

The Actuarial Profession
making financial sense of the future

Pensions conference 2010

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Climate Change and Resource Depletion

What will be the impact for actuaries?

Our world in 2050

June 2010

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Our world in 2050 Agenda

The Resource and Environmental Group:

- What we do.

We are going to paint a 2050 scenario that, in our opinion, and based on scientific consensus is likely in respect of:

- Climate Change.
- Rarefaction of Natural Resource.

The aim is then to discuss what the impacts are likely to be for actuaries and our clients.

We are not redoing the 'climate change' debate.

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Climate Change Where are we now?

2009 was the second hottest year on record

- The last 13 years have all been in the hottest 20 years since records began
- April was the hottest month on record
- General consensus:
 - World is hotting up
 - It's probably due to human behaviour
 - We don't really know that well the likely impact (and there will be 'good' and 'bad') but we can attempt to predict

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Climate Change Where are we now?

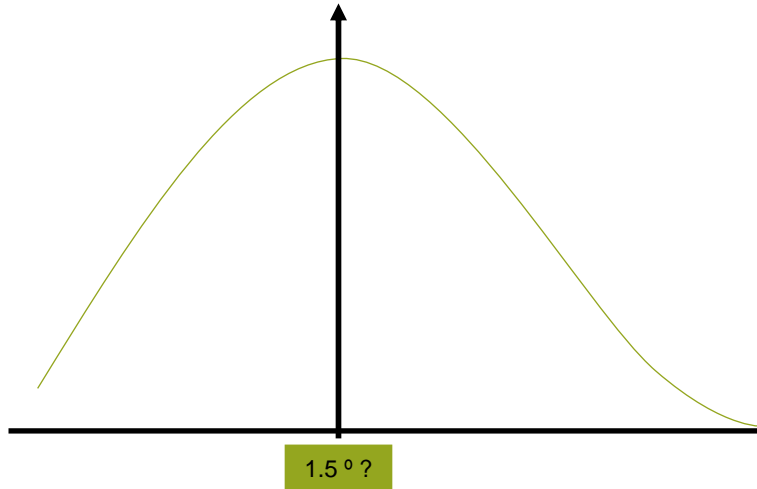
No agreement at Copenhagen – CO₂ emissions not reducing anytime soon

- In our opinion, the most optimistic scenario is a peak at 450 – 500ppm*
- Impact depends on views on effect of feedback mechanisms
- General view is that this implies global increases of around 3 degrees by 2100 but there may be feedbacks / tipping points
- Regional differences will be big

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In reality, there will be a range of likely outcomes



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Impacts of Climate Change

- More uncertainty on the impacts of climate change than the increase in temperatures ?
- Complex ecosystem with tipping points and feedback mechanisms

