



Should “making financial sense of the future” include issues due to Climate Change?

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GIRO 19 October 2005

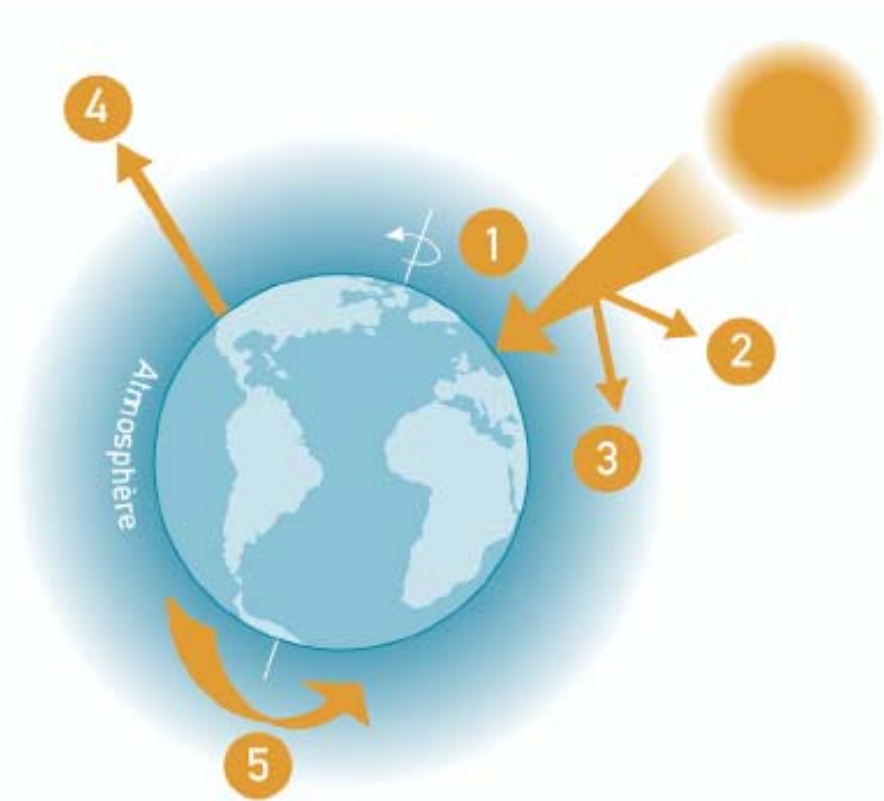
**Impacts of climate change on financial institutions’
medium to long term assets and liabilities**



I. Introduction

Green house gas (GHG) effect, a natural phenomenon

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- ① Only a portion of the solar energy hits the Earth.
- ② Remainder returns to space.
- ③ Absorption by the atmosphere.
- ④ Earth emits energy in the form of infra-red.
- ⑤ A portion of radiation is intercepted and absorbed by green house gases.

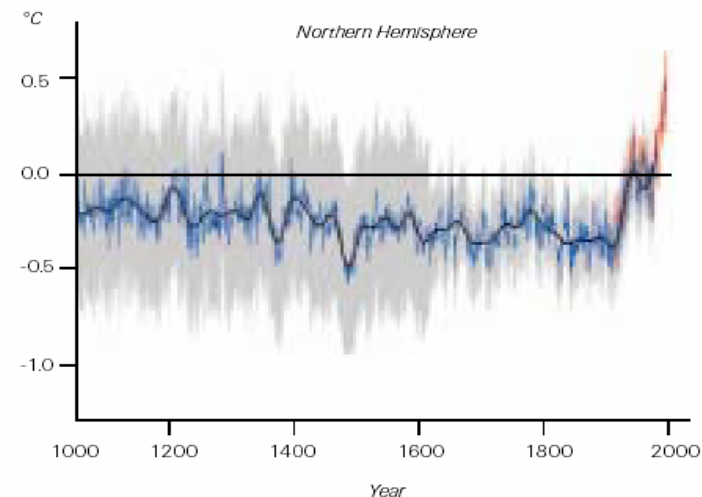
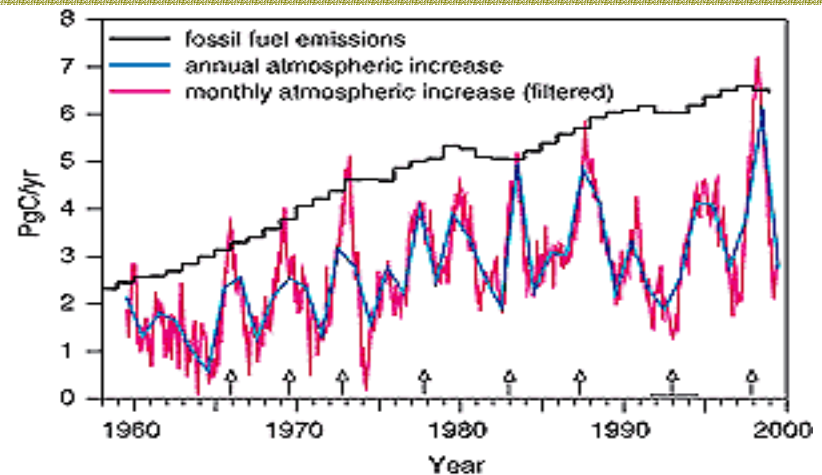


