

# Actuarial Association of Europe

IFoA Climate Change Working Party Update

# Making Financial Sense of the Future – Can You?

## Climate Change Working Party

**Presented by:**  
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**James McIntyre**

(Photo Credit: XL Catlin)

- Climate change is happening
- The past is not a good guide to the future
  - Assets
  - Liabilities
- Communication is vital



What, in your opinion, will the temperature rise be in the year 2100, compared to pre-industrial times?

(we are currently at 0.7°C)

- A)  $<2^{\circ}\text{C}$
- B)  $2-4^{\circ}\text{C}$
- C)  $4-6^{\circ}\text{C}$
- D)  $>6^{\circ}\text{C}$





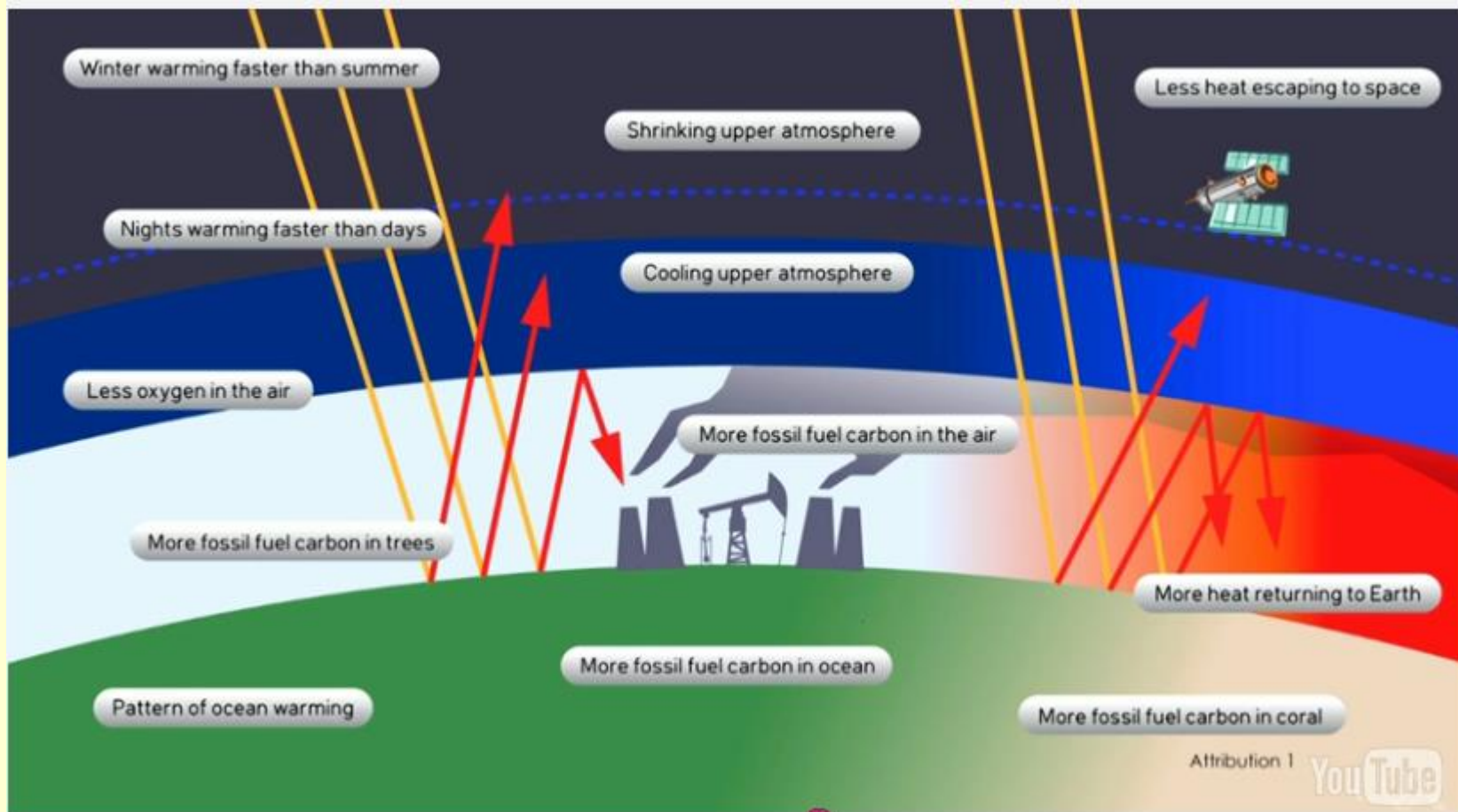
# CLIMATE CHANGE IS HAPPENING: CURRENT SCIENTIFIC CONSENSUS



- The physical science of climate change is settled.
- Subsequent IPCC reports have been more certain, and mostly, more pessimistic.
- Reducing emissions is the most sensible course of action.



