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# Resource and environment debate on climate change and sustainability risks

## Abstract of the London discussion

[Institute and Faculty of Actuaries, Sessional Research Event, London, 20 June 2016]

**Motion: "This house believes that actuaries should incorporate climate change and sustainability risks into their work"**

Climate change and the sustainability of the financial system is an important topic and a key area of discussion across the globe. This debate featured speakers from across a number of practice areas, including actuaries and those who work alongside actuaries, and prompted a thought-provoking discussion on how actuaries should take account of these issues in their work.

**Mr N. Aspinall, F.I.A.:** This meeting is about the resource and environment sessional debate. I am Nico Aspinall and I chair the Resource and Environment Board. The Resource and Environment Board was founded at the beginning of 2014 to bring greater focus on resource and environment issues for the actuarial profession.

We have a three line strategy. The first is to improve the support for existing traditional actuarial practice and to increase the sustainability content available to you.

Secondly, we are trying to get actuaries involved in the sustainability world, so we are providing actuarial input into the policy challenges of climate change, working with people who need our long-term risk and financial skills to interpret the results of their thoughts about the challenges of the 21st century.

The third line of our strategy is public interest. It is in the public interest that we are having this debate and I ask you to remind yourself of that challenge when you hear the points made by our speakers.

Tonight we are talking about climate change very specifically, but also wider topics such as resource scarcity and food and water security.

This is a debate on climate change and not actually a debate about climate change. It is about our role as actuaries, as leaders, in supporting the processes in policies and supporting the processes in business, in addressing climate change.

I am part of a generation that grew up in school with climate change as a fact and am concerned how little government and businesses over the past 20–25 years have done to address it.

I am gratified to see in December in Paris that COP21 sealed the debate on climate change, and global government came together to say that anthropogenic climate change is a fact. We need to

work to reduce the chances of disastrous climate change with this 2 degree target. That means significant reductions in carbon dioxide equivalent emissions from here on in; and broadly that means getting to about 2 tonnes per capita in 2050 across the whole population of the world. At the moment in Europe we emit about 12 tonnes of carbon dioxide equivalent. That means a reduction to one-sixth of this by 2050. That is in our lifetimes, and then getting towards net 0 by the end of this century. The later we leave that reduction to 2 tonnes, the quicker we need to get to net 0 to avoid the possible consequences of a more than 2 degree hotter world.

The challenge for Europe is stark going from 12 tonnes to 2 tonnes in the next 35 years. For a country like Australia, which is emitting more than 30 tonnes per capita, the challenge is much starker.

The scale of the challenge and the long-term nature of the debate is why actuaries are well placed to be supportive here. Thinking about that kind of time horizon are very much in the public interest.

Lillian Boyle will be our Chair for the evening. She is the Past President of the Chartered Insurance Institute and is the Deputy Chairman of the Isle of Man Financial Services Authority. For the past 7 years she has been on the conduct committee of the Financial Reporting Council, which is the committee looking after the conduct of actuaries.

**The Chair (Ms L. Boyle):** The debate is between four speakers. The motion is "This house believes that actuaries should incorporate climate change and sustainability risk into their work".

Our initial stance for those in favour, as show of hands: a "reasonable" number of you agree. For those against: interesting, two against the motion.

I am going to say a few words first of all. "Too big to fail" is a phrase used extensively in the world of the financial services and regulation both on a national and international basis. For example, we now have a legal case pursuing the appropriateness or not of such a designation on a financial institution.

However, this phrase is also one which is used in the debate on climate change, where it translates into the assumption, which is often argued, that the planet is so big that we cannot possibly have any lasting, harmful impact on the earth's environment.

This is literally an all-encompassing debate and one which potentially impacts all of us and the various component parts of our daily life, including the financial, physical and social environment, and within these the provision and use of insurance and the making and use of investments. Therefore, it is essential that there is ample opportunity for debate, discussion and consideration of how we, as members of our respective professions, might encompass this if we so choose to utilise the increasing amount of available data and integrate it, or not, into the products and services that we provide.

This forum provides us with one such opportunity to debate, listen, participate and finally conclude on how we would see the way forward.

On this basis, I should like to introduce you to the speakers. Trevor Maynard is the head of exposure management and reinsurance at Lloyd's and is responsible for monitoring the natural and man-made aggregations of risk across the Lloyd's market, including emerging risk.



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Cameron Rose is from Edinburgh and is a trustee of the Lothian Pension Fund. A councillor for 9 years, he leads the Conservative group at Edinburgh Council and is a regular contributor to the debate on the public policy implications of anthropogenic climate change and sustainability issues.

Meryam Omi is head of sustainability at Legal and General Investment Management and Brian Nimmo is a partner at Hymans Robertson and a practising scheme actuary. Whilst far from being a climate change sceptic, he has, nevertheless, accepted the challenge of arguing against the motion

**Dr T. J. Maynard, F.I.A.:** The most devastating impacts of man-made climate change are expected to occur in the second half of this century and beyond. Nevertheless, analysis shows that we are starting to see the effects today. Just 20 cm of sea level rise off the coast of Manhattan made the storm surge loss in Superstorm Sandy some 30% worse, according to risk modellers, RMS, in a Lloyd's report published in 2015.

In the coming decades we can expect to see an increasing number of effects and therefore our actuarial advice should, I argue, take this into account.

I believe that climate change will likely have as great, if not greater, impact on life, pensions and investments than general insurance, so actuaries working in all practice areas should consider its effects in framing our advice.