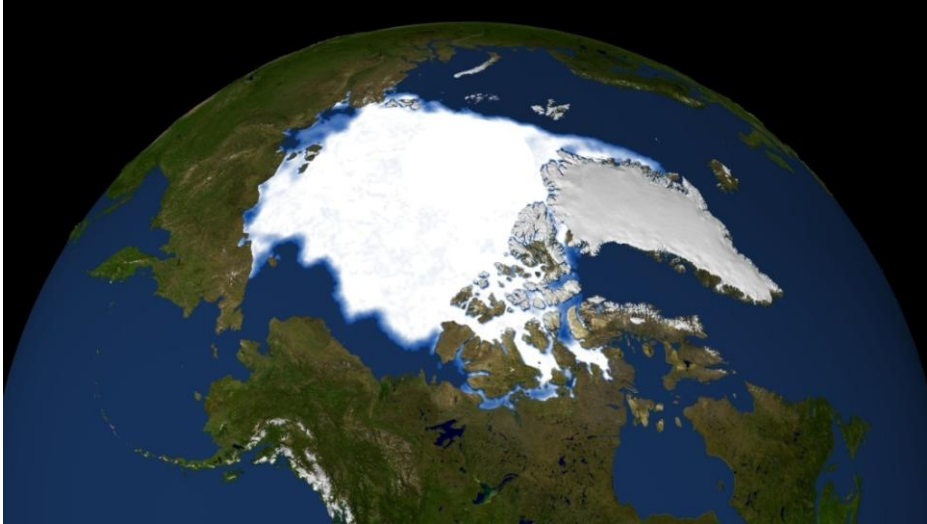
Extreme Weather Events and Trend	Likelihood	Major Projected Impacts
Frequency of heat waves and hot extremes increases over most land areas	Very likely	Wildfires. Increased water demand. Water quality problems.
Heavy precipitation events increase over most areas	Very likely	Damage to crops. Soil erosion. Flash floods. Landslides. Subsidence. Mudslides.
Area affected by droughts increases	Likely	Land degradation. Wildfires. Losses in agriculture (crops and livestock).
Intense tropical cyclone activity increases	Likely	Disruption by floods and extreme winds. Damage to coast and coral reefs.
Extreme high sea level	Likely	Increase of losses due to severe floods and sea surge. Increased costs of coastal protection and land-use relocation
Changes in wind, precipitation and temperature patterns	Likely	Increase of losses due to extreme weather events

Source: Zurich; summary of IPCC 2007

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Arctic Sea Ice Summer Minimum September 1979 (Source: NASA)

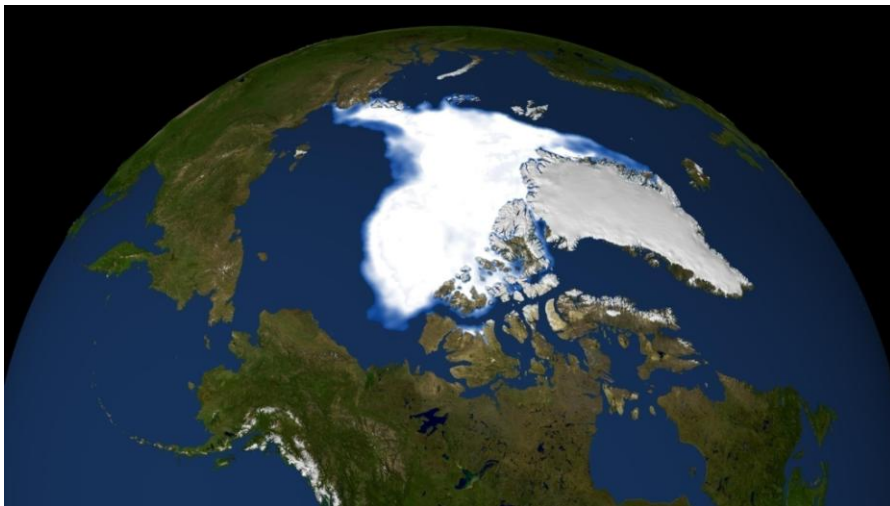


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Arctic Sea Ice Summer Minimum September 2007 (Source: NASA)



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Natural Resource Limits

We are likely to feel this first !

“It is no longer the ecologists who are the dreamers; it is those who think we can continue with infinite economic growth in a world with finite resources” French film maker Coline Serreau

- Fresh water is limited
- Oil and natural gas are reaching limits ('Peak Oil')
- Ores are at lower and lower concentrations
- Soil is suffering depletion, erosion
 - Palm Oil is symptomatic of our bad, short term choices
- Climate is stressed by higher CO₂
- Oceans are polluted, acidifying, losing fish (“no more fish in 2050” - UNFAO)
- Oil spills are in the news – Exxon Valdez shows the impacts