### ■ Consensus Science – Human Fingerprint in Warming

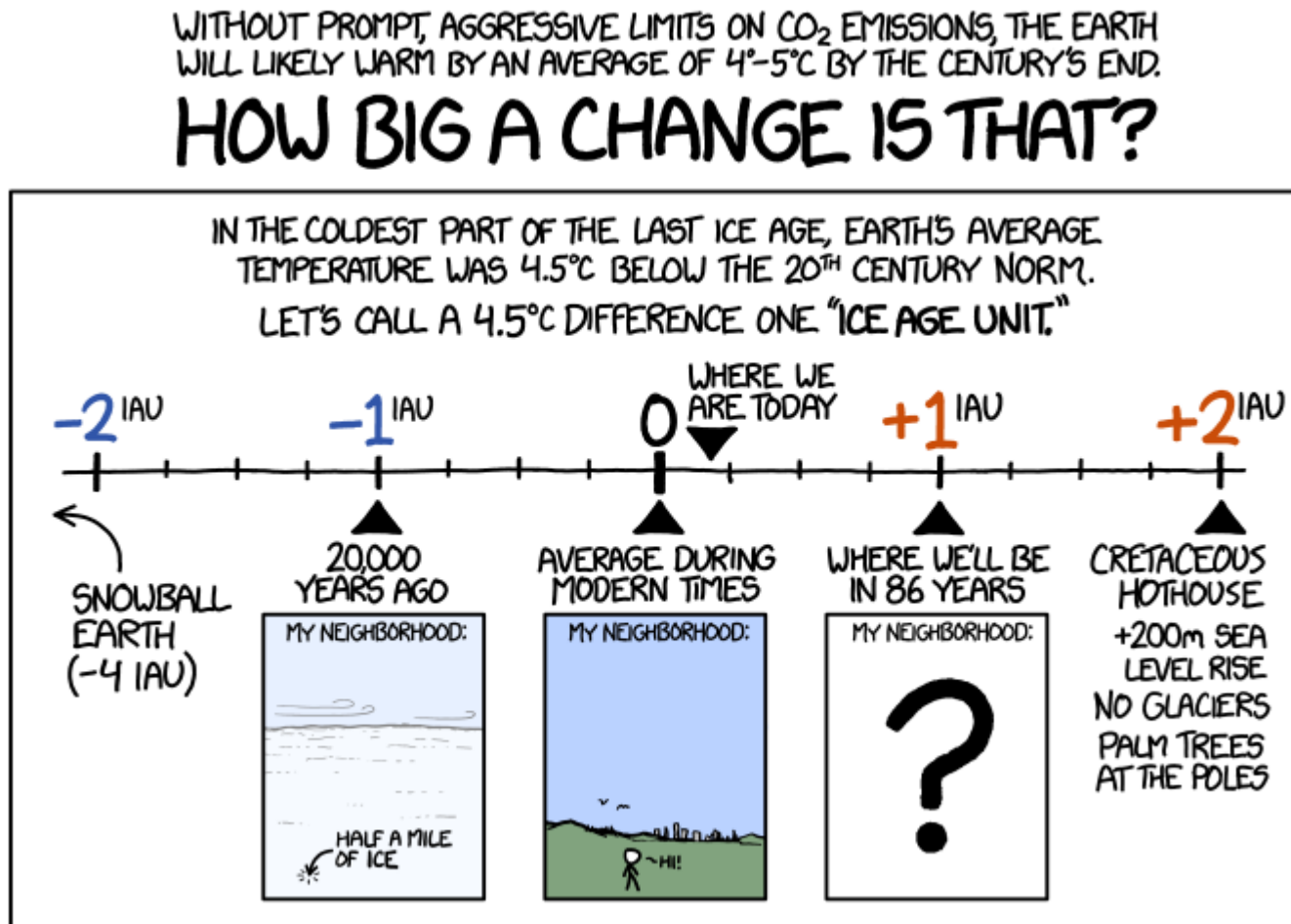


Source: EdX  
Denial101x

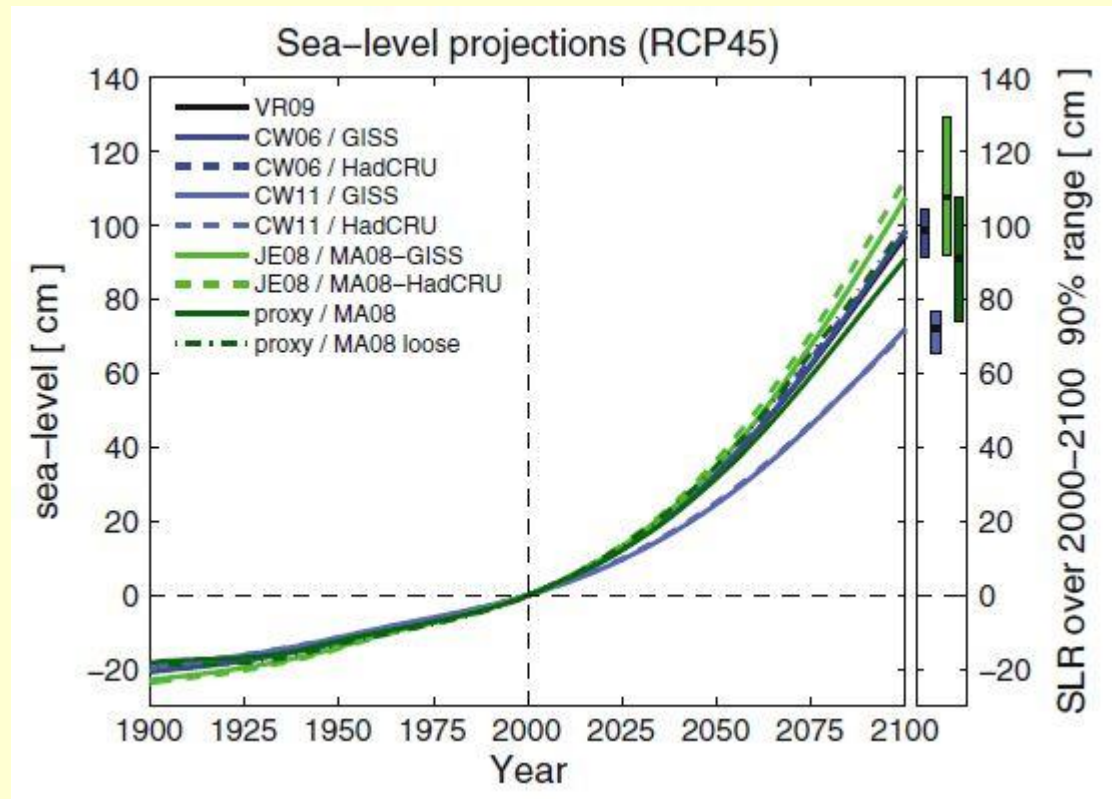
- IPCC View on Consensus
  - IPCC 1995: “The balance of evidence suggests a discernible human influence on global climate”
  - IPCC 2013: “It is extremely likely (more than 95%) that human influence has been the dominant cause of observed warming since the mid 20<sup>th</sup> century”



- Risk and Uncertainty



- Likely between 80cm and 1.2m sea level rise by 2100.
- Accelerating land ice melting presents significant downside risk.



Ramstorff 2011

- Climate-change related risks from extreme events are already moderate, and rise with further warming
  - Heatwaves
  - Droughts
  - Floods
  - Cyclones
  - Wildfires
- Causing
  - Death, injury, severe ill-health
  - Systemic risks due to breakdown in infrastructure and state services
- Distribution of impacts is uneven.



- IPCC report is sceptical of geo-engineering solutions.
- Stresses severe downside risk of unintended consequences of large-scale geo-engineering interventions.
- Reducing emissions and adaptation are recommended approaches.