Actuaries understand uncertainty. Our stochastic models typically produce hundreds of thousands of equally likely scenarios with widely differing outcomes. We also know that uncertainty should not paralyse us. We can make decisions under uncertainty – even deep uncertainty – and our role is to help decision-makers, such as trustees and boards of directors, make choices that are logically sound, evidence-based and resilient to uncertainty.

Despite the fact of climate change, the future is uncertain. Key variables include the strength of political will; the speed of decarbonisation; the landscape response to a warming atmosphere; whether positive feedback loops arise; and, in general, the degree of sensitivity of the earth's system.

When all those uncertainties are included in the models, the range of potential outcomes by 2100 is wide; from bad to devastating. It is useful to separate the key variables into those we can control and those natural features that we cannot control. Following an approach described to me by Simon Sharpe, Head of Climate Risk at the Foreign Office, we should then decide on which outcomes we want to avoid, such as avoiding more than 2 degrees of warming, and show the probabilities of those outcomes under different choices. This is a useful, decision-relevant method that is familiar to actuaries.

Let us review a slide taken from *Climate Change: A Risk Assessment* by the Centre for Science and Policy in Cambridge, UK (Figure 1).

This shows where temperatures increased globally by 4 degrees, which is the business as usual trajectory that we are on. Unless the government follow through on all their promises, the probability of regional rice crop failure rises from around 0 currently to between 10% and 75%, depending on the variety.

The 2010 heatwave in Russia and China led to reductions in wheat yields. In turn, this caused a major impact on traded wheat prices which many Egyptians could not afford. It has been argued – persuasively –



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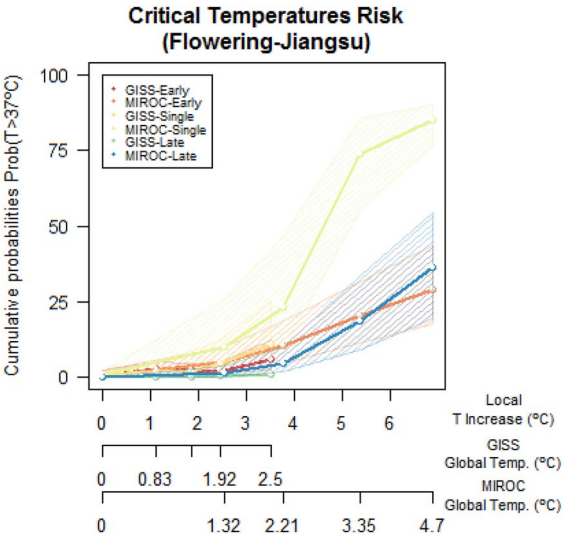


**Figure 1.** Critical temperatures risk (reproduced under CC BY-NC 4.0 license)

that this was a key factor in exacerbating existing tensions and leading to the Arab Spring. The longer term effects of this are unclear but the waves of migrations that have arisen appear linked. These are already fuelling tensions in the European Union and so the ripples continue to spread.

We must all realise that the causes of these events were relatively minor. There is the potential for far worse. For example, a report from the emerging risks team at Lloyd's of London suggests a one in 30 El Niño-driven scenario that could lead to all major staple foods increasing in price by four to five times, leading to widespread social and economic issues.

Leaders in Paris said that we must keep the temperature rise below 2 degrees and preferably below 1.5 degrees. The pledges in Paris, if carried out in full, might achieve 2.7 degrees. Even these will lead to radical decarbonisation, stranding many fossil fuel assets while renewable stocks increase rapidly in value.

As actuaries, we must help decision-makers realise that there are many possible futures, each with a significant probability of occurrence. For example, despite their poor track record to date, political leaders may pursue the necessary reforms in the required timescale. If so, asset stranding will occur.

Other examples include:

- Technology advances may make renewables cheaper than fossil fuels, and again asset stranding will occur.
- A string of larger than usual natural catastrophes occur and previously unsuccessful legal arguments are successful and pin blame on major fossil fuel emitters. Major liabilities arise. Do our slow pollution exclusions hold? Are any liability contracts targeted such as general liability? Are directors and officers responsible for errors and omissions?
- Political will fails and tensions rise, sparking an increase in terrorism and war.



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Each of these examples affects some aspect of the actuarial profession. None can be ruled out and each has significant probability. They form part of the uncertain future that we have to make financial sense of.

In summary, climate change and other resource shortage impacts are discernible today, and despite major uncertainty about the future, there are various scenarios with significant probability that will materially affect the structure of the economy in the next few decades. The uncertainty here is not balanced, with the downsides outweighing the upsides in both probability and severity.

The future has always been uncertain but this time it is different. This time there is a known negative trend. In such circumstances, we can surely expect material impacts on society either through positive technology change or through rising political tensions. Either case will at best lead to some sectors performing much better than others, and, at worst, lead to material under-performance of the economy relative to our assumptions. For this reason it appears essential to me that actuaries educate themselves about the potential impacts and then raise them for discussion with those that they advise.

We cannot know the future and some actions to mitigate one future will make another worse. We must consider our professional and ethical standards and take the debate to decision-makers

I sincerely hope that the arguments for the motion are accepted by this audience today and, if so, I call on the actuarial profession to formalise the requirements and to assist with professional education in this respect.

**The Chair:** To open the opposing argument we have Cameron Rose.

**Mr Cameron Rose:** I come at this from a public policy perspective and from a pension trustee perspective. I have a pension and I represent beneficiaries. Those are my areas of interest. I was almost going to say "expertise"; but I am not sure that I have any expertise – certainly not the sort of expertise which you have here.

