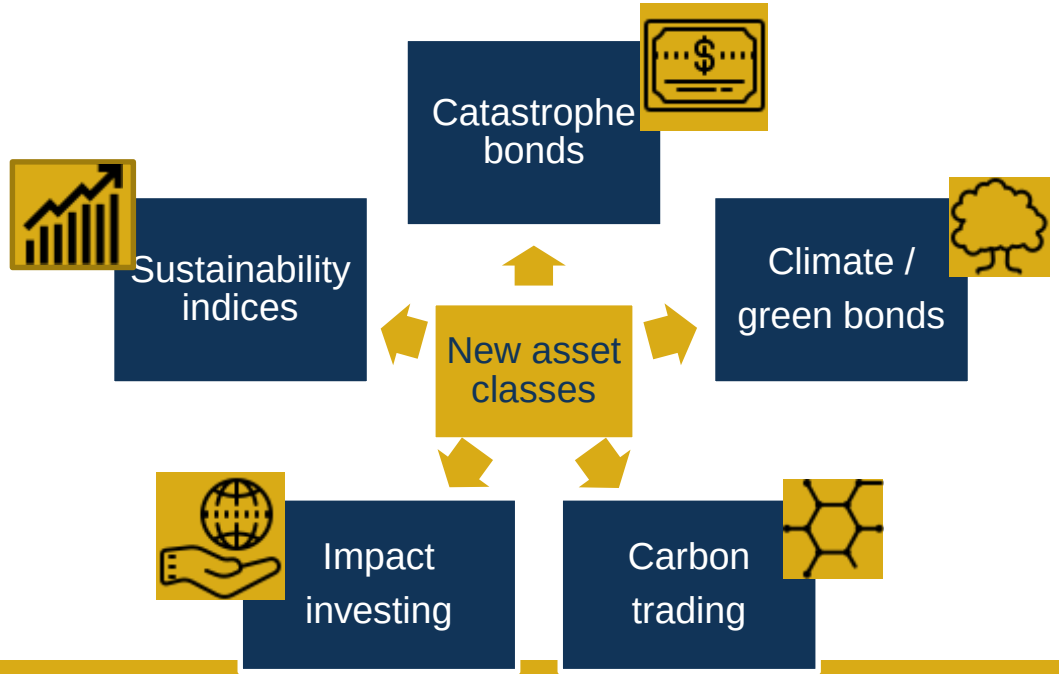
Capital market responses to climate change



Capital markets can play an important role in mitigating the impact of climate change

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New initiatives

UNPRI

- Six voluntary principles for investing and contributing to a more sustainable financial system

TCFD

- Increase transparency and disclosure around climate risk

High Level Expert Group

- European Union climate change policy framework initiative

Actuaries Climate Index

- Objective information on climate change using observable data

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IFoA climate risk alert

[Actuaries] “should ensure that they understand, and are clear in communicating, the extent to which they have taken account of climate-related risks in any relevant decisions, calculations or advice”

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Public and regulatory responses

Shareholder activism

- Enhanced disclosures: Exxon, Occidental, PPL
- Divestment campaigns

Legal challenges to corporate practice

- State of New York versus five oil majors
- Greenpeace versus oil industry expansion in Arctic

Swiss government study

- Pension funds, life insurers test portfolios against Paris climate agreement

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Public and regulatory responses

Transition Pathway initiative

- Assessment of companies' transition to low carbon economy

Pension fund fiduciary duty

- Fiduciary Duties of Investment Intermediaries (UK)
- Fiduciary Duty in the 21st Century (PRI, UNEPFI, Generation)

Pension fund regulation and ESG

- IORP II directive
- UK Pensions Regulator: financially significant risks

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Communication

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A wicked problem

“A problem that is difficult or impossible to solve because of incomplete, contradictory and changing requirements that are often difficult to recognise…Moreover, because of interdependencies, the effort to solve one aspect of a wicked problem may reveal or create other problems.”