# THE PAST IS NOT A GOOD GUIDE TO THE FUTURE: CLIMATE CHANGE AND ASSETS



- Climate change will have long-term *and short-term* effects on assets.
- Capital markets are already offering mitigation and adaptation tools to address climate change.
- Asset owners will be key in ensuring finance goes to reducing emissions and building resilience



# Counting the Cost



- Policy risk
- Public pressure risk
- Disruptive technologies risk

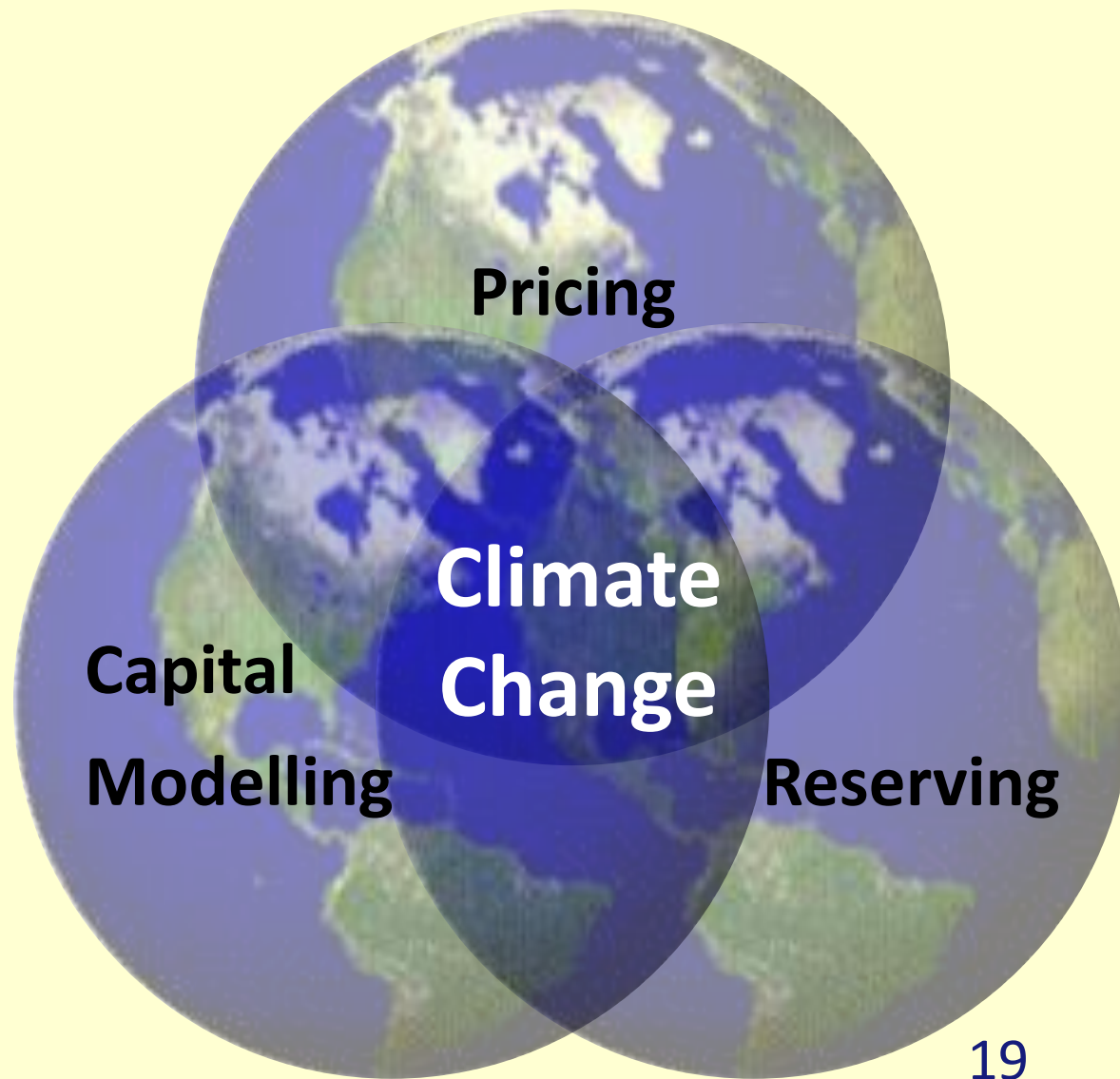


- Mitigation Approaches
  - Climate bonds
  - Infrastructure / Project financing
  
- Adaptation Tools
  - Catastrophe bonds
  - Micro-saving / insurance
  - Weather-based insurance



# THE PAST IS NOT A GOOD GUIDE TO THE FUTURE: CLIMATE CHANGE AND LIABILITIES







Should and will affect your risk selection



With change comes opportunity

Data to pick up new claims types, risk emergence, trends.





Extreme events are more frequent and more severe.

