



**Actuaries
Institute**

Insights – Climate Change Risks

Presented by Tim Andrews,
Emma Herd and Sarah Barker




Intensity & frequency of storms

Climate Change Risks – Insights Seminar
Actuaries Institute

Presented by Tim Andrews | September 2016





“We can expect ***fewer*** storms, but they will be more ***intense***”



A layperson's take on the science

Many types of storms. I refer to these three types:

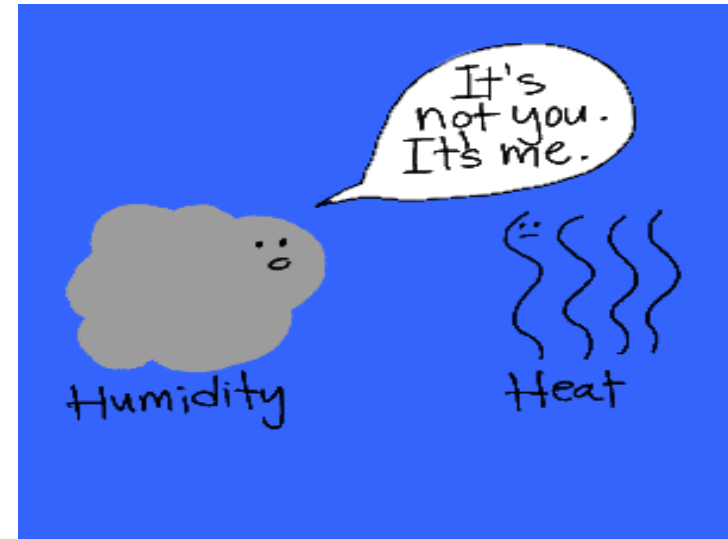
- 1) Thunderstorms (aka Convective Storms)
- 2) Synoptic Lows (aka Extratropical Cyclones, Mid-latitude Cyclones)
 - Include East Coast Lows (ECLs)
- 3) Tropical Cyclones (aka Typhoons, Hurricanes)

“There are many types of storms, and sorting out how aspects of each type respond to warming is where the science gets interesting.”

