

**The Actuarial Profession**

making financial sense of the future

## **Actuaries, Environmental Policy and the Public Interest**

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To be presented at the Actuarial Profession's ***Social Policy and the Public Interest*** event  
at the Institute of Actuaries on 9 June 2003

## **Introduction - Why should actuaries be interested in the environment?**

The environment is not a field normally associated with actuaries. It is also a wide field - the entirety of human activity is a mere subset of the environment – awash with experts of all description. Why should actuaries become involved? The main reasons are as follows:

1. In contrast to most other financial professionals, actuaries are concerned with the “long term”, specifically looking at asset and liability profiles in excess of 15 years. Environmental impacts, specifically climate change, are also “long term”.
2. The first industry to be hit by environmental or climate related disasters is the insurance industry. Any claims or premium rating will have to take this into account.
3. In a poll at the 2000 World Economic Forum in Davos, delegates voted global warming as the greatest challenge facing mankind. Any discussion of social policy or the public interest cannot ignore this issue.
4. Actuaries have valuable skills that could be vital in this area: actuaries’ key skills are putting financial values on long-term risk and clearly communicating the results. This input is often missing in debates on the environment.
5. The above points are important but periphery. The most important asset for most pensioners is not their pension or even their house, but their grandchildren. The main reason we should be considering the environment is that securing the financial interests of the population while damaging the life prospects of their descendants is a meaningless activity.

We are aware that we must be careful and specific as to which aspect of this field we choose to study. Sensible criteria would be to concentrate on areas with which we are already closely associated and to which we can add value.

In this paper, we will discuss two areas in which actuaries could usefully become involved: the impact of environmental issues on investment policy and adapting a risk model to assess environmental impacts.

## **Climate Change and Investment Policy**

Why are large investors interested in this intractable problem, when they have so many other problems managing in a falling stock market? Perhaps because the problem is very serious indeed. The UK Environment Minister Michael Meacher observed in a speech on 14 February 2003:

“already carbon dioxide in the atmosphere has reached 375 parts per million, the highest level for at least half a million years. Temperatures are projected to rise by up to 5.8°C this century, 10 times the increase of 0.6°C in the last century, and by 40% more than this in some northern land surface areas. This means temperatures could rise by up to 8.1°C in some parts of the world.”

Does this matter? The evidence suggests that it does. In China severe floods used to occur once every 20 years; now they occur in nine out of every 10. The number of people affected by floods globally has risen from 7 million in the 1960s to 150 million now. In 1998 two-thirds of Bangladesh was under water for months, affecting 30 million people. In the UK, 5 million people and 185,000 businesses are at risk.

Flooding is only the beginning. The number of people worldwide devastated by hurricanes or cyclones has increased eightfold to 25 million a year over the past 30 years.

Even more seriously, 10,000 billion tonnes of methane (a greenhouse gas 20 times more potent than CO<sub>2</sub>) are stored, according to the US Geological Survey, on the shallow floor of the Arctic, in sediments below the seabed. If the temperature surrounding the methane warms, it becomes unstable and methane gas is released, causing temperatures to increase further. Warming oceans also cause the waters to expand and the sea level to rise. Sea level is predicted to rise by 3ft over the next century, leading to huge areas of Bangladesh, Egypt and China being inundated.

We don't know the limits of nature - how much rain could fall for how long a period, how much more powerful and frequent hurricanes could become, for how long droughts could endure. The ultimate concern is that if runaway global warming occurred, temperatures could spiral out of control and make our planet uninhabitable.

Five times in the past 540 million years there have been mass extinctions, in one case involving the destruction of 96% of species then living. But while these were the result of asteroid strikes or intense glaciation, this is the first time that a species has been at risk of generating its own demise.

In response to this amazing threat an organisation called the Carbon Disclosure Project has formed to pool investor influence. An author of this document is co-ordinator of the project, whose signatory members have more than \$4 trillion in assets.

Tony Blair underlined the importance of climate change to institutional investors in February this year when he wrote: "Congratulations on the success of the Carbon Disclosure Project. It has some important messages for all of us. Crucially, it illustrates how the answer to reducing greenhouse gas emissions lies as much with companies and investors as it does with governments, international agencies and the public."

Another senior politician, the former US Secretary of State Madeleine Albright, was quoted in the Financial Times at the New York launch of the Carbon Disclosure Project: "Our business is to help investors vote with their money". So senior politicians, concerned with the public interest, are concerned about climate change, and the role of investors. Actuaries do advise pension funds how to invest and therefore in some senses, how to "vote" with their money.

Actuaries provide financial and prudential advice on the management of assets and liabilities - most especially where long-term management and planning are critical factors. It is very interesting to note here that climate change will have different impacts based on different emissions scenarios. In this sense, we actually choose the future.

For institutional investors, the issues are complex. For more than a decade there has been some rather sterile discussion of concepts like Socially Responsible Investing (SRI) or "Ethical Investment". This has led to July 2000 legislation requesting UK pension schemes disclose:

“The extent (if at all) to which social, environmental or ethical considerations are taken into account in the selection, retention and realisation of investments.”

But there is no clear definition of ethics. Speaking at the Carbon Disclosure Project launch, Derek Higgs, author of the Higgs Report on Corporate Governance, said:

“Too often investors and analysts say, well we don’t have information from companies so we don’t know what to ask and the response comes back from companies, well we don’t actually know what they want so we don’t know what to give them.”

The professional investment community is being told that they need to make sense of the long-term future. Perhaps they need actuaries to do it.