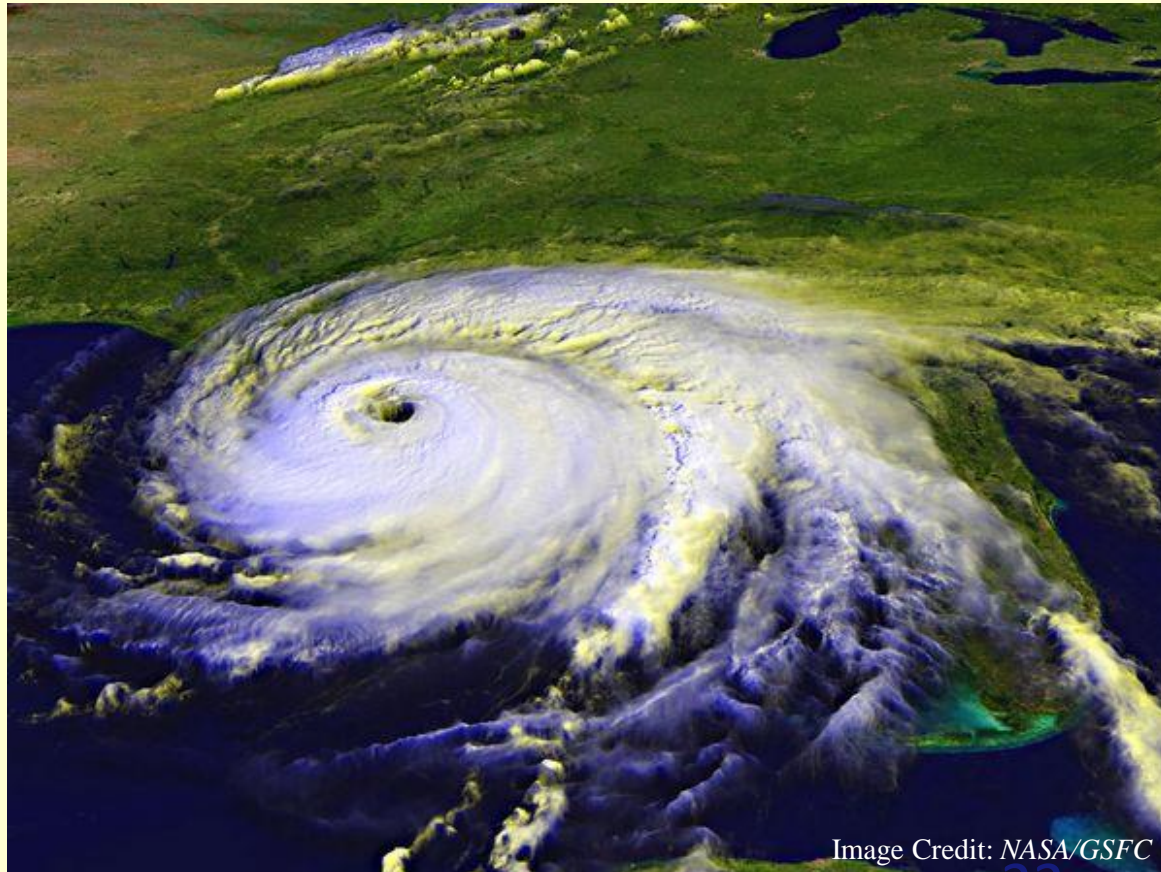


Image Credit: NASA/GSFC



# COMMUNICATION IS VITAL: COMMUNICATING THE RISK OF CLIMATE CHANGE



# A wicked problem

Where society cannot  
agree on either the  
problem definition or the  
solution.





Prof. Kahneman:

“I am very sorry, but I am deeply pessimistic. I really see no path to success on Climate Change”

- 1. Lack qualities that mark it as prominent or demanding attention**



“To mobilize people, this has to become an emotional issue. It has to have the immediacy and salience.”



Prof. Kahneman:

“I am very sorry, but I am deeply pessimistic. I really see no path to success on Climate Change”



- 2. People need to accept short term costs and reductions in living standard in order to mitigate against higher but uncertain losses at some point in the future.**

“To mobilize people, this has to become an emotional issue. It has to have the immediacy and salience.”

Prof. Kahneman:

“I am very sorry, but I am deeply pessimistic. I really see no path to success on Climate Change”

**3. Information about climate change seems uncertain and contested.**



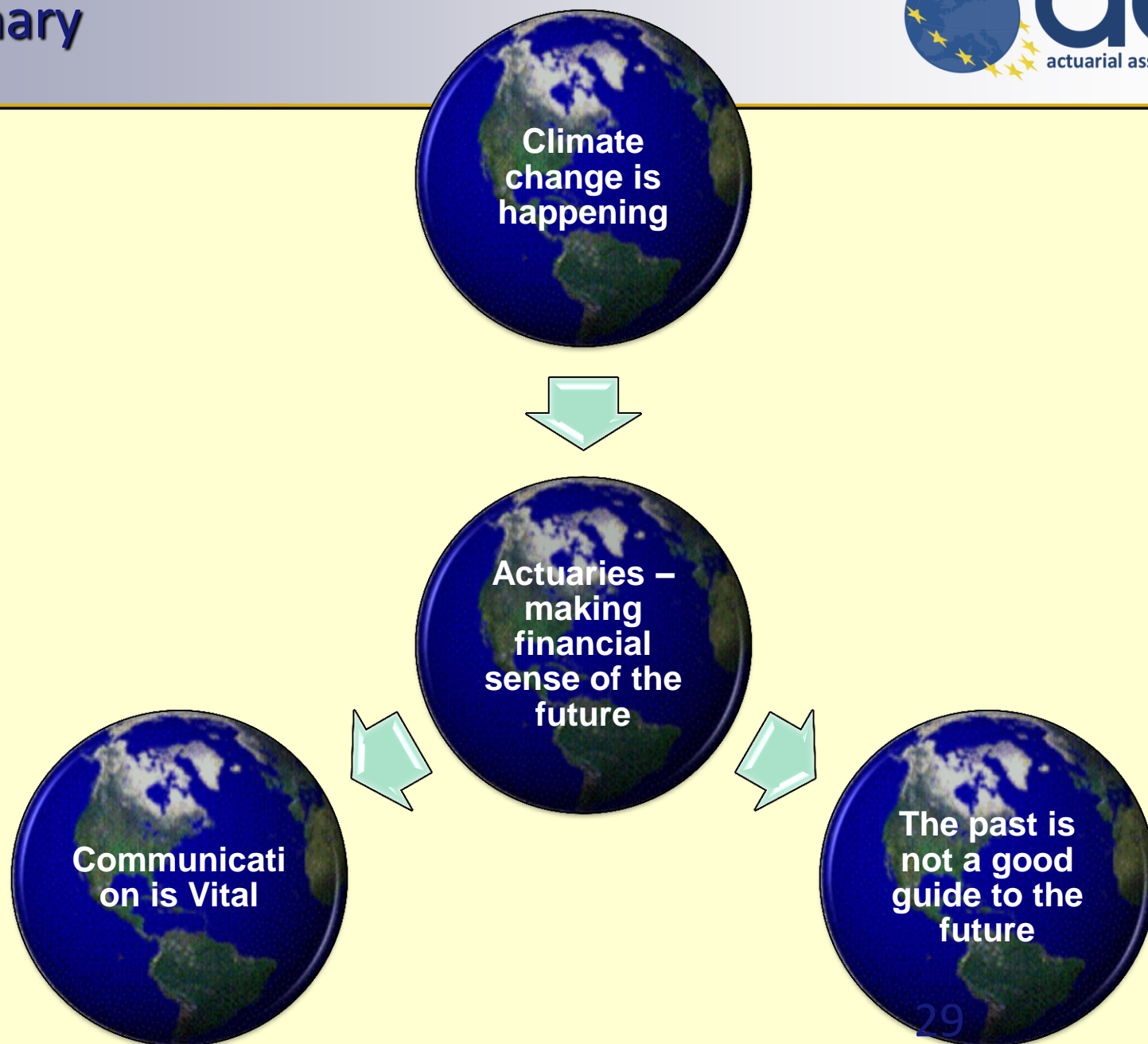
Image credit: Pete Gardner/Getty Images

“To mobilize people, this has to become an emotional issue. It has to have the immediacy and salience.”

# Can you make financial sense of the future?

“[Climate Change] developments have the potential to shift the balance between premiums and claims significantly and render currently lucrative business non-viable.”