I. Introduction

Climate change - GHG presumed guilty

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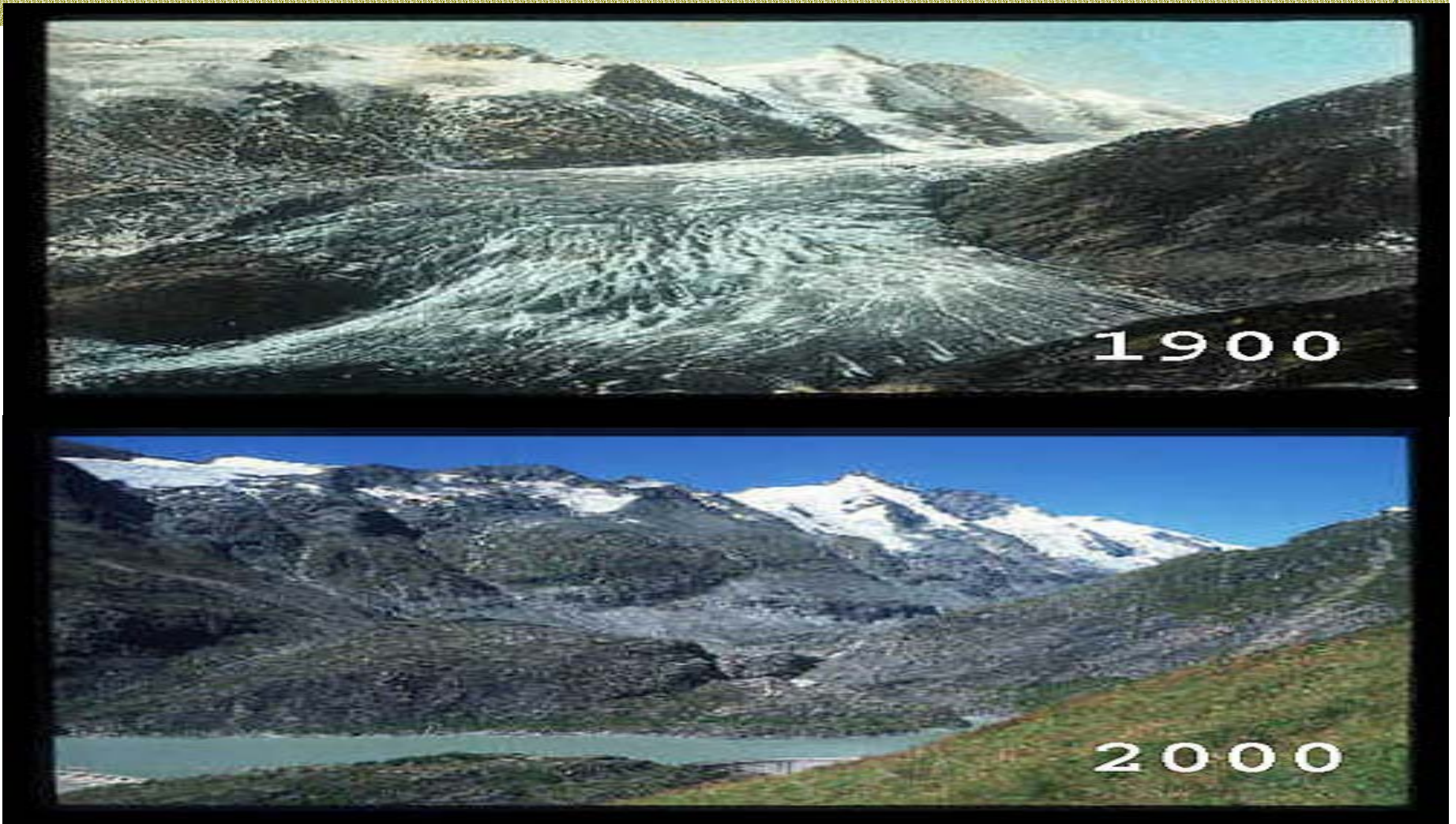
- Concentration of GHG in the atmosphere has changed
- Scientific models show that a change in concentration of the air causes a rise in temperature and climate disturbance (e.g. volcanic eruption in the Philippines).
- “global average sea level rose between 0.1 and 0.2 metres during the 20th century” (*IPCC TAR 2001*).
- Temperature increased by $0.6 \pm 0.2^{\circ}\text{C}$ over the 20th century.
- Surface temperature increased greater than during any other centuries in last 1000 years. 1990 is the warmest decade of millennium.