A few hundred yards from where I live in Edinburgh there is a plaque on a very old house commemorating the life of man called Joseph Black. He was a chemist and a physicist. He had lived there in the 1700s. He discovered what he called "Fixed Air" which we all now know as $CO_2$ or carbon dioxide.

The first part of the motion is "this house believes". I just want to underline in that this is for your personal opinion not that of experts, not arguments from authority, not arguments from consensus, but it is your opinion that we are looking for.

The second part of the motion is "climate change". There are two things to note about this concept, and they are important to grasp as you consider your view on the motion. Note that we are not talking about weather. Weather is a single event or a series of events. The dictionary definition of climate change is that climate refers to weather conditions prevailing in general or over a long period. That almost disqualifies the example which we heard earlier on of the 2010 hot period from Russia.

That is the first thing, the distinction between climate and weather.



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Secondly, the common meaning and use of the phrase "climate change" over the past 30 years or so is to refer to anthropogenic climate change; in other words, the element of climate change which is caused by humans over which implicitly we might have some control. The most common human effect on the climate is through $CO_2$. What you have to remember is that there is a natural variability in climate. We can show that from the records going back thousands of years, because, of course, Joseph Black, my erstwhile neighbour, as it were, discovered $CO_2$ 250 years ago, but in fact over this period there has been huge change.

Then we have the question of whether or not we should include sustainability risks in our work. That is actually just a little bit imprecise. Sustainability has many different definitions. My understanding is that there are at least 35 different definitions of sustainability. We might talk about the sustainability of a business model meaning nothing to do with whether it is good for the environment or not, or we might have one of the meanings with an environmental tinge. But there are many different understandings of what environmental sustainability is.

We have in front of us a motion which is broad and ill-defined. That, ladies and gentlemen, is the first reason why you should consider rejecting this motion.

Actuaries deal with measurement and management of risk and uncertainty, but we need to know what the nature of the risk to be measured and managed is before starting to calculate the quantum of that risk. Sustainability means all things to all men.

The second thing is to do with the nature of anthropogenic climate change, which has been the subject of societal debate currently. The meeting in Paris, which we heard about a few moments ago, in December adopted a clarion call to limit global mean temperature increase to 2 degrees, starting from the pre-industrial era about 200 years ago. That implies that we control, or at least have some influence on, the climate.

It is not my position that humanity has no influence on the climate. But how can we compute the extent of that influence? Is it small and insignificant or is it significant and potentially catastrophic as shown in Al Gore's 2006 "An Inconvenient Truth"? He showed graphics of an increase in sea level of 7 m.

There are at least two things which make this difficult. As noted earlier, the climate is always changing. We had the Roman optimum, where we know temperatures were warmer than the surrounding periods in history. We had the mediaeval warm period around 1000–1200 AD, when there is strong evidence to imply global mean temperatures were at least as warm as today. Then we had what we now refer to as a little ice age, roughly in the period 1600–1800.

We know that humans did not have a meaningful influence on the climate then and that the vast majority of greenhouse gases emitted by humans have been done so with the increase in the population over the last 30 or so years. So, how can we discriminate between human-caused climate change, or human-caused changes, and natural changes? That is the first thing: our climate is always changing.

Secondly, climate science is both very complex and, as it relates to human influence, in its infancy. From all the conferences, public debate and even legislation, you might not think that is new. But having moved on from fears of a coming ice age in the 60s and 70s, it was Margaret Thatcher in



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the early 80s who supported the setting up of the Intergovernmental Panel on Climate Change, the IPCC. Influential in its creation, she was later withering in her criticism of how it developed.

So it is new but it is also complex, and the extent of the influence of human $CO_2$ emissions alongside, for example, solar influence or the impact of clouds is actually hotly disputed and little understood.

As to the causes of the 15 or so years of pause in global mean temperature, there was no increase for 15 years, which was unpredicted by the vast majority of climate scientists. There are more explanations for this surprise than there are definitions of the concept of sustainability.

So, how can an actuary deal with these things? We have a huge range of possibilities for the extent of the human influence on climate, and difficulty in extrapolating natural variation from human causes, and we have a science which is very young and extremely complex. Added to that, the early indicators are that the ability of scientists to predict either temperature or climate extremes has thus far had little success.

That leads me to my third point. There needs to be some empirical or evidential basis to measure and manage risk and uncertainty.

There is very little empirical evidence to support a significant human-caused element of climate risk to date.

Most of the fears expressed in either the regulatory framework which was built up, the Climate Change Act, global agreements or general apprehension about various degrees of climate impact, are based on a hypothesis of science. That is the expectation of what should or might happen in the future, given our current understanding of the science, but given that the state of the scientific endeavour as to global climate is at such an early stage, given the complexity and immature state of the study of atmospheric science.

Let me summarise three reasons why you should reject the motion.

First, actuaries need to know the nature of the risk to be measured and managed. You do not have to be a scientist to realise the very real difficulties in quantifying a risk when you do not know what it is. You do not have to be a statistician.

Secondly, climate change is a field both very complex and very variable, and it varies naturally as well as the result of human impact. It is not a very mature science.

Thirdly, there is very little empirical evidence, as opposed to models, predictions and conjectures; there is very little track record on which to make measurements and manage risk. Remember that climate is a long-term thing and we are actually making judgements on very short periods.

Ladies and gentlemen, I invite you, for these, among many other reasons, to reject the motion.

**The Chair:** For the second case in favour of the motion, I will ask Meryam to speak.

**Ms Meryam Omi:** My focus is not on the climate change science but looking at this risk as an investor and what our clients are worried about, the clients who would have been given advice maybe from you as pension schemes, insurance companies and so forth.