Actuaries have the skill set to help understand, communicate and adapt to the future







**Thank You**

**Any questions?**

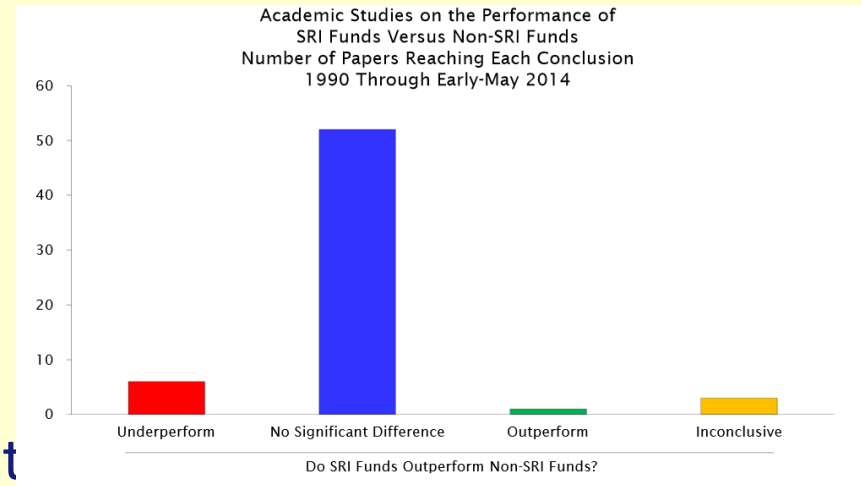
Any ideas or want more details  
please email

[ccwp2014@googlegroups.com](mailto:ccwp2014@googlegroups.com)

# Capital Market Considerations

## ESG Approaches to Equity Investment

- Problem of Stranded Assets generally addressed by either:
  - ESG Investment Approaches
    - Specific ESG Indices (e.g. FTSE4Good)
    - Shareholder engagement
  - Divestment
- “Alpha” case for ESG investment approaches has historically seemed thin.
- However, may be at a turning point (e.g. Carbon Tracker).




# Capital Market Considerations

## Effects on Asset Classes

- Mercer 2015 study estimates sensitivity of assets to climate risks.
- Economist 2015 report tries to estimate tail risk measures. For example 6C warming represents a PV loss of between \$10trn and \$40trn (depending on discount rates).

Figure 8: Sensitivity to the Climate Change Risk Factors — Asset Class Level

ASSET CLASS	T	R	I	P
Developed Market Global Equity	< 0.25	> -0.25	> -0.25	> -0.25
Emerging Market Global Equity	< 0.25	-0.25	-0.50	< 0.25
Low Volatility Equity	0.00	> -0.25	> -0.25	> -0.25
Small Cap Equity	< 0.25	> -0.25	> -0.25	> -0.25
Developed Market Sovereign Bonds	0.00	0.00	0.00	0.00
Investment Grade Credit	< 0.25	> -0.25	> -0.25	> -0.25
Multi-asset Credit	0.00	0.00	> -0.25	0.00
Emerging Market Debt	0.00	> -0.25	-0.25	< 0.25
High Yield Debt	0.00	> -0.25	-0.25	> -0.25
Private Debt	0.00	0.00	0.00	0.00
Global Real Estate	< 0.25	0.00	-0.75	< 0.25
Private Equity	< 0.25	> -0.25	-0.25	> -0.25
Infrastructure	0.25	> -0.25	-0.50	< 0.25
Timber	< 0.25	-0.75	-0.50	0.25
Agriculture	0.25	-1.00	-0.50	0.25
Hedge Funds	0.00	0.00	0.00	0.00



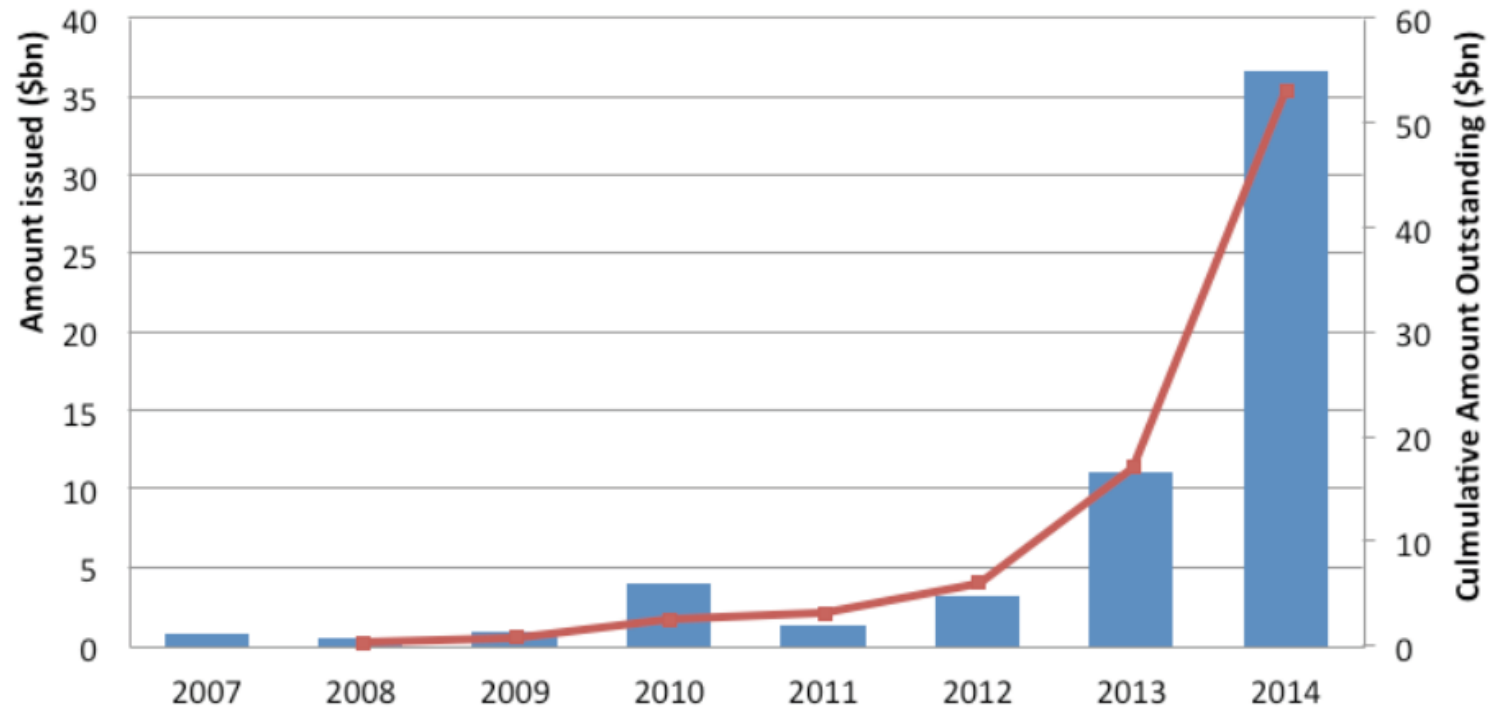
Negative

Positive

# Capital Market Considerations

## Climate Bonds

### Green bond issuance has exploded



Data as of 31st Dec 2014



## Access

- Project Finance – co-investment / direct
- Equity
- Debt
- Example platform – NAPF