I. Introduction

Climate Change at our doorstep



Austrian Glacier, Pasterze



I. Introduction

Observations (*IPCC TAR 2001*)

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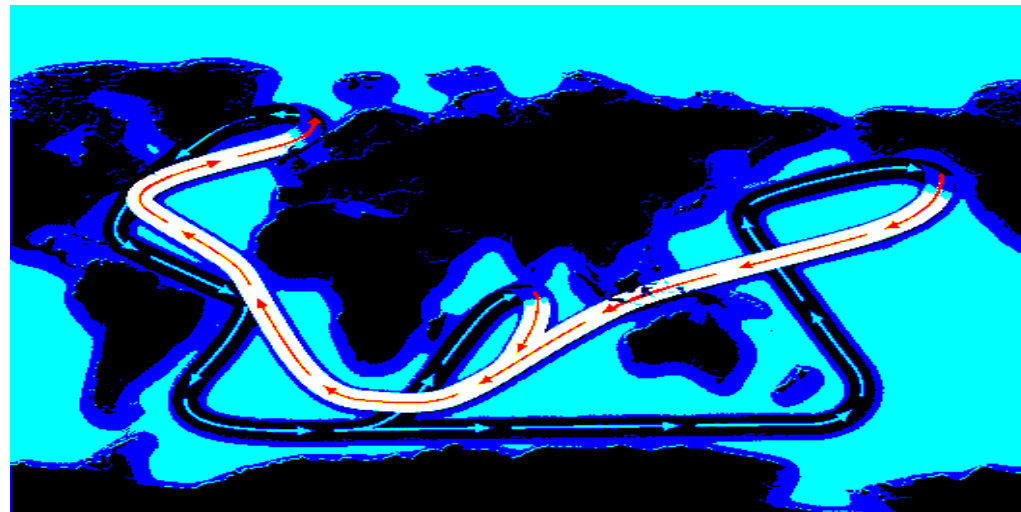
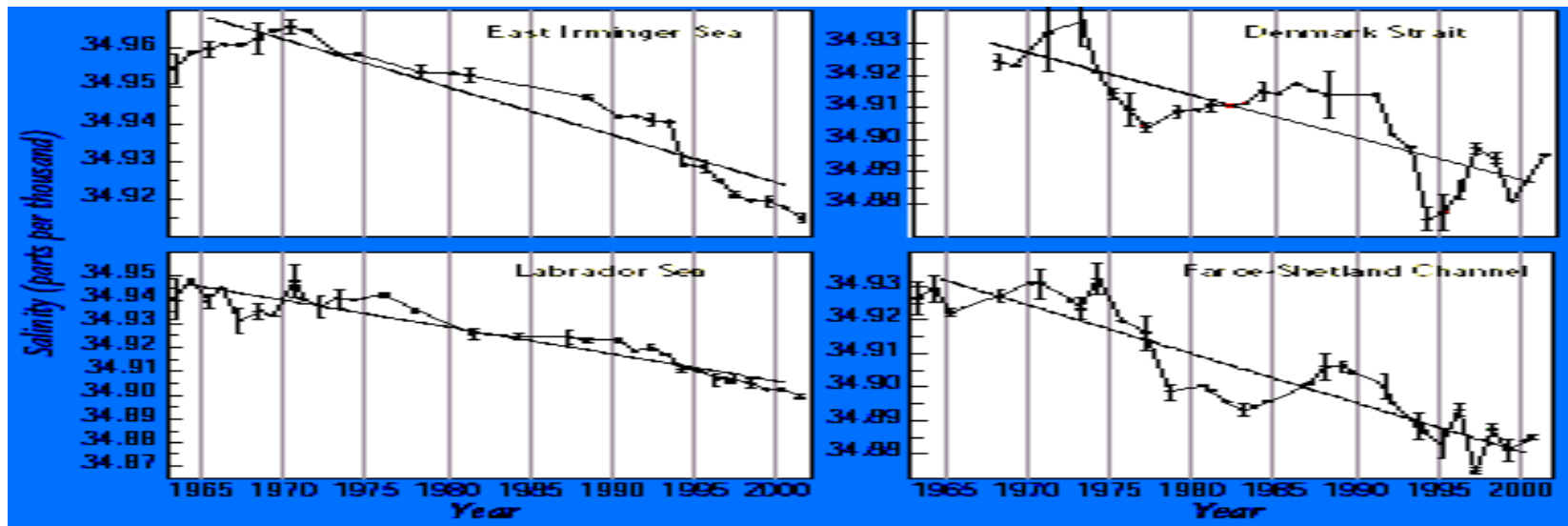
Indicator	Observed changes
Continental precipitations	Increase by up to 10% in Northern Hemisphere (although decrease in some regions, Africa).
Heavy precipitation events	Increased at mid and high northern latitude.
Frequency and severity of droughts	For some regions such as Asia and Africa, an increase in the frequency and intensity of droughts have been observed in recent decades.
El Nino events	Has become more frequent, persistent and intense during last 20 to 30 years compared to last 100 years.
Breeding, flowering, and migration	Earlier flowering, earlier bird arrivals, earlier breeding seasons, earlier insect appearances observed in northern hemisphere.
Weather-related economic losses	Some increase in inflation over the past 40 years is linked to climatic factors.