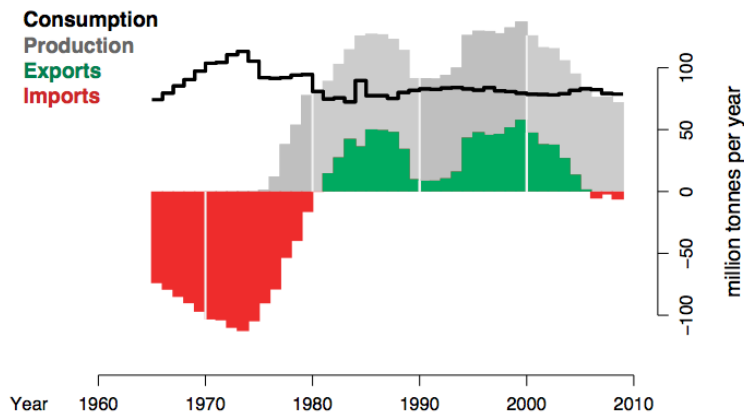
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Current British Situation

United Kingdom : Oil

2008 imports increased by 170 %



Data: BP Statistical Review 2009 Graphic: mazamascience.com

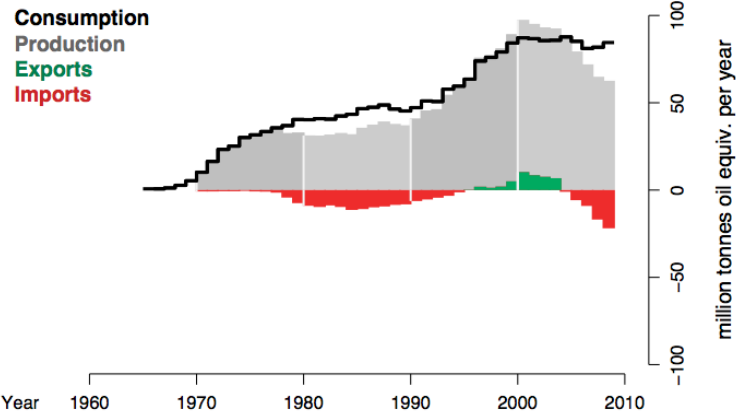
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Current British Situation

United Kingdom : Nat. Gas

2008 imports increased by 29. %



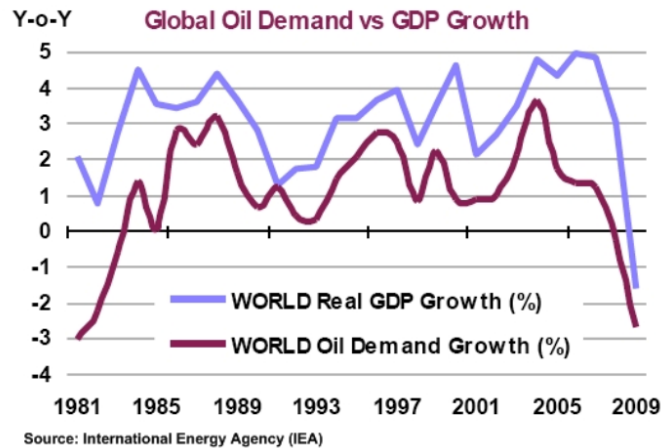
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Data: BP Statistical Review 2009 Graphic: mazamascience.com

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No Oil – No Economic Growth

Oil Demand Correlates With Global GDP



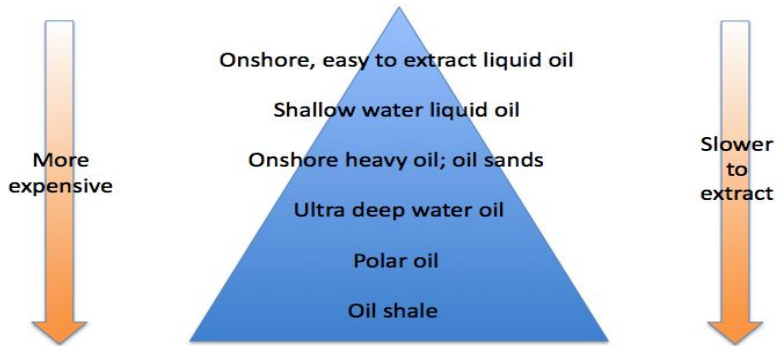
http://aspo-usa.com/2009proceedings/Dave_Cohen_Oct_12_2009.pdf

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But there is stacks of oil left...