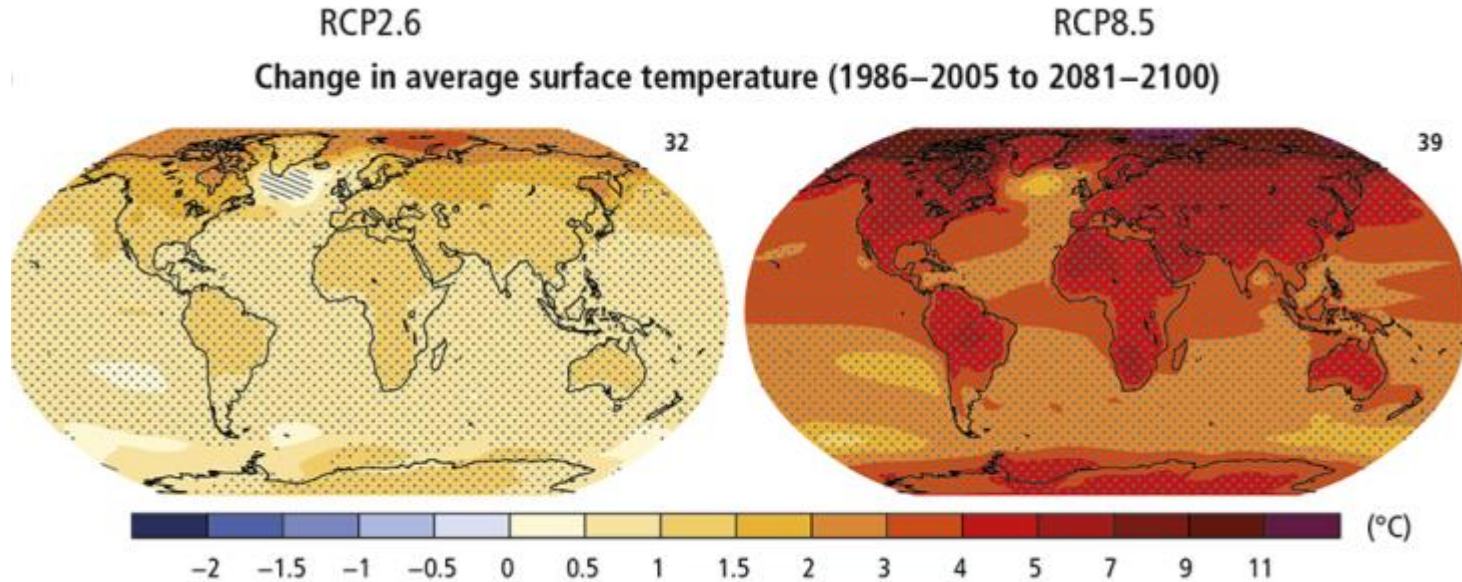
Anthony Del Genio
NASA

More intense

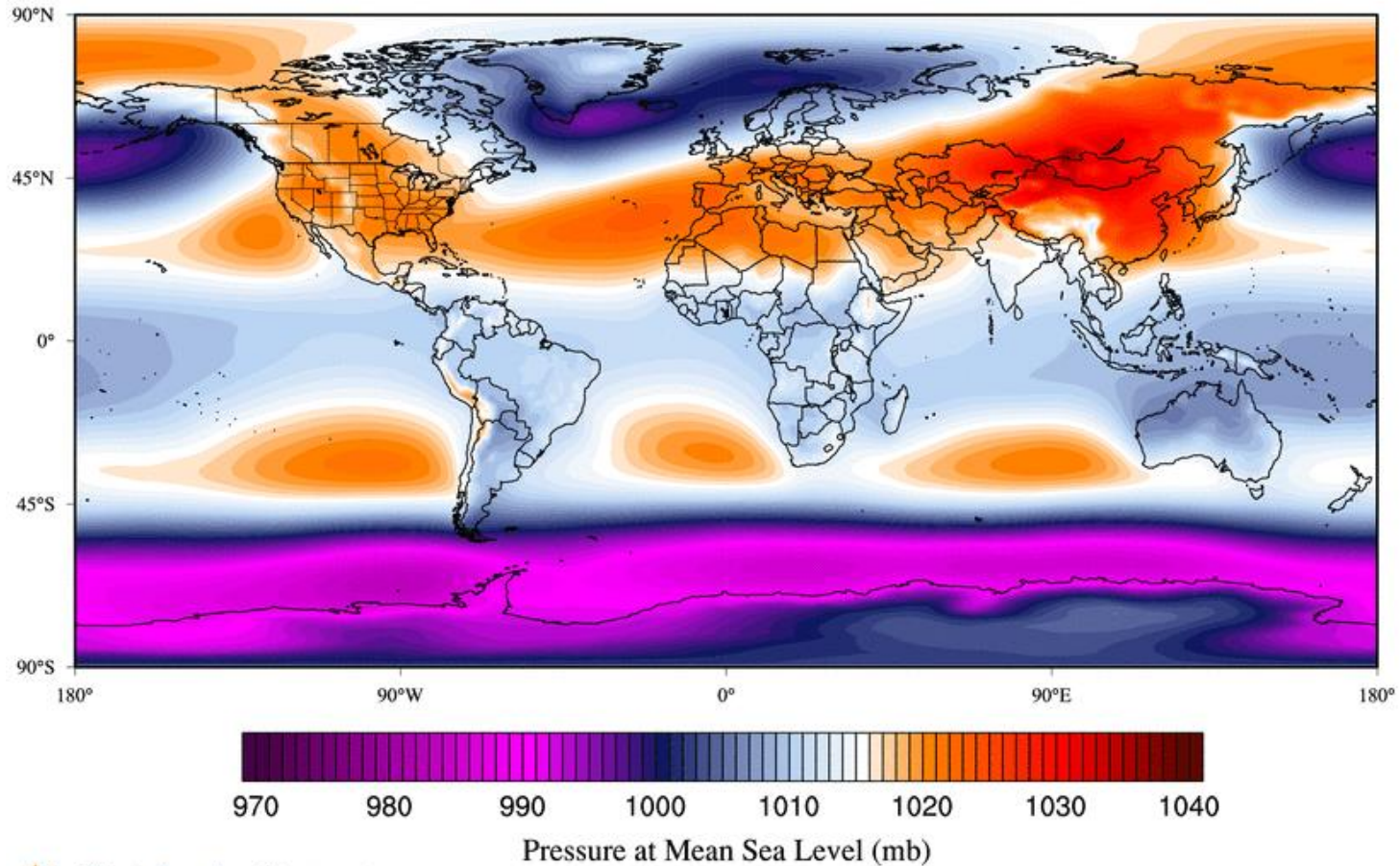
- More heat
 - = more evaporation
 - = more moisture in atmosphere
 - = more rain when storms occur
- More heat
 - = warmer air
 - = more convective heat transfer
 - = more energy, stronger winds
- More heat
 - = warmer oceans
 - = more energy to cyclones
 - = stronger winds



But.....decrease in equator to pole temperature gradient will be important



IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.



Lower frequency



Cyclones – increase in wind shear in tropics.
Cyclones need low levels of vertical wind shear.

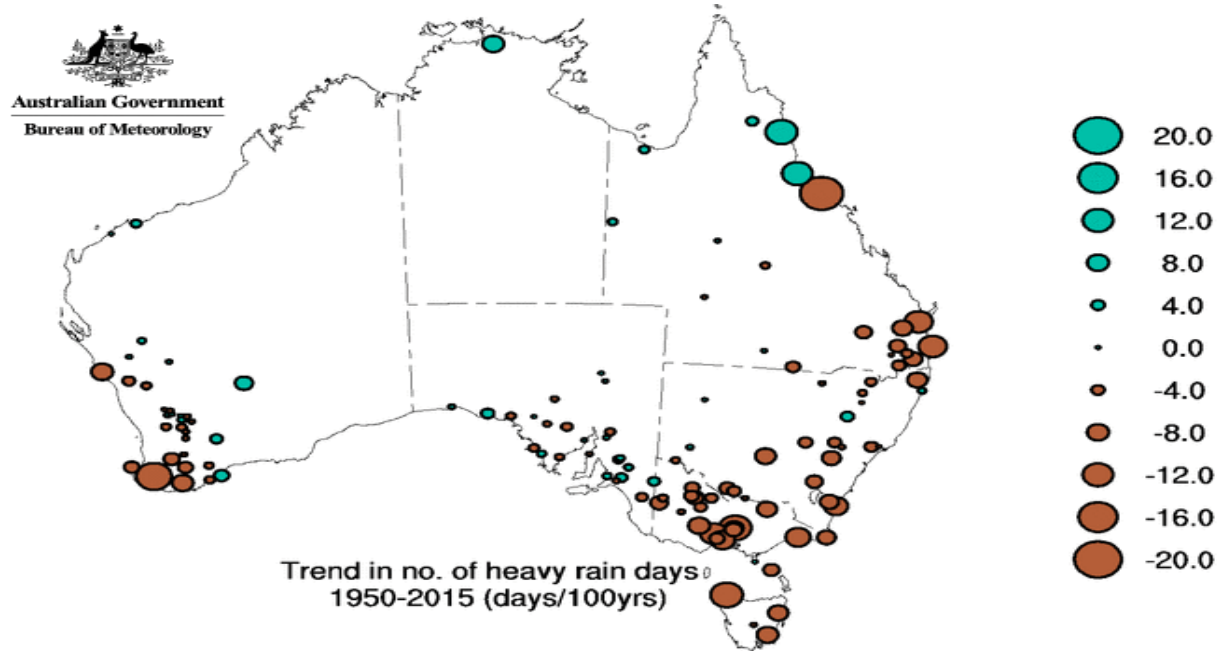
Synoptic Lows – will shift polewards,
and less wind shear in mid latitudes.