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Firstly, climate change is not a problem you or I can solve. However, if I put it in a framework that this is an energy issue, or this is an energy transition issue, then we definitely can play a part.

What is happening is that the way we have always generated energy is changing. It is changing because we have new technologies. It is changing because we are realising that it is killing us in many ways, whether that be health impacts or overall climate risks, and so forth. Not to mention the geopolitical risks that a lot of energy is causing.

We globally decided that we are going to curb emissions to the point where it is manageable, that is the 2 degree increase from the baseline. We have all agreed that anything above 2 degrees is a very scary scenario for which we have no climate model. It is an "off the cliff" situation. We have never had it in our lifetimes, in our history. You cannot model it if you do not have any numbers. That is why we are limiting it to 2 degrees.

So the policy is as robust as it gets. Policy is never that robust. Technology is compelling in terms of being able to generate energy in different ways, not to just talk about renewables, but whether it be storage, or electrification or different ways that we can decentralise the consumption of energy. All this is happening. That is threatening the old energy model. In that transition period, we are faced with potential assets being stranded. The current model of investment is based on the fact that a lot of companies are betting on being able to dig fossil fuels out of the ground. If they will not be able to do that in the future these assets will lose their value. So clients are coming to us and saying "What fiduciary duty do I have in looking at the current valuation of the companies that we are invested in and will they have the same valuation in the future?" And also many of our clients are worried that their investments are actually creating a temperature increase that is going towards 4 degree temperature rises.

They do not want to be a part of that because nobody wants to live in a world which is 4 degrees higher than the baseline.

So, they are coming to us and saying, "What can you do?". They are saying "I have this investment belief. We believe climate change is something that we need to deal with. We believe energy is changing in terms of extraction and consumption. We believe we need to do something with our investments. How can you help us?"

I am thinking that we are investment managers, somebody should have helped you before you came here. Is that not the investment consultants? Is not that your asset allocation people who looked at your portfolio, who looked at the risk, and then come to us with the investment solutions? I think that we are missing a couple of steps. There is not that much you can do once you have decided on your investment strategy. You have chosen your index. You are either asking us to track it or outperform it. There is not much we can do if you have decided that 25% of your portfolio is going to be exposed to energy stocks.

It is really a question for you as to why would you not look at this when the people who own the assets are worried about it.

The other part which I just cannot get my head around – and I am not an actuary so please excuse me for oversimplifying – is that we have data, we have information, we make investments every day using data on how much we invest in companies that have carbon reserves, that have carbon emissions and that are investing into low-carbon energy. If we can provide you with a data set for



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you to do at least a top level assessment of how the assets are exposed to some of those risks then let us share some information here.

I have been told many times by many actuaries that you do not do the same thing for the liabilities that you do for the assets. I think we have a lot of information on the liabilities side that we need to match with the asset side. I know that we are not going to have a perfect solution. We are not going to solve climate change necessarily in one go. We can start to match the same information that we have in trying to get a sense of how much an average person's investment portfolio is exposed to the potential risk in the future as policies and technologies develop over time. I think we have enough to go on with at this stage.

**The Chair:** For the final case against the motion, I will ask Brian to speak.

**Mr B. W. Nimmo, F.I.A.:** This motion is not about whether climate change is real or whether sustainability of resources in our world is an issue we need to address. I leave that debate for another day. I want to focus on the motion itself and what it is suggesting for actuaries. Like Cameron, I am going to break up the motion a little bit.

"This house believes that actuaries …". This is about actuaries only. No one else. About us as actuaries and about our profession. "Should" – this is a directional obligation – "incorporate climate change and sustainability risks in their reports". To me this is not about putting some general risk warning in our reports or fudging an existing model playing around with a discount rate in some manner. This is about actuaries incorporating climate change and sustainability risks in their models so they can advise clients in a meaningful way. To quote the modelling Technical Actuarial Standard: "so that models sufficiently represent the matters that are relevant to the decisions for which the actuarial information based on them will be used". That is our standard.

Trevor Maynard spoke about the models in use, but before I pause to have a look at them I just want to consider what we are trying to model. What do we mean by climate change and sustainability risks?

As Cameron Rose has mentioned, there are at least 35 different definitions of sustainability. The International Sustainable Development Research Society itself could not come up with a pithy little description. Instead, it wrote an 11 page paper. It is complicated. We can probably agree that the types of issues that we would include are: climate change, water scarcity, pollution, population movement, loss of biodiversity, rising sea levels. It is quite a list; all important issues that will affect the world around us and, by extension, our clients.

Any model that tries to incorporate all of these will be complicated and they will have their problems.

We know the reputable models will have been tested and they have been checked to see whether they could have predicted past climate changes. But that does not mean they are necessarily fit for the purpose of predicting future. Problems remain.

I do not have too long to second the arguments here. I just want to pick up on a couple of things.

The first is that models have not been able to predict recent stagnation of global warming. That is the point that Cameron picked up. I want to quote Hans von Storch, Professor of the Meteorological

Institute of the University of Hamburg. He says: "… we are facing a puzzle. Recent carbon dioxide emissions have actually risen even more steeply than we feared. As a result, according to most climate models, we should have seen temperatures rise by around 0.25 degrees over the last 10 years. That has not happened. In fact the increase over the last 15 years was just 0.06 degrees. A value very close to 0. This is a serious scientific problem".

Also, climate models play down some of the tipping point risks. We have been talking a little bit about whether 2 degrees is right or not. They are not very good at extrapolating beyond that.