Some people, including President Bush, argue that action to reduce climate change will be prohibitively expensive. This view is not held universally. Adair Turner, former Director General of the CBI, now Vice Chairman of Merrill Lynch, stated at the recent Carbon Trust lecture, that reductions in emissions of 60% by 2050 will cost our economy just two years deferred gratification. That is that to say, we would in 2052 enjoy the standard of living that would otherwise be achieved by 2050. So can we afford to avoid disaster? Yes.

Investors like UBS, Royal Bank of Scotland, Credit Suisse, Allianz Dresdner, Aviva and Merrill Lynch signed up for the Carbon Disclosure Project because they want data for two reasons. They want to know about the impact of taxation and regulation of greenhouse gases in terms of increased losses or profits. In addition they want to increase their understanding of the cost of reducing the size of the problem.

With anthropogenic emissions of 6.7 billion tons of carbon into the atmosphere each year - that is 25 billion tons of CO<sub>2</sub> - inaction by investors is unfortunately a big decision with massive impacts. As the Government Minister Michael Meacher has observed, these impacts are not in the public interest.

The key concept of investment policy is matching assets and liabilities. In the next section of this report, it is implicit that climate change is not in the insurance industry’s immediate financial interests. It is clearly not in humanity’s long-term interests, humanity includes life and pension scheme beneficiaries. It is actuaries’ fiduciary duty to take corporate governance in this area seriously.

### **Modelling the specific impact of climate change**

In 2001, the Chartered Insurance Institute published a research report “Climate change and insurance”. In it they show that the number of natural catastrophes have increased sevenfold over the last 30 years, global insured losses increasing five-fold.

It is generally agreed by the scientific community that the world is warming up due to human activity (that the 1990s were the warmest decade in the millennium, and that the rate of warming in the 20th century has been greater than in any of the last 900 years. 2003 is predicted to be the warmest year since records began). However, it is not agreed by how much and how fast warming will occur and what effect this is going to have. For example, the Intergovernmental Panel on Climate Change (IPCC) predict that the average global

temperature will rise between 1.1°C and 3.5°C and sea levels will rise between 18cm and 99cm by 2080.

It is obvious that this is going to have a considerable effect on many organisations – for example insurance companies, property investors, local authorities, governments, home owners – to name but a few.

However, knowing that the temperature will increase by x degrees over the next 50 years is not much practical use to most people or organisations; stakeholders need to know where, when and how the effects of climate change may be manifested.

The likely effects are increased rainfall, leading to increased flooding and soil erosion, and increased incidence of extreme weather events. Conversely, despite the increased rainfall, there may be more water shortages in many areas of the world due to increasing evapotranspiration, and possible cooling due to changes in weather systems (for example the reverse of the gulf stream). Increased property damage will be magnified because more people will live in flood areas and cyclone tracts.

It has been shown that there is non-linearity of property damage with event severity. Shifts in water and wind cycle will alter the location of severe events; new locations will not be as prepared so damage is greater.

In summary of the problem, there will be increased probability of weather-related damage and past claims data will be wholly inadequate as a guide to future impact.

One solution would be to adapt RAMP (Risk Analysis and Management for Projects) methodology. RAMP is a framework developed jointly by the actuarial profession and the Institution of Civil Engineers to manage risk on projects and place financial values on that risk.

RAMP is a comprehensive and systematic process for identifying, evaluating and managing risks in capital investment projects. The methodology behind RAMP could be adapted to consider climate change and other environmental impacts on geographical areas, property portfolios or corporate activity.

The remainder of this section briefly discusses how RAMP methodology could be applied to model environmental impacts. The discussion has been kept general, but for illustration we have shown how the Greater London Authority might apply RAMP thinking with a view to planning a mitigation strategy for climate change. Other local authorities, governments or property insurers could apply a similar logic.

A brief outline of the stages of the RAMP process is as follows:

- Risk identification – identify possible risk events and unforeseen events, using a brainstorming session and a risk matrix. This would require a combination of professionals such as economists, engineers and meteorologists as well as government planners. A risk event is a possible occurrence that would have a positive or negative impact: For example, a flood would have a negative impact on London's economy but a spell of good weather would have a positive impact.

- Risk analysis – analysing which risks are important from their likely impact and probability of occurring. For example, estimating the probability and frequency of a flood occurring, and if it were to occur, the damage it would cause. Both the probability and impact will be probability distributions rather than a figure. The impact will depend upon property prices and other economic factors, such as economic growth and interest rates. The exercise will have to be repeated for each possible outcome, for example drought, storms, etc.
- Financial evaluation – calculating the net present value. Combining the probabilistic meteorological models with financial models of economic growth.
- Risk mitigation – The RAMP evaluation processes will provide a model of the potential damage and its cost. This can then be used to identify mitigation strategies and give a cost comparison. For example, the immediate cost of enlarging the Thames Barrier against the cost of excess flooding.

It must be stressed that actuaries do not have the necessary skills to adapt RAMP meaningfully. However, working with other professionals, an adapted RAMP could be used to identify risk (in the above example, how climate change will impact London's economy), quantify the risk, and decide upon the most effective mitigation strategy.

### **Conclusion**

Any organisation serious about social policy and the public interest has to consider the environment. Moreover, actuaries' expertise can be utilised in this area. Risk management techniques, for example RAMP, could be adapted to model risk from climate change and other environmental causes. Actuaries have a fiduciary duty to ensure investment policy considers potential environmental damage.

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