I. Introduction

Potential abrupt shift - Gulf stream disappearance

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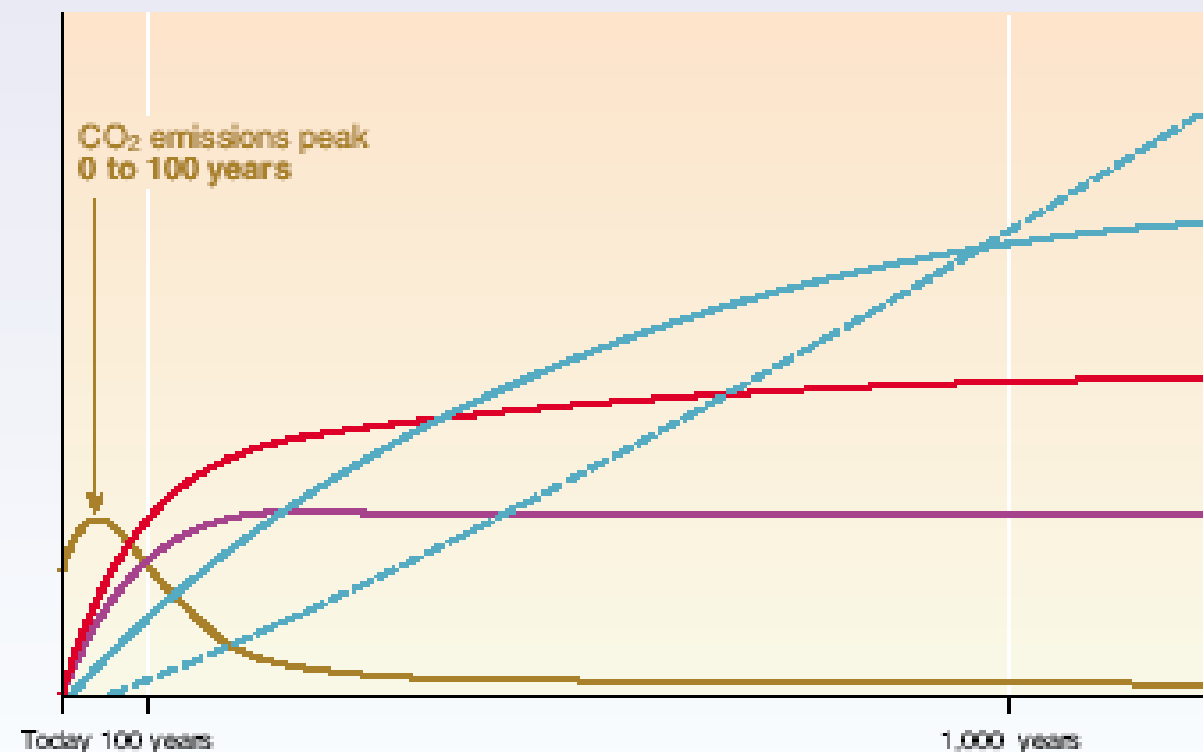
II. Relevance of CC to projections of liabilities and assets

Timeline of predictions

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CO₂ concentration, temperature, and sea level continue to rise long after emissions are reduced

Magnitude of response



Time taken to reach equilibrium

Sea-level rise due to ice melting: several millennia

Sea-level rise due to thermal expansion: centuries to millennia

Temperature stabilization: a few centuries

CO₂ stabilization: 100 to 300 years

CO₂ emissions

Even if all emissions were to stop today, climate change would still occur.



II. Relevance of CC to projections of liabilities and assets

Impacts on ALM and solvency

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- Predicted timing of climate change (CC) is particularly relevant to financial institutions as most of their liabilities translate into medium to long term cash-flow projections which assets have to match:
 - Life insurance typically receives premiums for decades and guarantees over a life time,
 - Pension funds receive contributions until retirement,
 - Banks lend for periods of 20 years or more.
 - General insurance (GI) long tail business can have claims over 10 years,