If you go beyond 2–3 degrees, these models break down. For instance, Yale University has acknowledged that the model they have developed and used assumes a rise in global temperatures of 19 degrees which would lead to only a halving of world output. Given that 19 degrees is linked with human extinction, I do not think that model is working that well.

While there are clear problems of the climate change model, the bigger issues come when we try to superimpose them on to our economic models. We are then beginning to guess about what impact global warming will have on the economy and financial markets. What impact will rising sea levels have on UK gilt yields? I do not know.

More importantly, many economic models assume that there is an underlying growth rate. Nicholas Stern, President of the British Academy and Chair of the Grantham Research Institute at on Climate Change at the London School of Economics, has noted that even with a rate of growth underlying economic growth of 1% per annum, over 100 years this is as close to a trebling of our output.

Let us just imagine that we superimpose our 19 degree increase in global temperatures. We have a net 35% growth in output. These models are just not fit for purpose. Nicholas Stern notes: the models come close to assuming the impacts and costs of global warming will be modest and are close to excluding the possibility of catastrophic outcomes.

The second area of concern that I have is what do actuaries do with these models? If we just look at financial assumptions in our work, many, or most, of us will take our starting point from current market conditions. We will use mark to market approaches, which leads me to the question: what is already priced to the markets in terms of climate change and sustainability risks? If we believe that markets are perfect, then all current knowledge has been priced into the markets. I suspect that most of us will agree that that is not likely at the moment.

It is unlikely that markets are taking no account of client risk or sustainability issues, so the likely positions of markets are that they are somewhere in between, taking some account of these risks.

So what exactly are we asking of actuaries? We are asking them to disregard markets and to form a different economic view from that implied by markets. At the very least, we are saying that we first need to understand the extent to which market pricing does reflect climate change and sustainability risks; secondly, to strip that out of the pricing; thirdly, to superimpose our own views. We would need to do this for inflation, asset returns, gilt yields and much, much more.

The question I have is: are we sure that we can do this? If we are going to impose our own views and say we know better than the financial markets, we need to be sure that we know what we are doing.



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Looking around this room, you are not all that much younger than me, so many of you will remember that the last time the actuarial profession professed it knew better than the financial markets, it did not end well for us or the pension schemes we were advising the time.

Are we sure that if we are asking actuaries to move away from mark to market pricing that we have the skills to do so?

That brings me to the final point. With the exception of some, if not all, of you present, I question how many actuaries currently have the skills, experience and knowledge to build and/or understand climate change and sustainability risks models, alter those models as appropriate, understand the extent to which financial markets are already pricing these risks, and to make the necessary changes to mark to market models to reflect the actuarial perception of the world?

The Actuaries' Code is very clear on this point. It states: "members will not act unless they have an appropriate level of relevant knowledge and skill". I would argue that many, if not most, actuaries do not yet have the appropriate level of knowledge and skills. What the motion asks of actuaries is likely to end with one of them in a hearing in front of a disciplinary panel.

To conclude, we are not yet in a position whereby we have models that are fit for purpose; that we do not yet have enough knowledge to change our mark to market models; that many actuaries would be in breach of the Actuaries' Code if they tried to do so at this time. So, admittedly with a slightly heavy heart, I ask you to find against this motion and to view its defeat as a wake-up call for us as actuaries and the actuarial profession to take the steps to be able to reflect climate change and sustainable risk in our work.

**The Chair:** We have four quite diverse comments on the motion, both for and against.

**Mr M. J. Clark, F.I.A. (opening the debate discussion):** I came to this debate thinking I need to persuade this room of actuaries to vote for the motion, but I can see there are as many people on the panel who need to be persuaded as there are in the room, which I counted as one but I think the proposer counted as two. There are only four people on the panel so I will change the nature of my remarks.

In the investment world, we have regulators, the climate change task force is doing lots of things and that is likely to impose reporting regulations on both asset owners and investment managers. Asset owners have investment beliefs on this. I have just come from a conference and I thought I could use the Environment Agency's pension funds policy to address the impact of climate change.

Page 7 says "We" – that is the Environment Agency Pension Fund – "will directly contribute … including using the actuarial valuation and funding strategy development". So the clients of this profession are already seeking the advice, and the help, that they need.

Many pension funds around the world have investment beliefs on climate change, to name four: CalPERS in California; the Environment Agency, I have mentioned; AP4 in Sweden; HESTA in Australia.

So those who gather the savings of we citizen savers are dealing with this. As an investment manager, we manage a low-carbon portfolio. We are familiar with low-carbon indices.



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I would say the train has left the station. There may be some actuaries in the room who do not know the profession is producing a guide for pension fund actuaries on this very topic.

Back in April, 175 countries went back actually to sign the Paris agreement properly. 15 said that they had enshrined it in domestic legislation. The first was Fiji, which may soon disappear, so they have a great interest in this.

I strongly urge all those who came in the room to vote in favour of the motion to do so. I encourage some of the four who may still be opposing it also to vote in favour of the motion.

**Mr N. S. Spencer, F.I.A.:** I found Brian's points more interesting and persuasive. I want, maybe briefly, to address some of the challenges thrown up about the science. The science is without doubt; I think anyone taking time to read the Investor Group on Climate Change guide, the climate change risk assessment, and suchlike, will find it very compelling.

In brief, complexity is no reason for something to be wrong. We have looked at validations in both quantum theory, otherwise none of our smart phones would work through the transistors, and Einsteinian efforts, without which Tim Peake would certainly have landed in a very different place.