A huge amount of oil is available



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It's the flow rate stupid

- We are reaching peak production
- Doesn't matter how much is there, it's how quick and easy it is to get out

But surely renewables will step in ?

- *Renewables will play a role but are oversold*
- *Don't rate the chances of an electric plane*
- *Lithium for car batteries is running out*
- *Economists and their ham sandwiches*

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What the World could look like in 2050

- Climate change starting to impact agricultural yields and water shortages
- Conflict increases as does migration
- Globalisation reverses (agricultural self sufficiency becomes the key issue)

Our Predictions

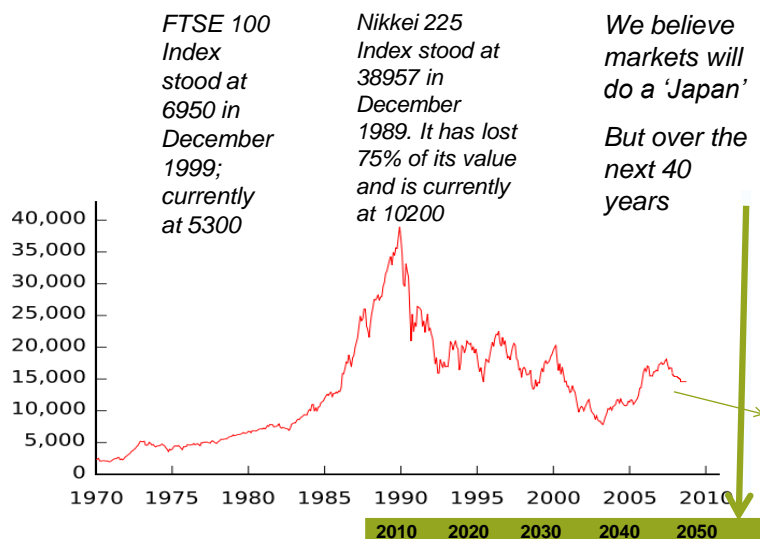
- Oil is at \$300 a barrel (and £1= \$1)
- Water prices have increased 5 fold in real terms
- Energy prices have increased 10 fold in real terms
- Food prices have increased 5 fold in real terms
- Salaries reduced by 20% in real terms

And China and the US control it

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Stock Market Performance



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Breakout Questions

To choose 3 from the following:

- How will climate change impact mortality assumptions?
- Why have current mortality improvement assumptions not been borne out?
- With a shortage of resources and high oil prices, what will be the impact on inflation and therefore pension increases, cost to companies and governments?
- What impact will the end of cheap energy have on your investment return assumptions ?
- How will benefit design change if we have zero economic growth over a sustained period?

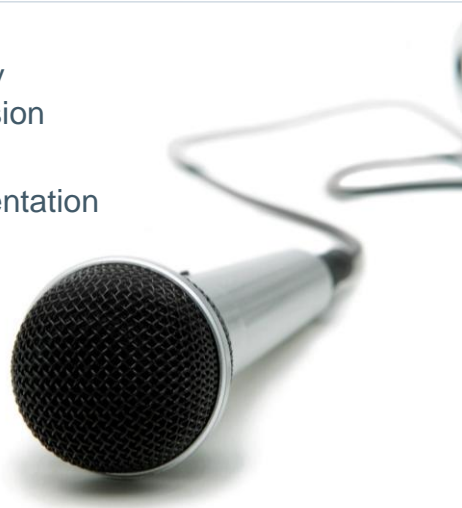
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Questions or comments?

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