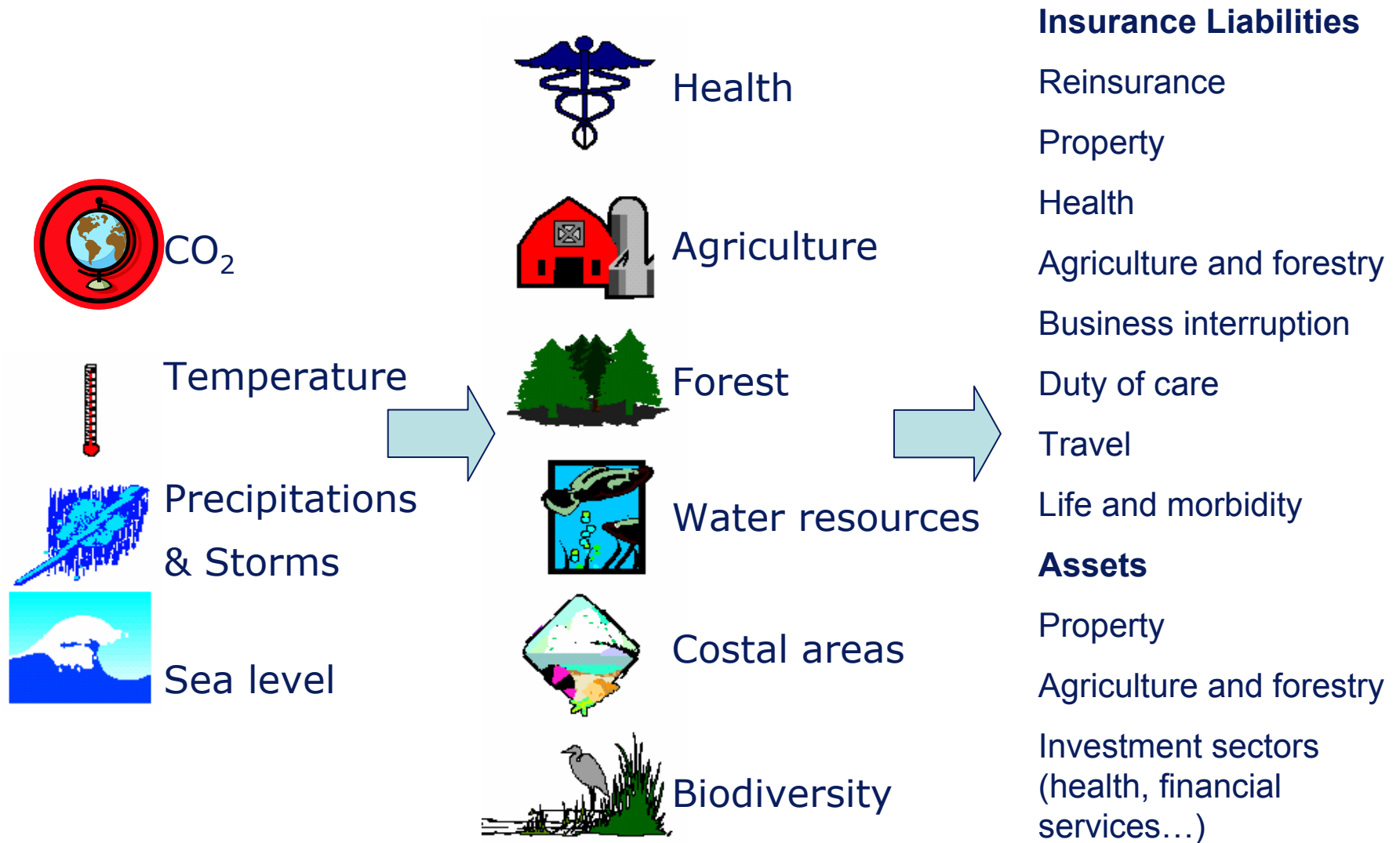
ALM is “investigating part or all of the future financial outcomes of a company under conditions where the assets, liabilities or both may vary” (J. Lang 1998).

ALM is where “the possible financial outcomes of the company (e.g. solvency, profitability or some other measures) can be investigated under a variety of scenarios relating to the projected value of assets and/or liabilities” (J. Lang 1998).



III. Impacts of Climate Change

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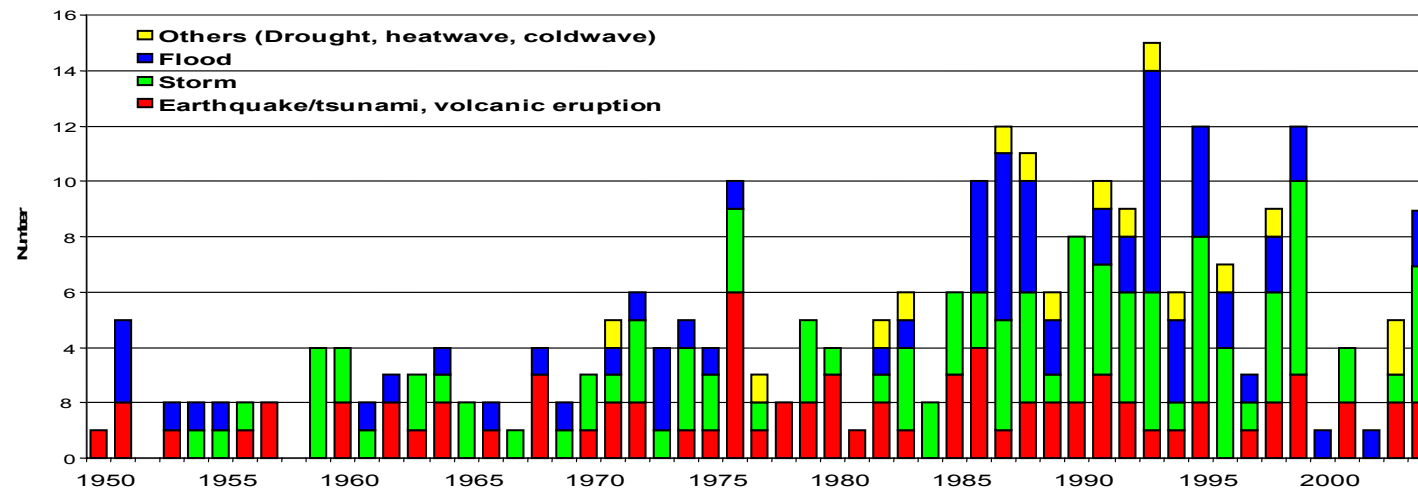
III. Impacts of Climate Change

Direct impacts on Liabilities, Catastrophes increase

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- A factual increase in the number and size of catastrophe claims.
 - an issue for reinsurance companies and GI business.
- "Changes in many atmospheric processes will significantly increase the frequency and severity of heat waves, droughts, bush fires, tropical and extra tropical cyclones, tornadoes, hailstorms, floods and storm surges in many parts of the world." (Berz G., 2004 Munich Re)