Thunderstorms – less wind shear in some
areas.

**What can we see in the
experience?**

Intensity of rainfall



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Issued: 16/06/2016

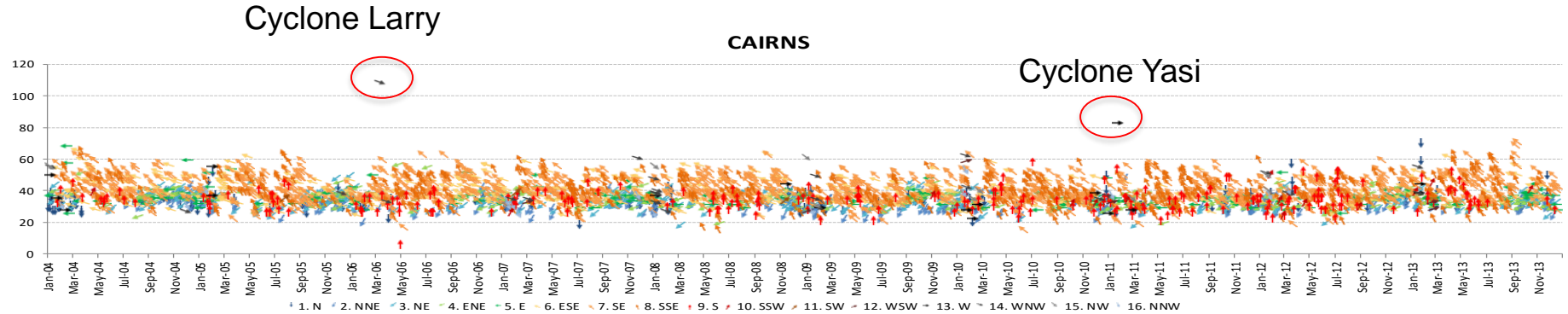
Study of 40,000 storms

- Study of 40,000 storms in Australia
 - across 30 years at 79 locations
 - precipitation over 6 minute intervals
- More intense extreme rainfall events
 - At this stage increase appears modest – around 2% per 1°C.

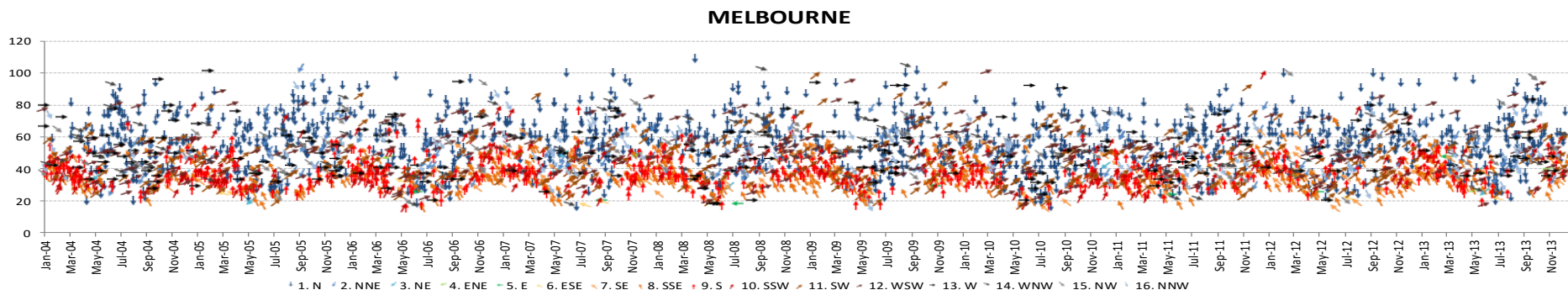
That is 17 storms
per location p.a.

Wasko et al, 2015

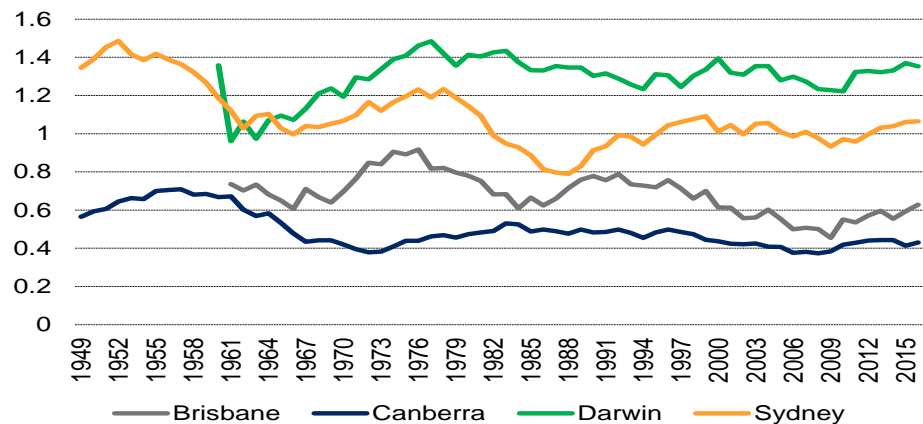
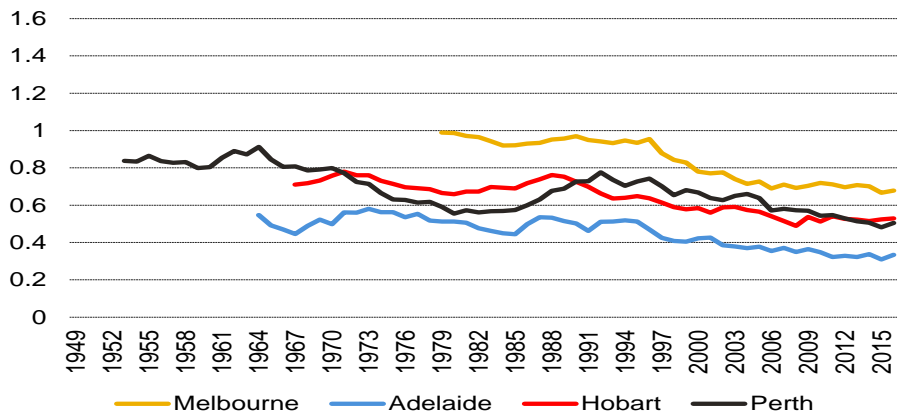
Weather station data - Cairns