The science was tested over many thousands of years looking at the linking between carbon dioxide and the impact of temperature and areas such as the man-made impact. In fact the kind of chain models, as pointed out by both of the opposers, are not wrong. If anything, the way that they are looking is that they are too conservative and the risks are to the upside.

Where I had more sympathy was in regard to Brian's view. He says if we are trying to do forecasts, to what extent is this already in the data, in the market, and allowed for?

The challenges there are that actuaries do need to take more than market prices. Very little of our work is on a purely immunised basis where there is no allowance for reinvestment risk or risk premiums. Actuaries are forming a judgement that they have to take and there is not a direct market price for it.

Consequentially it is not sufficient just to look at the market, even if you believe it is efficiently priced. I suggest most of the answers over the long term the market doesn't necessarily have a price for, but there is room for judgement.

In regard to the same point in terms of breaking the code, I am afraid that you have caught everyone on a Morton's Fork then, because if you do not have the skill to understand it, you also cannot write a report on it.

In fact, in doing anything, if this is a true risk, you will be breaking the code. What I would suggest is a pragmatic way forward: both to have a look at some of the risks of the impact in terms of what is going on, maybe just do this through further prudence in the basis which actuaries use and then look to refine that over time to be more explicit about the risk.

Two further ways that I would put forward that this directly impacts us is not only in regard to the broad economic models, but we could look at the balance of a sponsor's ability to pay. It is very clear that a sponsor's risk could be very much larger in 15–25 years, but that does not form



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part of the market price. It requires analysis about what that sponsor is going to be like in 15–25 years' time.

The second part, whether you believe climate change is real or not, is actually now irrelevant to this debate because what we have seen is government policy action that is going to impact the economic futures and so the change involved in regard to particularly energy companies is going ahead. So there is a need to take that into consideration.

Whether you believe that they have got the science right or wrong, it is a reality of regulations and government policy today.

**Mr Aspinall:** I thought I would make one positive point and one negative point.

The negative point is that we are right, climate models are not great but neither are the financial models, because in 2008–2009 we completely missed the global financial crisis. Having an inaccurate model is not an argument to stop actuaries from doing something. Indeed, I was listening to all the debate and thinking wherefore the precautionary principle. If we know less about the consequences of our actions, surely we should be doing more to prevent damage from them as opposed to treating that as a reason for inaction.

The positive point is – and maybe this is actuarial terminology – that we have spoken a lot about risk. When Meryam Omi was speaking I thought about the opportunity here. We are talking about moving our economic systems into a completely new world: green energy; sustainable business; and worrying about infrastructure from a positive light. Institutional investors who get there first will make more money than institutional investors who get there last. Actuaries can be a very strong force as a part of that. The opportunity we should be talking up is that we should be mentioning the risk. We must not lose sight of the opportunity side of it. I would ask you to endorse this motion.

**Mr P. G. Meins, F.I.A.:** I have a series of questions related to what Meryam Omi was saying about the role of investment consultants.

One issue is where some pension funds, perhaps encouraged by their members, are requiring or trying to insist that the managers do not invest in high carbon investments – for example, some of the big oil companies. Are they taking a moral stand or could this be justified on financial grounds?

You could say from a financial return point of view that, if everyone is selling these investments, this may drive down prices and provide a buying opportunity. The price may reflect the problems that they are going to have with climate mitigation, in terms of higher taxes, maybe government intervention into what they can actually do. Everything has a price so selling a stock when it is already depreciated may be difficult to justify financially. How should trustees and consultants deal with that?

If your consultants have said you should have a passive approach to investment based on market indices, you will have large holdings in the big oil companies: should you engage with these companies, to get them to change their strategies to reflect the realities of the future?

What is better: engagement or divestment?



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**Ms Omi (responding):** If I were to put myself in your shoes without understanding exactly what you do: Mark Carney laid this out in terms of three buckets of risk: transition risk; physical risk; and liability risk.

Liability I guess does not sit with this so much. But if you try to tackle everything, that it is not really possible and I do not think anybody has a model.

Physical risk looks at whether changes in the future would impact an investment portfolio over a timeframe. That is probably incredibly difficult because we are getting into weather patterns that we have never had before.

For you to say "I do not know" is quite powerful. "We are going into an area where we have no data and we have no idea what is going to happen to your portfolio". I am sure that you are not allowed to say something like that, but something along those lines is really powerful. You have to say that if you cannot figure it out, then we have to do something about it.

The second point is the transition risk, which is what I was talking about, the fact that basically the way we generate energy is going to change. You can do that tomorrow. You can figure out how much an investment portfolio is exposed to energy. It is not that difficult.

Then you can say to your client "This is your exposure. What do you want to do?" You do not have to have the answer; you just have to be able to show it.

The third point is liability risk. I do not know where the liabilities sit in terms of responsibility here. Effectively the asset owner takes the responsibility. But they have asked you for your advice. Who is going to be sued in the future for not having looked at it? I do not know. If your actuarial code does not allow you to do that, then you have to change it tomorrow because we have a problem with your code.

**Mr Nimmo:** The Actuaries' Code allows you to say "We do not know what we are doing; we do not know the answer". But that is not what the motion is saying. The motion is saying that we need to incorporate it into our work.

**Ms Omi:** And then to say that you do not have a model. That is fine. Can you just say that because we are getting false comfort today. That is the biggest problem here.

I want to say on the engagement and divestments, which we get asked about a lot, I have been talking to BP and Shell for the past 6 years and they are having some movement. When you ask an engineer to stop digging, it can take a long time. You can trust us to do some of that work of engagement. But if 15%–20% of your portfolio is exposed to the whole sector, whether it be through equities or bonds, you can take some actions here.