Number of events



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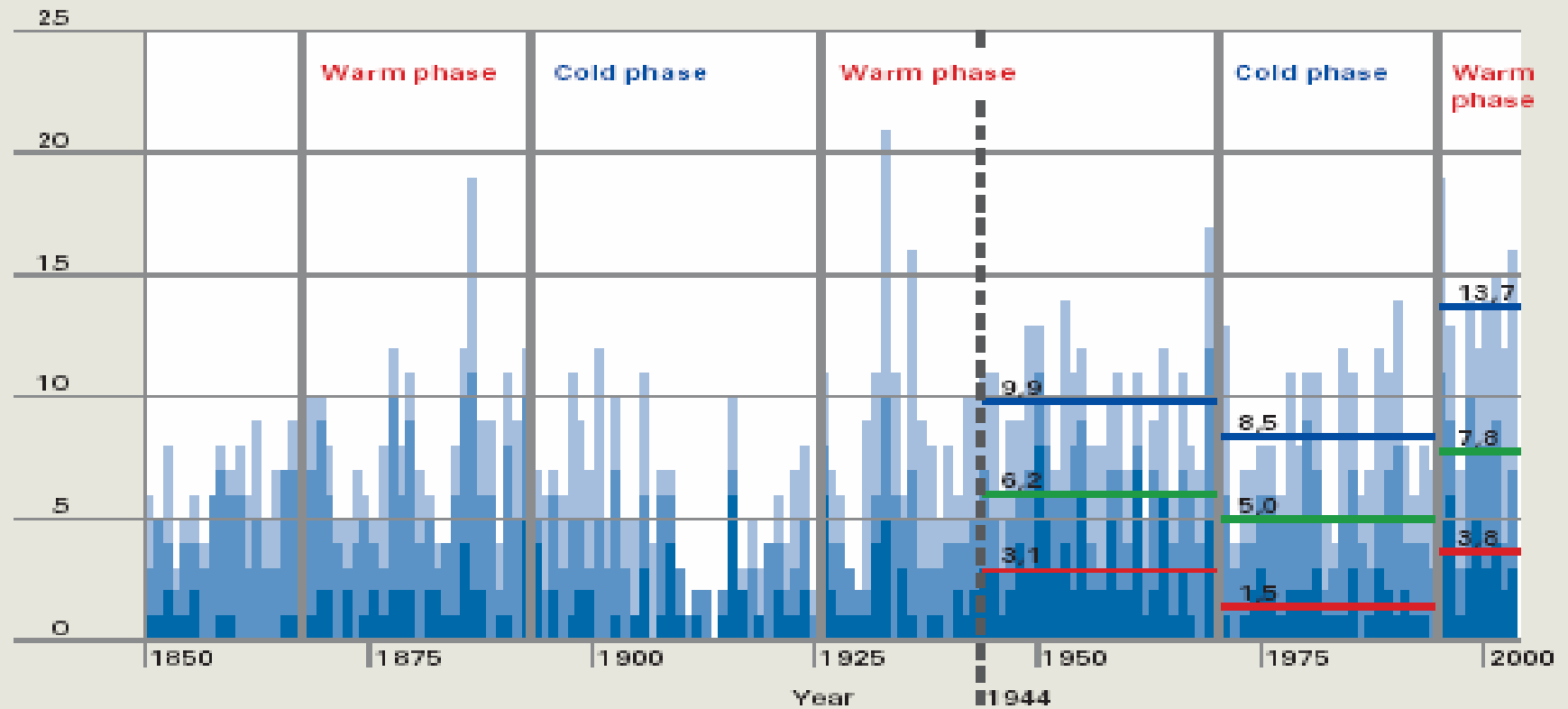


III. Impacts of Climate Change

Direct impacts on Liabilities, Catastrophes increase

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Fig. 8 Annual number of tropical storms and hurricanes in the Atlantic



Munich Re predicts a 40 billions US\$ bill for insurers and reinsurers for Katrina and Rita compared with 17 billions (2004 US\$) for Andrew the largest so far in 1992.



III. Impacts of Climate Change

Direct impacts on Liabilities, property insurance

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**ABI preliminary estimates of future costs of weather insurance claims in the UK
(GBP millions, 2004 prices – No adaptations)**

	Today		2050	
	Annual average	Extreme year	Annual average	Extreme year
Subsidence	300	600	600	1,200
Storm	400	2,500	800	7,500
Inland flood	400	1,500	800	4,500
Coastal flood	-	5,000	-	40,000 (London affected)

This will be true also for the rest of Europe and will reshape the property insurance market.

- **Appearance of red lining system,**
- **Adaptation measures will be taken into account,**
- **Pricing will not solely be an analysis of past experience anymore.**



III. Impacts of Climate Change

Direct impacts on Liabilities, health insurance

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Global warming (GW) will have numerous impacts on people health.

- Increase heat waves and night time temperatures make people more vulnerable;
- Increase in the dispersal of particles will increase respiratory and cardiovascular diseases;
- Increase in respiratory diseases also coming from enhanced pollen production;
- GW through milder winters and flooding will cause the emergence of mosquitoes and rodent spread diseases in temperate weather areas (e.g recent West Nile outbreak and malaria in New York);
- Gives also place to the emergence of infectious diseases and water contamination diseases;
- In parts of the world, GW threaten food supply and therefore increase the problem of malnutrition;
- All the above diseases may be more virulent for children.

However

- GW will also have beneficial effects such as a decrease of cold related health problems.