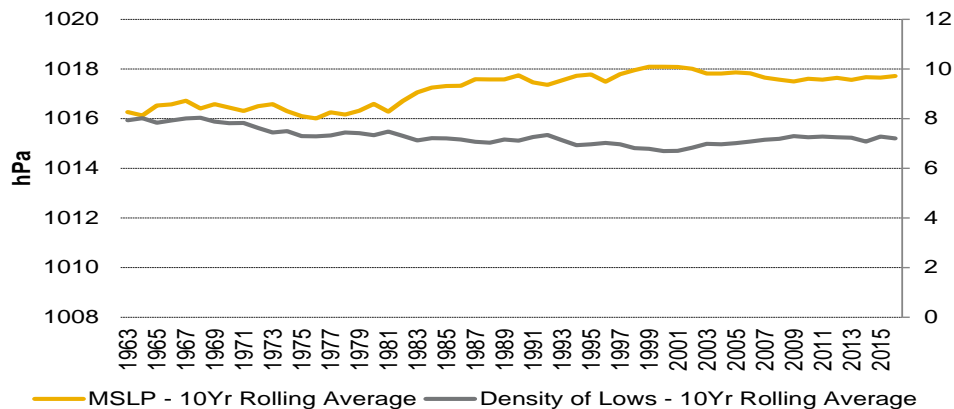
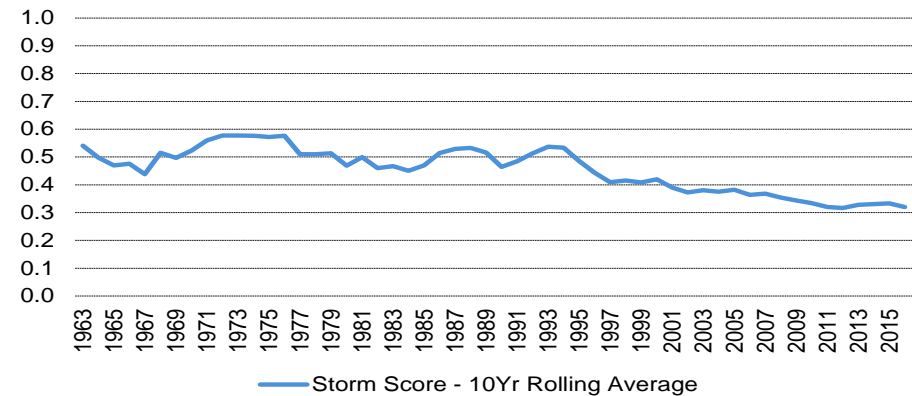
Weather station data – Melbourne