## Barriers – Investment opportunities / conditions\*

- Lack of political commitment over the long term
- Regulatory instability
- Fragmentation of market among different levels of government
- Lack of clarity on investment opportunities
- High bidding costs during procurement
- High risk of investment opportunities
- Lack of transparency, benchmark, data etc

## Barriers – Investor Capability

- Lack of expertise in infrastructure
- Scale of pension funds
- Misalignment of interests between fund managers and pension funds
- Short termist investors
- Regulatory barriers
- Liquidity of pension funds

\* Barriers list drawn from Oliver Wyman and OECD research

### Disadvantages:

- Basis risk – between event and crop
- Spatial risk – local variations in peril against station being used to calculate loss payment
- Temporal risk – variation within seasonal crop phases
- Product risk – poor relationship between measure used and the loss being generated
- Lack of weather data
- Technical capacity and expertise to set up a program up

### Advantages:

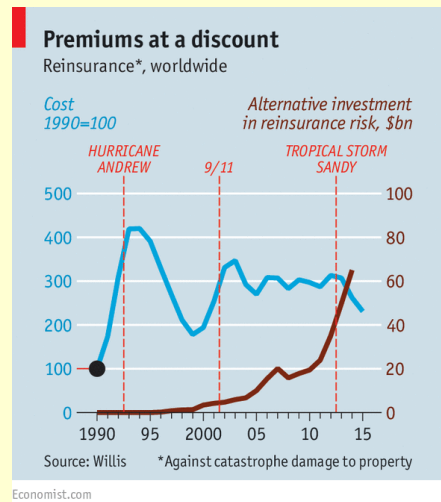
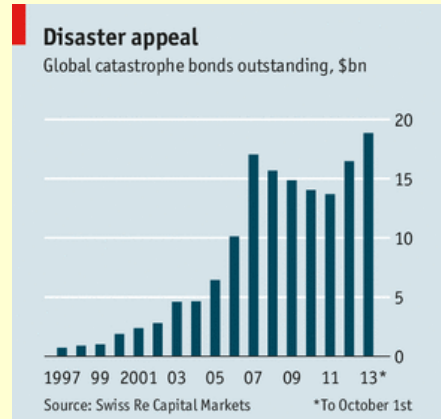
- Transparency – access to the same information on which payments made
- Cost – lack of loss adjustment cost, lower distribution costs
- Remove adverse selection – as payment relative to defined metric
- Time – payouts can be quick to people who need them
- Where basis risk minimal, good coverage

# Capital Market Considerations

## Catastrophe Bonds

### Role in insurance market

- Market expected to quadruple in next 10 years
- Competition from cat bonds makes it harder for reinsurers to raise premiums, leading to reduced profits
- Global 'Disaster Gap' between insured and uninsured losses estimated to be \$168bn, with climate change and urbanisation expected to exacerbate future losses from catastrophes
- Cat bonds, along with other alternative investment in reinsurance risk, could play an important role in closing the gap



Source: Economist.com



# Capital Market Considerations

## Micro Saving / Finance / Insurance



Variety of definitions, but main feature is around saving/ insurance/ finance specifically being offered to the low income market. Risks could relate to health costs, livestock, crop or personal property.

What is the link to climate change? Rising sea levels, increased frequency of climate related disasters , shortage of food/ water means more of the low income market is exposed to the risks of climate change and so produces increased opportunities for the capital markets/ insurance companies.

What is the link to capital markets? Capital markets may finance micro finance institutions allowing the appropriate structures to be set up in order to offer this type of cover. Returns on this type of business may be uncorrelated with other investments and so produce potential for diversifying returns in the same way that catastrophe reinsurance offered opportunities for the pension funds in the index linked security space.

Linked to weather based insurance as offering is on a similar approach:

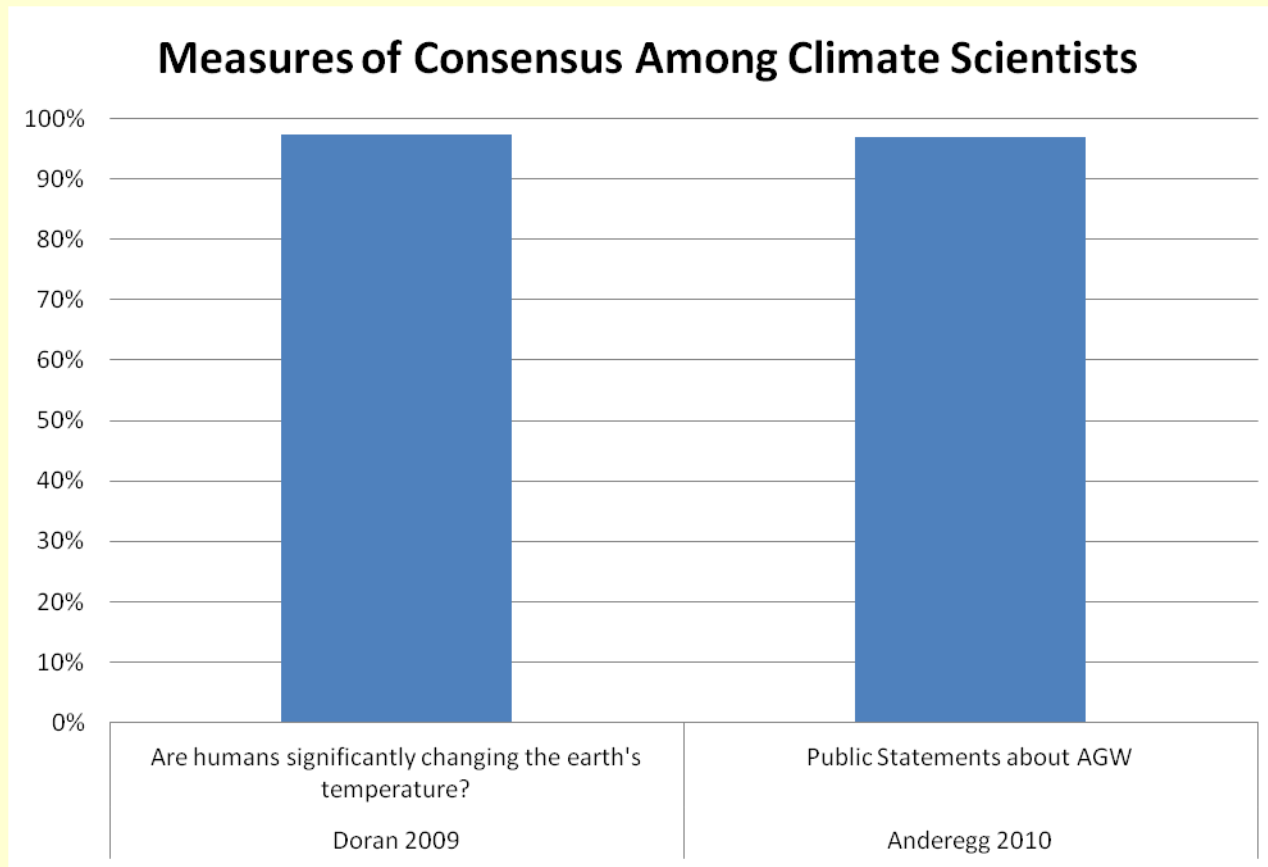
- High volume/ low premium transactions
- Payouts small and cost of adjusting claims small
- Innovative delivery channels (banking, agricultural products, mobile phones etc.)
- Customized products and processes
- Generally in emerging market economies