Wikipedia

Source: Wikipedia

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Tools and frameworks for communication

- Per Espen Stoknes' five Ds and five Ss
- The Uncertainty Handbook
- Climate Visuals

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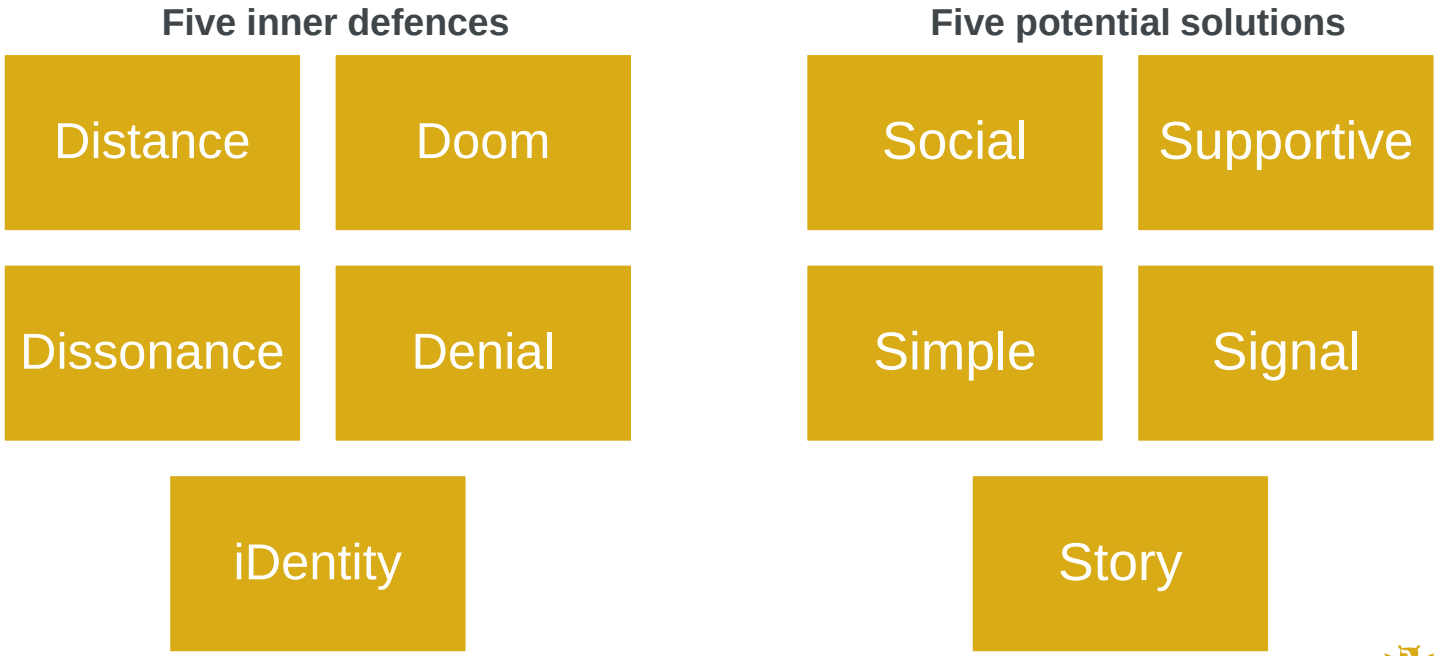
Per Espen Stoknes' five Ds and Ss



Watch the Ted Talk

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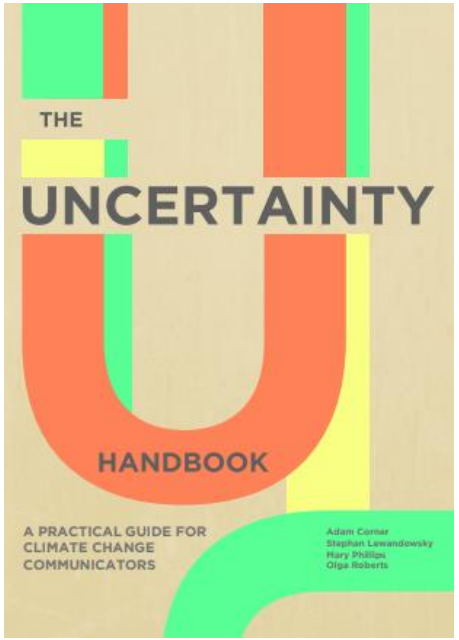
The Uncertainty Handbook

1. Manage your audience's expectations
2. Start with what you know, not what you don't know
3. Be clear about the scientific consensus
4. Shift from 'uncertainty' to 'risk'
5. Be clear what type of uncertainty you are talking about
6. Understand what is driving people's views about climate change
7. The most important question for climate impacts is 'when', not 'if'
8. Communicate through images and stories
9. Highlight the 'positives' of uncertainty
10. Communicate effectively about climate impacts
11. Have a conversation, not an argument
12. Tell a human story, not a scientific one



For more info go to [The Uncertainty Handbook]

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Climate Visuals

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More images at Climate Visuals

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Action

What are your takeaways from today's session?

Science

Past, present and future

Implications

Insurance and capital markets

Communication

The communication challenge

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Questions

Comments

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