IV. Impacts of Climate Change on Assets

Direct impacts on Assets

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- Mostly through an increased severity of natural catastrophes (floods, storms, droughts), an increase of temperature and an increase of sea level. CC will have direct negative consequences on numerous classes of assets such as:
 - Property sector,
 - Agriculture and forestry (some areas of land will depreciate while other will be better of),
 - Specific industry sectors (Health, Tourism, etc).

CC will be very much location-specific. Therefore efforts of adaptations or avoidance of such risky investments seems relatively feasible.



IV. Impacts of Climate Change on Assets

Regulatory impacts on Assets

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Since the Rio conference in 1992, “practical” regulations have been put in place. The Kyoto protocol (2005), reduces emission of 6 GHG by 5.2% below 1990 level between 2008 and 2012. The EU scheme prepare Europe to its Kyoto protocol requirements and involves various reduction within industries via National Allocation Plans (NAP). Also UK renewable obligation certificate, trading scheme.

Europe “cap and trade” initially include electricity generation, oil refinery and other heavy industries (2005 to 2008). The EU country NAPs provide a list of industries and companies directly affected (see NAP at www.defra.gov.uk).

- **The energy sector, heavy emitting sector and long investment and planning cycles**, makes it a strategic sector in the trading system. Current leverages include investing more in combined-cycle gas turbine, renewable energies, better energy/transmission efficiency, technological solutions of carbon capture and storage.
- Large energy companies will have to adapt and progressively phase out their core products. They will have to move to products only at an experimental stage today and better delivered by newly formed companies



IV. Impacts of Climate Change on Assets

Regulatory impacts on Assets

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The oil and gas business is seen extremely vulnerable to how the international community will deal with the CC

Exxon Mobil are investing into the research of new combustion technologies. Shell are looking favourably at natural gas as a transition fuel. BP or Chevron Texaco are looking at sequestration solutions naturally or through capture to injected into the ground

“utilities have long been regarded by investors as a stable, defensive sector. Market de-regulation and carbon constraints are bringing a new set of value drivers, not only for long-term responsible investors, but for financial markets at large.” (IIGCC).

Other sectors immediately affected include : energy, oil and gas, transport, manufacturing.

This suggests a high level of uncertainty within sectors which have traditionally been very stable and long term with consistent return, ideal for FI investments.



IV. Impacts of Climate Change on Assets

Macro-economic impacts on Assets

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The magnitude and the global reach of CC could affect the world economies deeply and cause:

- **world political instability (widening north-south gap, migration, food supply issues);**
- **crisis of confidence in economies, inadaptability of current economic model to CC, no replacement product to fossil fuels exist yet and CC increasingly more visible.**

Moreover, this could coincide with:

- **A known end to oil and gas reserves, which would cause an energy crisis bigger than 1974,**
- **Global environmental issues, such as loss of biodiversity starting to be an issue.**

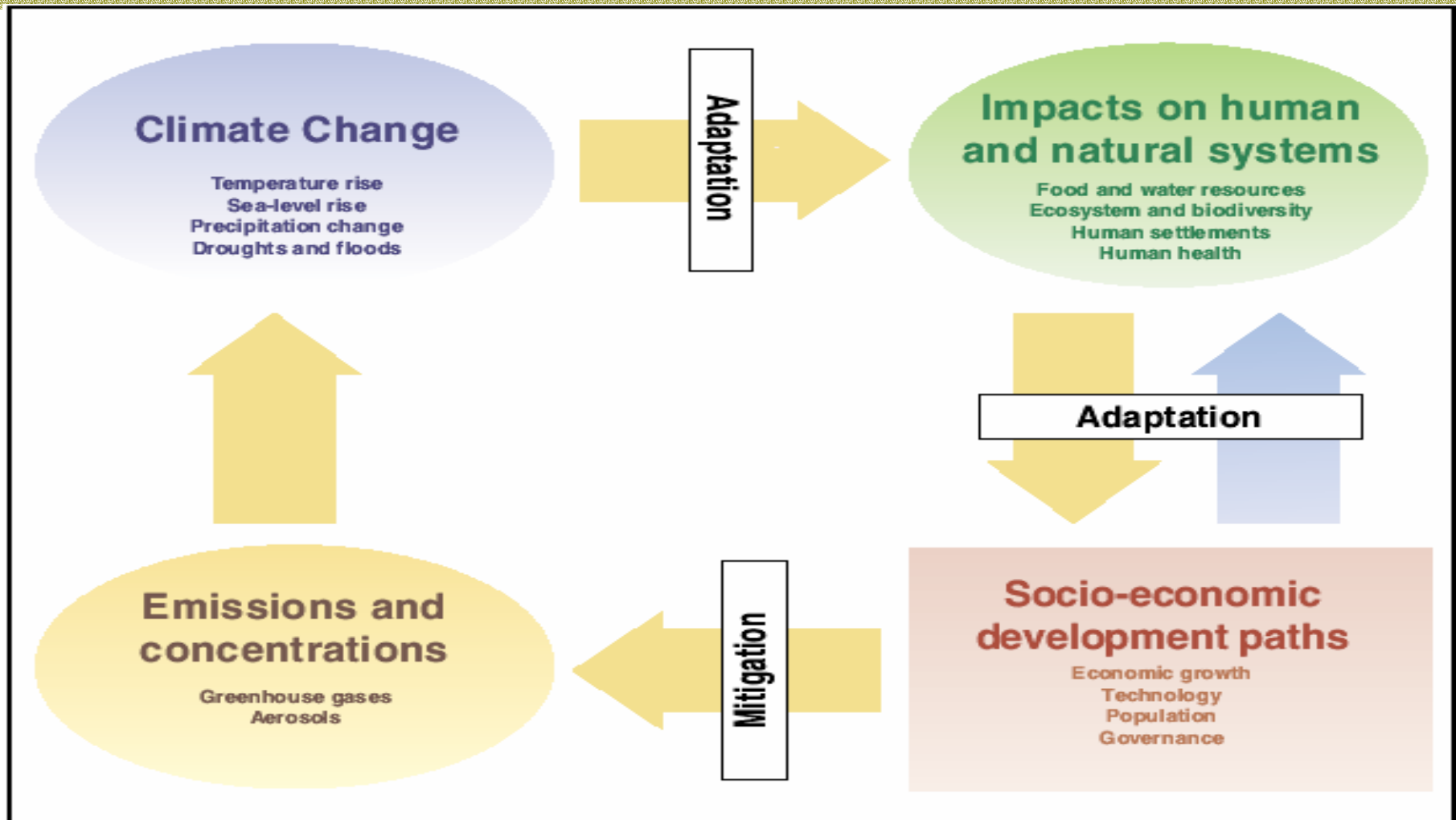
The above clearly shows that there seems to be enough alarming signs so that CC is considered by projection specialists such as actuaries when projecting liabilities and assets in the medium term.