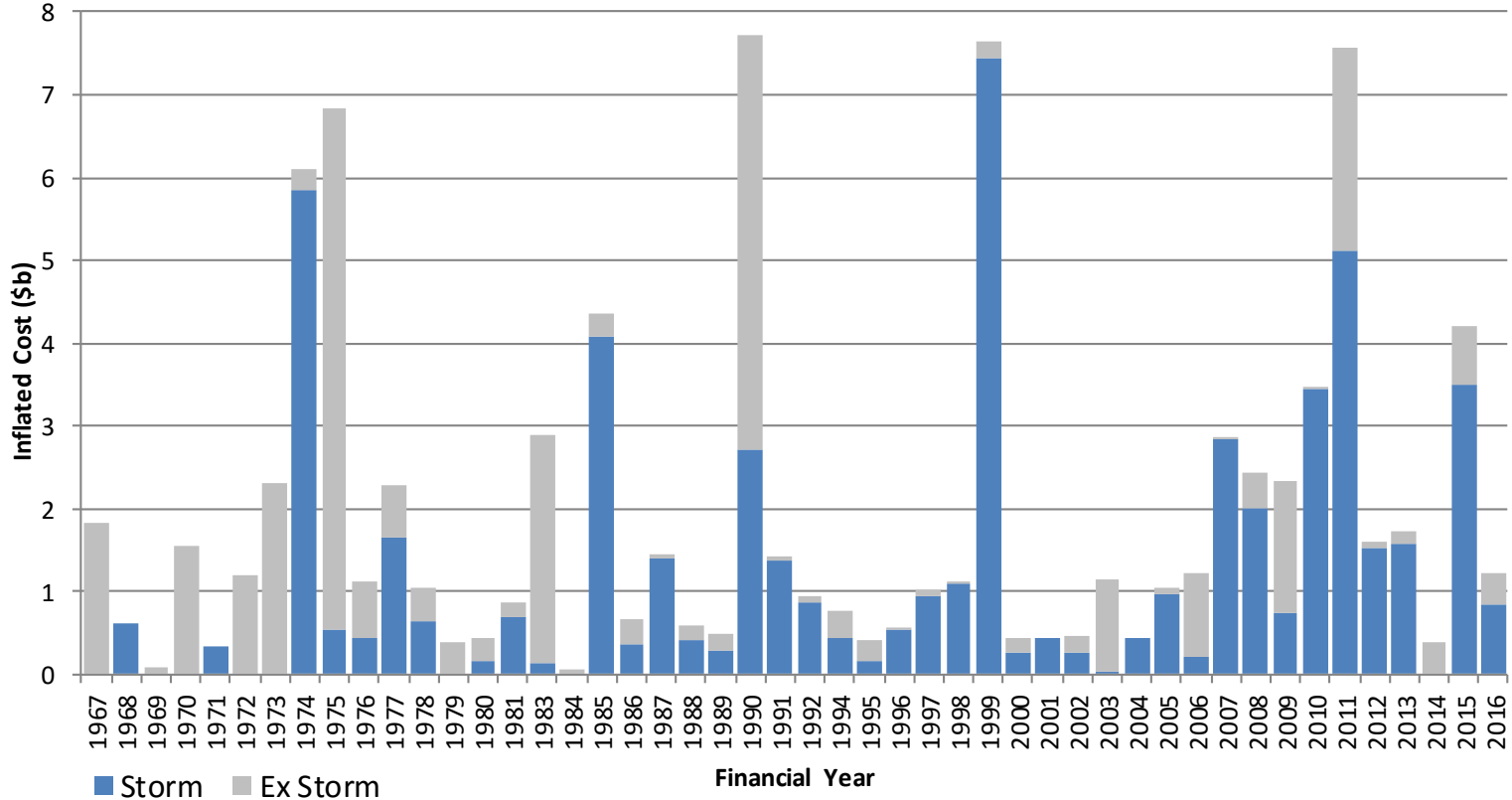
Finity's storm score – capital cities



More detail on Adelaide



ICA natural disaster event costs



Summary



Summary – Changes in storms

- 1) Difficult to assess
- 2) Vary by region
- 3) Normal cycles remain important
- 4) Impacts to date modest, as we would expect
- 5) Data broadly consistent with the science
- 6) Storm surge to be the most significant impact?

Contact



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www.finity.com.au

INVESTOR GROUP ON CLIMATE CHANGE

The Actuaries Institute

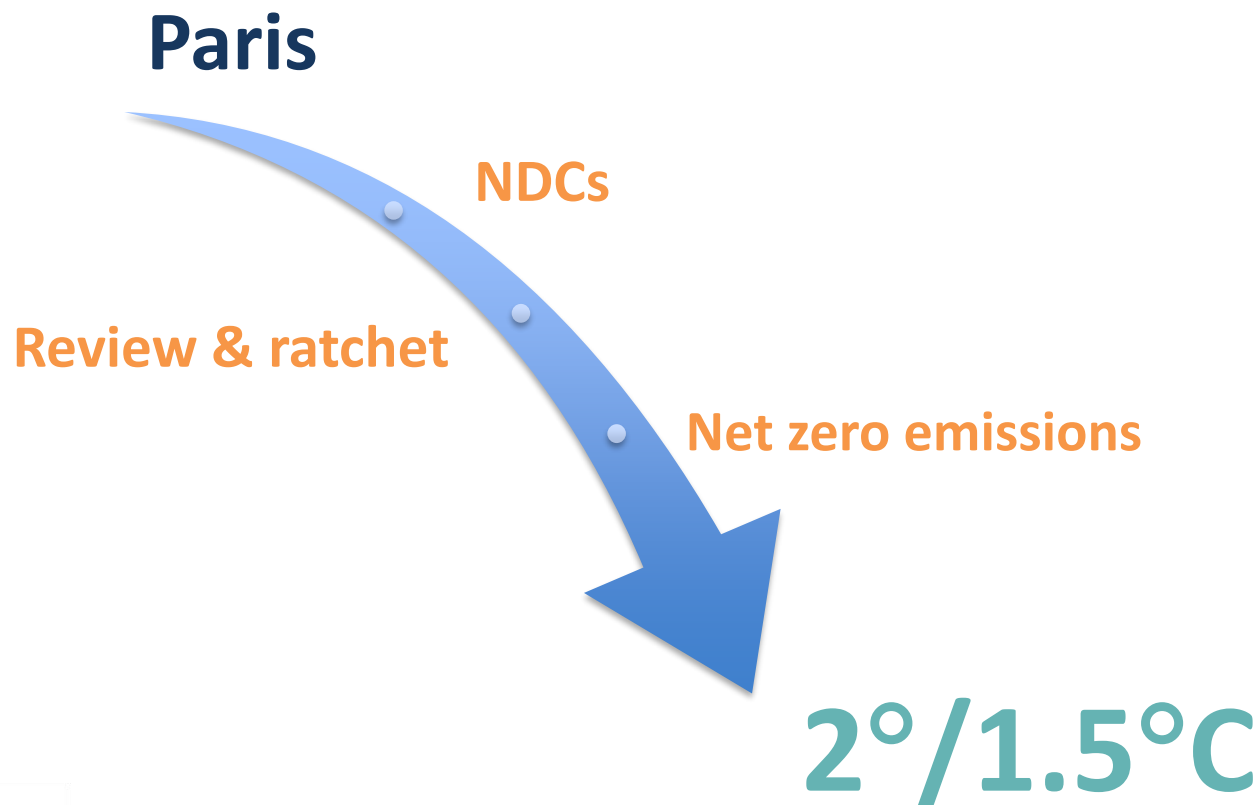
29 September 2016

Quick summary

- Defining carbon risk
- How does carbon risk become a financial risk?
- What is happening internationally?
- What are investors doing?

The 'Paris Agreement'

The Paris Agreement creates a pathway and a process for ongoing change. This is acting as an investment signal.