So what are the difficulties

- Pricing, lack of good quality data to generate policies at an affordable price
- Profit, or rather potentially not making loss weigh up the cost of doing business against the benefit given to society of provided the cover
- Education, purchasers still sceptical around benefit and value of this type of cover
- Low cost distribution

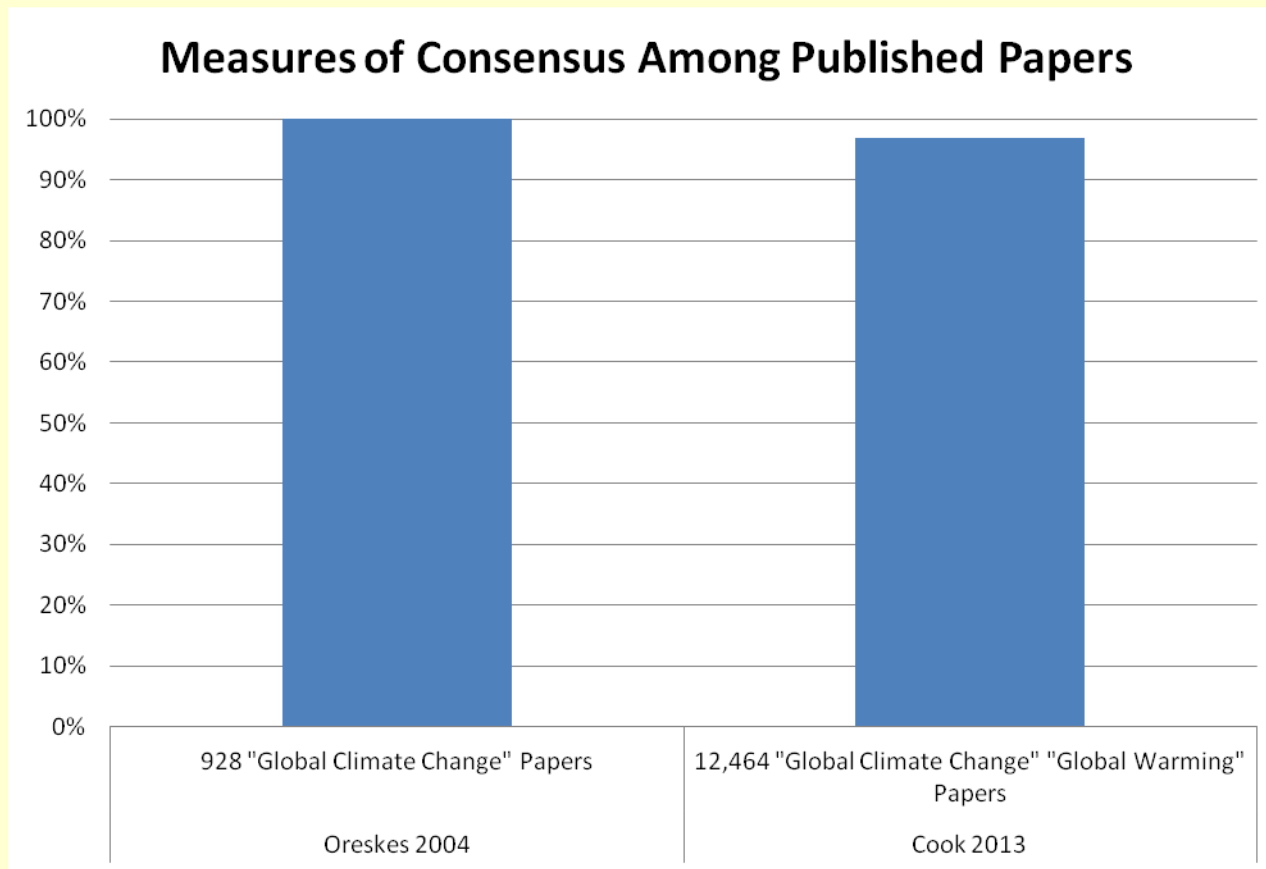
# APPENDIX

### ■ Consensus Among Scientists





### ■ Consensus Among Papers



Definition: fixed-income financial instrument linked in some way to climate solutions, either to raise funds for climate change solutions (i.e. mitigation) or adaption related projects or programs.

Who can issue? Governments, multi-national banks or corporations

Structure? Standard fixed income, repay bond over a certain time period, plus either a fixed or variable rate of return.

### Types of bonds:

- Green “use of proceeds bonds” – earmarked for green projects – full re-course to the issuer
- Green “use of proceeds” revenue bonds – revenue streams from the issuers are collateral for the debt
- Green Project bond – ring-fenced for the specific project – recourse is only the project assets
- Green Secutitized Bond – either for specific green project or go directly to underlying green project – recourse is to group of projects that have been grouped together

When is infrastructure 'infrastructure' ?