You might be able to say "You know what? I want an opportunity space. I want actually to reallocate some of the capital into the future opportunities".

That elevated conversation with the asset owners is what we need. We are not getting it because you say "This is investment-grade. That is fine". But is it? It might be investment-grade today but it might not be in the future.



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**Mr A. M. Slater, F.I.A.:** I have a few comments. I guess it comes down to the interpretation of the motion and in particular the word "incorporate". If I interpreted that as "I should be aware of" and determine whether it is actually relevant to the piece of work I am doing, then of course it is relevant. I imagine in a few years' time, we will be talking about CRISPR – Clustered Regularly Interspaced Short Palindromic Repeats.

Does it mean I need to be an expert in the models used by the debate around climate change? No, it does not. Will there be people in the profession who choose to become experts in those? Yes, I am sure there will be as an embryonic wider field.

So I voted "yes" because it is almost phrased as if you could not vote "no". Am I going to write a section in every report on climate risk? No, I am not. I can see – and the point has already been made – that there are going to be detrimental impacts from the various changes to the climate which may or may not be caused by humans. I can also see, in terms of the financial markets, that there are going to be opportunities.

I am a mathematician. The weather is a chaotic system in a mathematical sense; which is inherently unpredictable. Therefore charts like we have on the screen are nice for consultants to produce but you might as well have got a bunch of schoolkids to draw some lines with coloured pens for all the meaningfulness that they have.

Should it be debated within the profession? Absolutely. It is a risk because it is part of society today. Therefore we cannot be blind to it.

**Mr J. G. Spain, F.I.A.:** I am going to disagree with Andrew (Slater). I actually put my hand up to object to the motion because it was really "mother and apple pie". It did not tell us anything at all about how we could possibly do it. I object to that. If I am going to have to do something, I want to know how to do it. I am not saying that I want to be spoon fed.

I am not denying climate change, by the way, except for the fact that there does appear to be quite a lot of censorship in the scientific world about how far it has gone. That troubles me. There probably is a lot of climate change. I have not a clue and Brian is correct: there are certainly not enough people in the actuarial profession in the UK who have any steer on it. Until we have that, if we ever have that, we cannot go there. This is not just a matter of the Actuaries' Code, it is a matter of how can we possibly tell clients this is what you should be doing. "No, I cannot prove it. I cannot give you any statistics. I have not a clue where we should be, neither do you, neither does anyone else, but do it anyway" especially when you might have double compensation because one of the advisers is saying "Do this" and then you come along under the precautionary principle, as Nico called it, saying "Let us do it a bit more. We cannot be too careful, can we?".

That way lies disaster financially because capital is being wasted. That is not something that should be done in a rational economic world. And that is what we are trying to make sense of.

**Dr Maynard:** I want to respond to that general theme around advice. Brian, in his talk, seemed to be asking for perfect advice, and that statement made there seems to be saying "Until I know everything, I cannot comment".



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But doing nothing is in fact doing something. You are choosing not to talk about an incredibly important risk. It is very hard to see how there will not be major impacts from this on the economy in the next 10 or 20 years, either through regulation or through the climate itself.

I do not agree with this idea that until I know everything, I cannot say anything.

I used to work in life and pensions and that is a slightly more cautious part of the profession than general insurance, where you are constantly surrounded by other people with opinions, claims people, underwriters and so you are almost forced to speak up a bit more. It is quite uncomfortable for actuaries because we like to be certain of our facts before we say anything.

What I argue, and to the point about what does it mean, is not suggesting that every report has to have a detailed section saying exactly what climate change will mean and what actions you need to take. But raising this as a debate and saying there is an uncertain future – and to the earlier point as well – actually saying that we do not know anything and that the past history is now no longer a good guide and our models are no longer as certain as we thought, is again a very strong statement to make under the code.

I urge everyone here to be a little bit less actuarial actually and to realise that we are a respected profession. If we say that this is worth considering and we should start thinking about it, then people will listen, and we should be saying that.

**Mr J. Harris:** Like Meryam, I am not an actuary. I offer a thought from the investment world. One of the things that we are seeing at the moment – Meryam mentioned Mark Carney – is in France they have recently introduced legislation, Article 173, soon to be followed, I understand, in several other countries around the world. That requires their funds to disclose the carbon risk in their portfolios, the carbon footprint.

However, we have spoken with the people who advised on this legislation and they explained that usually French legislation is very prescriptive. However, in this case, it was very open-ended. In fact, the funds are open to disclose their carbon footprint, whatever that may mean, however, they choose because there is no prescriptive way to do it at the moment.

The legislation is designed to begin this process of thinking about their transition risk and possibly their physical risk, to get the ball rolling and then in future years the legislation will become more prescriptive.

I thought I would offer that for your consideration because it seems like you are doing a similar thing by proposing this motion.

**Mr Clark:** I wanted to come back with an example of the work that I have done. Also, as a slightly frustrated non-panellist, on Paul's point it does not matter if it is a moral or a financial issue. If asset owners, if pension fund trustees, are going down this road, they are doing it and they are our clients, so in some sense that issue falls away. Some will do it for moral reasons; some will do it for financial reasons.

To address the point made previously, the regulatory train is coming, so let us get ready for that.



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The example that I offer from my professional work is helping pension fund trustees develop their investment beliefs. I am not telling them what to believe, I am helping them. Here is the evidence. Here is all the stuff that is going on. Now develop your own investment beliefs, given that you have shown some interest in the subject.