Climate as financial risk (and opportunity)

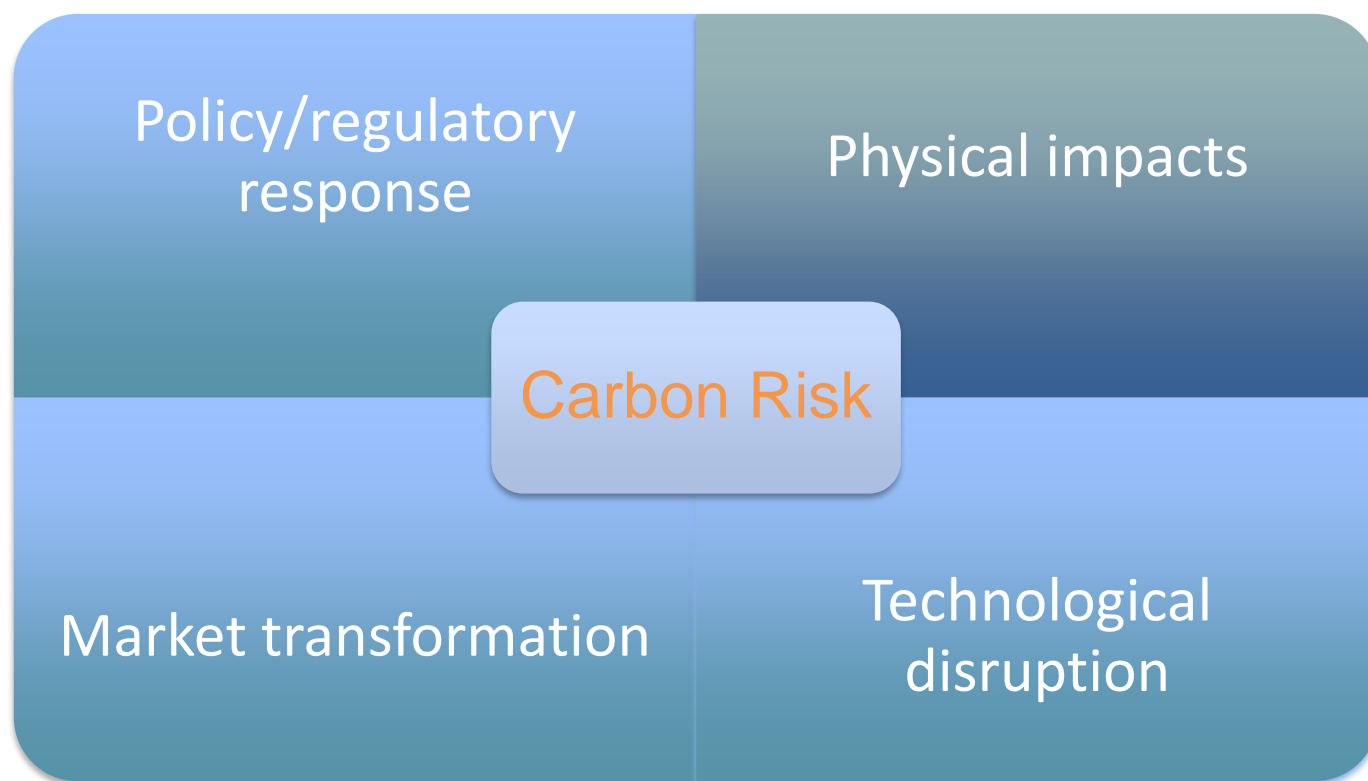
“climate change is a **TRAGEDY OF THE HORIZON** which imposes a cost on future generations that the current one has no direct incentive to fix”

“**SUCCESS IS FAILURE...**
too rapid a movement
towards a low carbon
economy could materially
damage financial stability”



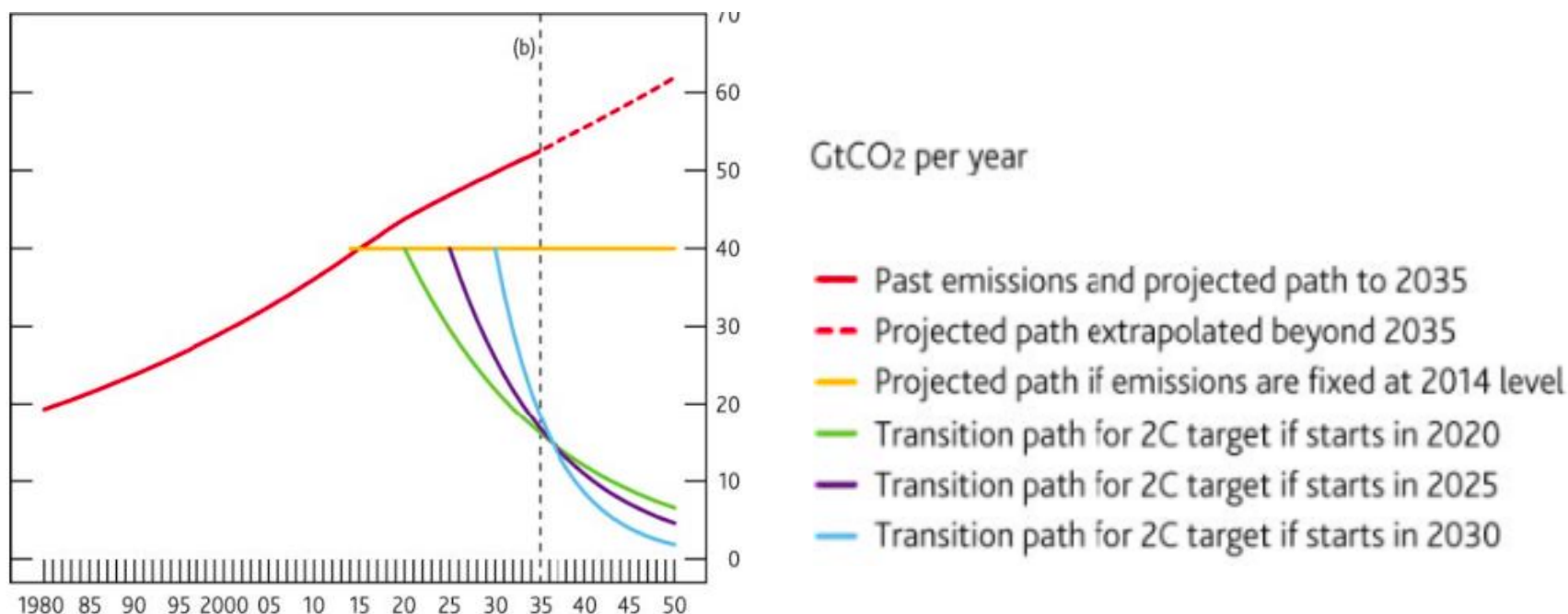
What is carbon risk?