- For resilience
- Resilient

Infrastructure categories:

- Transportation
- Food production
- Water services
- Power
- Communication networks
- Waste Removal
- Housing
- Healthcare
- Education



## Funding Gap

Placeholder for graph 1 showing OECD / WEF / OW estimates for estimated required investment over the next few years versus Preqin's data / Towers Watson survey on actual investment

Placeholder for graph 2 showing that, according to Preqin, institutional investment is below target allocations

Blurb of *say what can be seen from graphs above*

Graph 1: OECD / WEF's estimates are a few trillion whilst actual institutional investment is a fraction of that

Graph 2: Institutional Investment is below target allocations

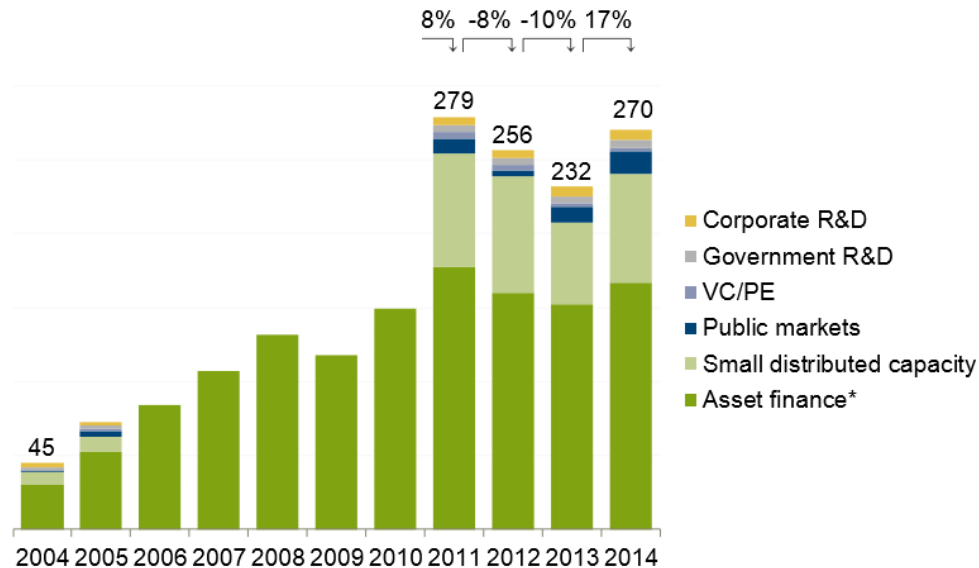
# Capital Market Considerations

## Investment in renewables

GLOBAL NEW INVESTMENT IN RENEWABLE ENERGY  
BY ASSET CLASS, 2004–14 (\$BN)



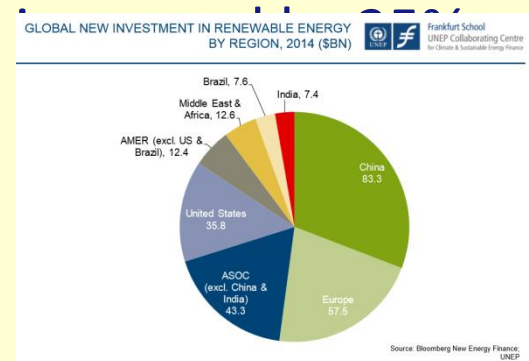
Frankfurt School  
UNEP Collaborating Centre  
for Climate & Sustainable Energy Finance



Note: \*Asset finance volume adjusts for re-invested equity. Total values include estimates for undisclosed deals

Source: Bloomberg New Energy Finance

Increase since 2013  
largely driven by  
new investment in  
solar and wind  
energy (solar  
investment



Source: Bloomberg New Energy Finance, UNEP

# Capital Market Considerations

## Weather based insurance



This type of insurance is for people practising agriculture as a means for survival as opposed to commercial farmers, used for two main reasons; economic development and disaster relief

How? Conventional crop insurance relies on direct measurement of damage to pay a claim, weather index insurance removes costly impact of claim assessment by being made relative to an objective measurement e.g. rainfall, temperature, vegetation cover. The aim is to align the relative measure as much as possible with the performance of the crop.

Features of weather index contract:

- pre-defined trigger
- period of time for which the contract is in force will usually be over the growth period of the crop
- claim payment as a lump sum or related to the performance relative to the trigger
- there is a limit to the value of the payment

Risks? Basis risk relative to measure, scale.



# Capital Market Considerations

## Catastrophe Bonds (Cat Bonds)



- Emerged in mid-1990s after losses from Hurricane Andrew
- Generally cover natural disasters like hurricanes and earthquakes in developed economies but bulk of future growth may be in other parts of the world

### How do they work?

- Capital market investors buy the bond from issuers
- Issuers typically government bodies or reinsurers. May be issued via an offshore special purpose vehicle
- Issuer reinvests in low risk securities and pays regular interest to investor unless catastrophe occurs. If a qualifying event occurs, issuer keeps capital and uses it to cover claims
- May be triggered by number of different criteria e.g. when losses reach a certain amount or wind speed exceeds particular threshold
- Typically issued for around 3 years

### Role in managing climate change risk

- In 2014, the African Risk Capacity launched the Extreme Climate Facility (XCF). Under this programme, more than \$1bn of catastrophe bonds will be issued over a 30 year period from 2016
- Aims to provide additional investment in climate adaptation in the event that weather shocks such as extreme heat, droughts, floods or cyclones increase in occurrence and intensity across the continent
- Index will track increases in the frequency and magnitude of extreme weather events over and above an established baseline. Bond maturity payments will be made to countries in the affected regions if the index exceeds pre-defined thresholds

## Appeal

- Attractive as an investment
  - Returns uncorrelated with stock markets
  - High yields
  - Only 3 out of 200 bonds triggered in last 15 years
  - Reinsurers can use cat bonds to offset own portfolio risk
  - Tax breaks on offer
  - Generally fully collateralised
- Can be used to cover risks that have become too expensive or risky for insurers to insure
- Potentially cheaper form of insurance for those that need cover
- Distributes risk more widely. Diversified pool = more resilient?
- May help reinsurance options expand into new, underinsured markets in the developing world (e.g. less than 1% of damage by 2015 earthquake in Nepal covered by insurance vs 80% in Christchurch earthquake)

### Concerns

- Recent catastrophes have not triggered cat bonds to pay out so many investors not yet experienced big losses. Prices may be distorted by naïve investors who do not fully understand risks
- Recent yields have fallen due to influx of money – yield is just over 5% p.a. (it was about twice that 2 years previously). May be poor value for risks involved
- Typically poor credit ratings and largely untested as a credit instrument
- Difficult for investors to monitor risk exposure (much of the market based in Bermuda and Cayman Islands, which is less stringent than Europe or US on capital requirements and financial disclosure)
- Creation of ‘shadow insurance’ with systemic implications
- Reinsurers may end up underwriting riskier events to maintain profits – more than is prudent
- Potential to undermine climate resilience as might introduce an attitude of complacency amongst the insured
- Questionable ethics – poorer region generally contributed less to climate change in terms of CO<sub>2</sub> emissions but represent areas most at risk of climate catastrophes. Cat bonds result in potential transfer of wealth from poorer regions to investors in richer regions



# Draft stakeholder analysis

Power+

Government

Business

Regulators

Capital markets

Media

Consumers

Academics

Educators

NGOs  
etc

Financial services

Actuarial  
profession

+

Interest

General public

*Other things to think about:*

- Attitude to climate change
- Relationships between