That work will be accentuated by a whole range of non-governmental organisations active in this space. Let me introduce some of the room to the Asset Owners Disclosure Project which has rated pension funds in the past 4 years. They are now going to rate investment managers and investment consultants. And why not scheme actuaries on their application to this topic?

Let us avoid what happened in Canada. When this topic cropped up in Canada, it prompted the formation of Actuaries for Integrity in Climate Change Communication with the bye-line: "we are not climate change deniers we just do not think the science is proven".

There are many people in this room who would say science is never proved but you get to the point where you know that it is pretty likely.

**Mr S. D. Baxter, F.I.A.:** My background is working in the area of longevity, where I actively look at climate change and the implications that it has on mortality and longevity. For my contribution I should like to step back and make two observations.

The first is with regard to our charter, which I recollect makes reference to serving the public interest. Does this not suggest that climate change and sustainability should be towards the forefront of our minds? I would be interested in the panel's views.

Secondly, the work that we do ultimately feeds through to products that consumers purchase and use, be it effectively a pension plan through an institutional vehicle or an individual product. I am reminded of the work that I have seen recently on the needs of the younger generation, the millennials coming through, who have an absolute concern over sustainability issues, climate change and other issues of a global nature. If we do not incorporate at least an understanding of our consumers, and their concerns around this subject, are we actually failing in our duty as actuaries?

**Mr Rose:** Steven makes a good point about consumers. In a sense I represent the client side. I may not represent them all but there are certainly quite a lot of people out there and what you have to take into account is that as an issue in society this is falling down the priority list. On a list of some 15 UN issues across nations, they have a response which suggests that this is the 15$^{th}$ of the 15 issues in terms of ordinary people's priorities.

One just has to keep that in mind as you consider what people think. We are a democracy and that counts as well at the end of the day.

There are a couple of other points that I should like to pick up. Nick talked about climate models in particular. Which models are we talking about here? Is it the ones that Meryam made reference to in her statement "it is killing us" or "we are falling off a cliff"?

My point is that there is a wide area of uncertainty here. It is not my position that humans are not influencing climate at all. I agree with some of the things that Trevor said where he said that no

action is actually an action. We are actually doing something. We are also in danger of doing the wrong thing. Sometimes to do nothing is better than doing the wrong thing.

There are lots of examples of that in this particular field where there is significant harm which makes it a moral issue.

Again I agree that in a particular discipline you do not necessarily have to take the moral point of view; but there are moral issues here that we have to take into account. It is not that the only one is the fact that we are doomed – if indeed that is the case.

There are huge variations in the predictions. There is huge disagreement. There might be a majority of people who would take the position that Trevor outlined as he did at the beginning. But there are many top-class scientists who take a different position. We have to bear that in mind because the regulatory environment is changing.

We had Paris a few months ago; but we also had Kyoto 8 or 9 years ago. Kyoto did not get very far. Copenhagen did not get very far.

One wonders whether Paris will get very far. There have been a number of indications already that a number of key countries, like India, are pulling back from that.

So the precautionary principle, yes. That does not mean inevitable action in a particular direction. You have to bear in mind that this issue of climate change is an issue which we must address. There are all sorts of different shades. We do not actually know whether it is going to be the catastrophe that was referred to a few moments ago or something that, I would argue, we can over a period of time make a measured impact on what needs to be done over the coming years.

Whether we have 20 years or 100 years to do that makes a world of a difference in what we do. There are huge uncertainties here and one has to be careful about jumping off the cliff, or taking a particular course of action, when actually the evidence might not – because nobody is sure – substantiate that.

**The Chair:** I am now going to ask Trevor to conclude for his side as well.

**Dr Maynard:** At the beginning, a number of arguments were made which were effectively arguments against climate change. If you want to see what the scientists are saying on this, you can go to Skeptical Science.com or you go to Real Climate.org. These are written by climate scientists, and every single one of those arguments is explained as to why it is false. These have been debated for 20–30 years. They are settled science. There is no discussion about those.

This idea about variation in predictions and debate, again, is true in the sense that there is a debate about the precise details of how the future unfolds; but there is no debate at all about the impacts in terms of are they happy? 97% of scientists agree. And if you go to the Skeptical Science site you see there is another link to a site which talks about a piece of work that reviewed about 1,000 papers from scientists and 97% endorsed the consensus position that humans are causing global warming. This is not a scientific debate any more.

The variation in impact is ranging from bad to devastating. There is uncertainty and none of it is good news. The best that we can hope for is a bumpy landing rather than a hard landing.



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My argument is that there is major structural economic change coming, and I do believe that for this profession staying silent is not appropriate.

**The Chair:** I will sum up a couple of points that we have heard.

From Trevor are you have heard that there are potential issues, the impact on the political and the social environment. We heard from Cameron that the science is very young and perhaps this is not the time to make a move and consider things further. Meryam has highlighted the issues that investors have and their uncertainty and whether they will pressurise their advisers to push forward to give them an idea of the impact of climate change and therefore drive people to have to have an opinion.

Brian felt that there were a number of issues that also dealt with whether or not it was the right time for the profession to go forward, and could we actually have the appropriate knowledge and skillsets to be able to carry out the work?

On the basis of those arguments, and all have been very cleverly put, and from the contributions from the floor, would you like to now vote again on the motion?

We have had some changes, as there are now three against the motion. That is encouraging for the "against" side.

Thank you very much, ladies and gentlemen for everything that you have contributed this evening. It has been very good and very interesting.

In concluding I would say as a non-actuary I would be exhorting the profession to take the opportunity to be the leaders in this field of debate.



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