TRANSITION RISK and PHYSICAL RISK dimensions



Transition risk = how steep is the turn?

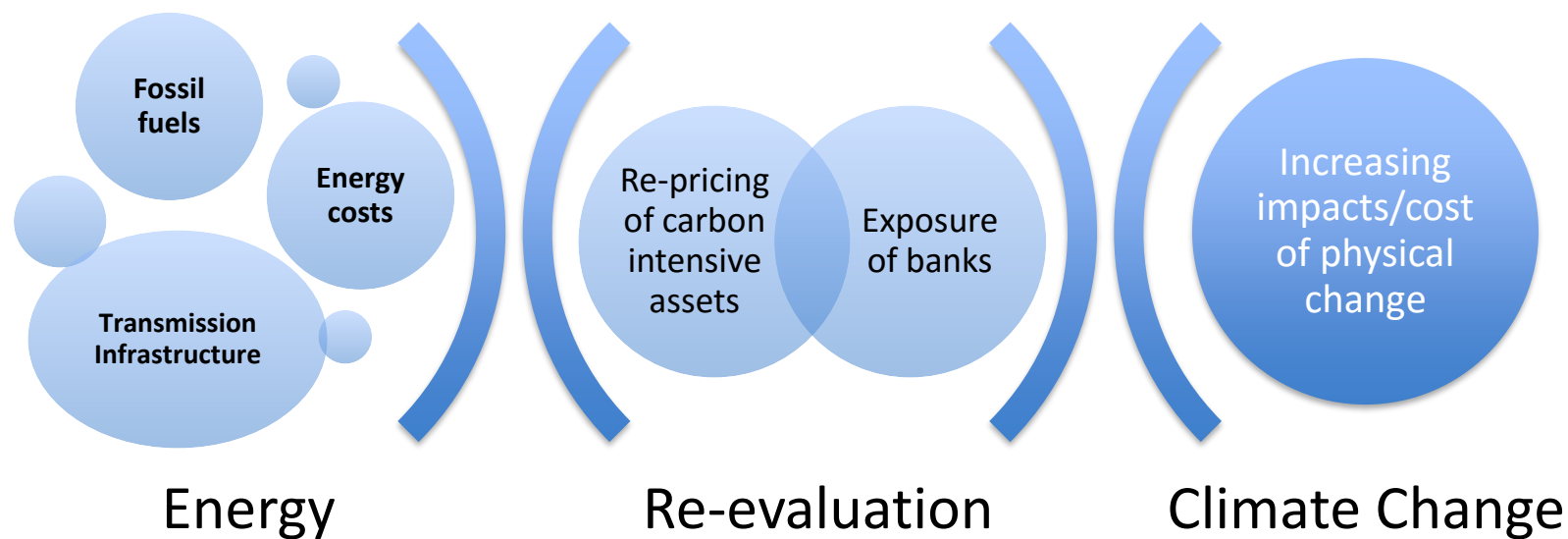
Possible trajectories of carbon emissions, modelled on basis of using global '2°C carbon budget' by 2100 (>66% of less than 2°C, emissions shown until 2050)



Source: Prudential Regulation Authority (PRA) (2015).

Note: The historical growth rate in carbon emission is inferred from its 1970-2013 average; forward growth rates are based on PRA calculations using International Energy Agency (IEA) World Energy Outlook (WEO) 2013 projections and fixed at their 2035 level thereafter. The vertical line at (b) refers to the estimated date at which the carbon budget is expected to be exhausted if the flow of emissions were fixed at the current level (shown by the orange line). This estimate assumes that CO₂ emissions from fossil fuels, industrial processes and land use remain fixed.

How does this become a systemic risk?



International action

A quick look at two exemplars

France

French Energy
Transition Law

China

Green Finance

Good data = good pricing = good investment

1. Strengthen and standardize corporate disclosure
2. Related exposures of financial companies stress tested against transition scenarios
3. Additional guidance and application of financial risk management tools and frameworks to carbon risk.

Disclosure is key to unlocking capital shift

The objective of the TCFD is to promote climate-related disclosures that will:

1. Support informed investment, credit and insurance underwriting decisions about reporting companies
2. Enable a variety of stakeholders to understand the concentrations of carbon-related assets in the financial sector and the financial system's exposures to climate-related risk

Financial Stability Board (2015, November 9). Proposal for a disclosure task force on climate-related risks.

What outcomes are we likely to see?

“Investors need to see the strategic as well as the static”

- Governance
- Completeness
- Comparability
- Forward looking
- Scenario analysis
- A proportionate response
- A commercial response
- Engagement with financial regulators?

Speech delivered 22 September.

www.bankofengland.co.uk



What are investors doing?