IV. Adaptation and mitigation of CC

Should it be taken into account in projections?

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IV. Adaptation and mitigation of CC

Should it be taken into account in projections?

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Economies will progressively adapt to CC and put in place measures which will fight against CC (mitigation).

ALM has to factor in the efficiency of adaptation and mitigation measures

- **Adaptation measures may become a condition to insurability or of a discounted premium rate (e.g. building dykes to protect an area), paid by the policyholder or government.**
- **Financial institutions could also finance adaptation measures to protect their assets and liabilities.**
- **Adaptation leads to known result however does not address the source of the problem.**

Adaptation appears as a certain cost versus an uncertain cost of mitigation however mitigation is an uncertain but limited cost versus an ever increasing and uncontrollable cost of adaptation. This compares the cost of reducing GHG emissions versus bearing the overall cost of CC.



IV. Adaptation and mitigation of CC

Is there a role for actuaries?

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- **Ethically financial institutions cannot not do anything (taken into account in SRI).**
- **Insurance companies cannot exclude risk without developing a negative impact.**
- **Financial institutions have collectively the financial power to contribute significantly to mitigation of CC.**
 - Insurance companies, pension funds and banks represent over 50% of world stock markets and therefore can put pressure on companies they invest in.
 - FI should invest for the long term and therefore are able contribute significantly to long term mitigation efforts.
 - Financing mitigation efforts such as investing into renewable energies is probably taking a stake in an area of future considerable growth.
 - FI can influence mitigation actions but will have difficulty to do anything about the potential macroeconomic consequences of CC.

Initiatives from financial institutions: Carbon Disclosure Project (UK), Institutional Investors Group on Climate Change (UK), Investor Network on Climate Risk (US).



Conclusions

Recommendations and message to actuaries

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- **Actuaries should keep abreast with developments of CC to understand the impact this may have on liabilities and assets.**
- **Actuaries have a duty to keep their employer aware of medium to long term risks brought about by CC.**
- **Projections scenarios should start taking CC into consideration and include catastrophe scenarios as a result of CC.**
- **Financial Institutions should understand how to address the issue and start allocating part of their assets to mitigation vehicle investments (low carbon tech, renewable energies).**
- **Impact on assets is potentially greater than on liabilities.**



Conclusions

Recommendations and message to actuaries

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Need for further research on

- Correlation between temperature and occurrence of catastrophic events.
- Consequences of CC on GI and health insurance
- Pricing of GI products have to become more forward thinking

Conduct projections differently

- Develop a possible set of CC scenarios for use in asset and liabilities projections following understanding position of scientists and experts on the issue.
- Assets projections and allocation recommendations have to become sector specific.

Dialogue with asset managers

- Asset managers have to report their CC exposure top management and actuaries (insurance) and to trustees (pension).
- Asset managers have to factor in long term objectives.

Interesting websites to visit:

<http://www.sias.org.uk/papers/ClimateChange.pdf>

<http://www.cdproject.net/>, IIGCC, Munich Re (Topics Geo),

http://www.thecarbontrust.co.uk/carbontrust/climate_change/trustee1_1.html,

The background of the slide is a collage of three images. The left image shows a small, dark, two-story house partially submerged in floodwater, with a large tree in front of it. The middle image shows a tall, modern skyscraper next to a classical building with columns; a brightly lit Christmas tree stands in front of the skyscraper. The right image shows a palm tree being blown over by strong winds in a stormy, overcast sky.

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14 June 2005

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This topic interest you? Do not hesitate to join the Institute of Actuaries’ Environmental research Group (ERG).