1. Measuring
2. Decarbonizing
3. Investing
4. Engaging

Growing investor collaboration

INVESTOR ACTIONS

ALL

MEASURE

ENGAGE

REALLOCATE

REINFORCE



Montréal Pledge
MEASURE



Portfolio Decarbonization Coalition
REALLOCATE



Low Carbon Registry
REALLOCATE

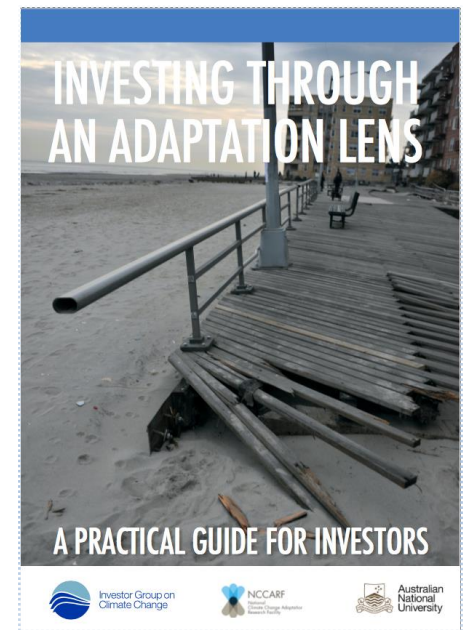


Global Investor Statement on Climate Change
REINFORCE

<http://www.unepfi.org/work-streams/property/sustainablerei/>

Preparing for adaptation / physical risk

- Understanding the risks
- Getting better at asking the right questions
- Identifying interdependencies and the risk of maladaptation
- Looking at capital requirements (capex vs opex) and the cost benefit analysis
- Looking at risks specific to industry sectors



Thank you



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Liability risks - corporate governance & disclosure

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Special Counsel, Minter Ellison

Insights: Climate Change Risks
Sydney, 29 September 2016

Bank of England framework

- Referencing climate risk framework adopted by Bank of England Prudential Regulation Authority
 - **Physical** – ecological impacts: gradual onset and catastrophic
 - **Economic transition** – market impacts driven by policy, technology, social responses to those physical risks
 - **Liability consequences** – **failure to mitigate, adapt or disclose**



**BANK OF ENGLAND
PRUDENTIAL REGULATION
AUTHORITY**

Liability exposure issues

- Focus: *prevailing corporate laws*
 - Corporate risk exposure? (eg *negligence, misleading or deceptive conduct*)
 - Directors' liability exposure? (eg *fiduciary duties, misleading or deceptive conduct*)
- Consider impacts on
 - risk/valuation/ratings issues;
 - 'feedback loop' – driver of behavioural change; and
 - financial lines insurances?

CORPORATE LIABILITY RISKS?

Negligence

- Negligence – failure to manage material foreseeable risks associated with climate change
 - Damage to third parties and shareholders
 - Litigation frontiers eg *Illinois Farmers Insurance v Chicago*

COURT

- *Consider: failure to include in actuarial models?*

Misleading disclosure

- Statements and omissions
 - Valuation assumptions and methodologies, line items and forward-looking risk statements?
- Line items
 - Asset valuations and revaluations – eg *Shell, Exxon*
- Assumptions and methodologies
 - Models fail to provide for relevant risks – eg *NAB*
- Adequate caveats / forward looking risk disclosures
 - General, boilerplate cautionary language may not be meaningful
 - *In re Harman Securities Lit'n* (US, 2015): 'a person who warned his hiking companion to walk slowly because there might be a ditch ahead when he knows with near certainty that the Grand Canyon lies one foot away'

Application of general rules in climate context

- International regulators beginning to apply general disclosure requirements in climate change context
 - NY Attorney General – Peabody U.S. Assurance of Discontinuance
 - ExxonMobil – investigations by AG's in *20 US States*



ATTORNEY GENERAL OF THE STATE OF NEW YORK
ENVIRONMENTAL AND INVESTOR PROTECTION BUREAU

In the Matter of

**Investigation by ERIC T. SCHNEIDERMAN,
Attorney General of the State of New York, of**

Peabody Energy Corporation,

Respondent.

Assurance No. 15-242

ASSURANCE OF DISCONTINUANCE

Specific guidance

- *US* - SEC Guidelines; California Insurance Commissioner
- *EU* – Directive on Institutions for Occupational Retirement Provision; Non-Financial Disclosure Guidelines; France Energy Transition Law Article 173
- *Global* – World Federation of Exchanges; G20 Financial Stability Board (Bloomberg TCFD)
- *Australia* – Senate Eco Refs Committee; APRA



DIRECTOR EXPOSURES?

Fiduciary duties

- Duty to exercise **due care and diligence** in the pursuit of the corporation's (or beneficiaries') **best interests**
- *What does that mean in practice?*

Due care and diligence

- Post-Centro professionalism and pro-activity – the ‘4 E’s’ of DCD
 - Unlikely to be reasonable:
 - denial
 - ignorance/presumption
 - uncertainty paralysis
 - default to regulatory or peer baseline
- Litigation frontiers
 - Coal pension cases
 - Client Earth

***What do these liability
risks mean for actuarial
practice???***

Issues to consider – initial thoughts

- What do we need to do to ensure that these risks are being efficiently incorporated into our models? *What does our due care and diligence look like?*
 - Asset valuations and re-valuations?
 - Credit ratings – sovereign, corporate and product/debt instruments? How do uncertainties and tail risk factor into drivers/outlooks?
 - Portfolio valuations?
 - Bad debt provisioning?
 - Risk assessment, pricing and premia?
 - Opportunities as well as risks (climate bonds etc)?
 - Forward-looking disclosures?
 - Adjustment of models on individual company and sectoral basis?
- Litigation as a material financial risk in itself – who is most exposed, what are the potential exposures?
- Insurances - what does this mean beyond property to financial lines – including PI?

Questions?