

# How worthwhile is financial protection against disasters for developing countries?: a panel discussion about how actuaries are helping to answer this question

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## Abstract of the London Discussion

[Institute and Faculty of Actuaries, Sessional Research Event, London, 24 March 2014]

This abstract relates to the following paper: Sovereign disaster risk financing and insurance (SDRFI) impact appraisal, by Tse-Ling Teh.

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**The Co-Chairman (Mr D. J. Grenham, F.I.A.):** The intention of this meeting is to showcase some of the work carried out by the actuarial profession, the Department for International Development (DFID), the World Bank and others, in what we can provide to developing countries.

The reason why we are here to present this is that there is quite a bit of actuarial involvement in this project. It is all about risk assessment and how to deal with that, how to assess it and how to communicate it. Those are issues which are very topical and important for actuaries.

I have been privileged to have been involved in some of the work that this group has been doing. I have thoroughly enjoyed the ability and the capacity to be able to interact with people from DFID and the World Bank, and to have the opportunity to work in wider fields and apply my actuarial training to something, which, it is hoped, has a wider developmental impact.

**The Co-Chairman (Mr M. Noel):** As most of you know, the World Bank is an international financial institution. We are owned by most of the governments of the world. Our job is to extend credits, technical assistance, guarantees and products to developing countries and emerging markets. Our job and our mission is to reduce poverty and to ensure shared prosperity within these countries.

Within this overall framework, we have a special interest in insurance because it is critical to make sure that when people start to escape poverty, they do not fall back into destitution at the first accident in their life, whether it is a life event or a catastrophic event. If we want to achieve a sustainable reduction in poverty over the medium to long term, we believe that insurance has an absolutely critical role to play in achieving this end.

Within this framework, the disaster risk finance and insurance programme is probably the fastest growing programme that we have in our insurance work around emerging markets and developing countries. We have a lot of institutions to thank for that. It is a global partnership. There is a Global Fund for Disaster Risk Reduction and Recovery. It is a multi-donor fund.

I think it is very important to mention the critical role that has been played, and continues to be played, by DFID because the programme we are going to talk about is funded by DFID, and without it, the programme would not exist.

It is about partnerships and this is an excellent example of such a highly successful partnership.

The disaster risks and insurance programme has several pillars; a sovereign pillar, property catastrophe and agricultural insurance. In the sovereign pillar, our goal is to provide comprehensive risk solutions to governments.

For events that are very frequent and of low intensity, we try to develop fiscal management solutions. For medium frequency, medium impact events, we develop instruments such as contingent credit facilities that a government can draw on when a disaster occurs. Of course, for the more catastrophic events, we enter into the insurance area with a broad array of instruments. We work in close collaboration with the Treasury Department of the Bank. We help structure various types of risk transfer instruments.

There have been successful examples of tools that have been scaled up to the point where they were accessing the reinsurance market through bonds.

An early example of the risk pool can be seen in the Caribbean, where there are 16 countries pooling their risks in the area of hurricanes and earthquakes. This has been a successful risk pooling instrument that the Bank helped put together. It is now being extended to the countries of Central America. We hope by June to have all the countries of Central America joining the pool in time for the next hurricane season.

Another example is the Pacific Islands catastrophic risk insurance facility. We had our first payout after a cyclone hit Tonga in January. Within 2 weeks of the cyclone, the payout was made. That is the proof that this is a concept, which works and is much more efficient than waiting a long time for agencies to mobilise themselves when a catastrophe hits. The insurance instrument has proven to be highly efficient and has improved, in a tangible way, the life of the people who have been affected by such disasters.

The goal, of course, is to globalise the programme. We are working in partnership with other donors, such as the EU Commission, to roll out the programme in three regional economic communities of Africa covering 23 countries, and there are also very interesting experiences in more advanced countries, such as Colombia, where the governments are looking for the programme to protect their assets. Now we are also reaching down to municipalities, for whom we are trying to develop risk management solutions to protect their assets, so the programme is not only sovereign but also becoming sub-sovereign.

The second pillar of the programme is property catastrophe. We are piloting a programme in the Balkans, in the Caucasus. The interesting thing about this is that our teams are developing a web-based platform for integrating the issuance of property catastrophe policies. We believe that these platforms could cut the cost of writing these policies by as much as 40%. If we are successful in doing this, it will have a massive impact in terms of access to property catastrophe products because by cutting the price of the product we will allow greater access to people of low to medium income.

The final area under this programme is agricultural insurance. We have a programme called the Agricultural Insurance Development Programme, where we are trying to develop public/private

partnerships to support agricultural insurance in a number of countries. Perhaps, the most important example is the national insurance programme in India touching, today, 30 million farmers on a yearly basis. The Mongolia livestock programme is another example touching 16% of herders in the country, with an index-based product. The idea there is to globalise access to agricultural insurance in emerging markets in developing countries, in particular, with the development of innovative index products across a wide range of countries from Africa to the Caribbean to South Asia.

The programme which we are going to discuss is critical, because in the middle of this, it is very important that robust systems are developed and put in place to ensure proper monitoring and evaluation of the impact of these programmes. For example, if we put together a risk pooling mechanism, like in the Caribbean, any payout goes to the government. But then it is critical to ensure that systems are in place so that the payouts reach the people who are being affected by the disaster on the ground. That is the challenge. We need to make sure that the payout reaches the poor, and that is why this programme, which was initiated and supported by DFID, is so important to develop methodologies to ensure that we can properly assess the impact of these instruments in a wide range of circumstances. What kind of methodologies can we develop to assess these programmes and to measure the impact, and, in turn, how can we feedback from these assessments into the design of the instruments that we develop? This is a key challenge of this programme.

I should like to give the floor to Mr Dercon, the Chief Economist of DFID. Mr Dercon is a prominent development economist. He has been at the helm of the most advanced thinking in the field in the international community. It is a great honour to give him the floor.

**Mr S. Dercon:** I am very glad to be here because it is a way of acknowledging the role that actuaries, and also the Government Actuary's Department, have played in supporting the work that we are doing on the sovereign disaster risk financing and insurance impact appraisal project, about which Dr Clarke will tell us a little more.

I want to say a few things about the interest DFID has in areas to do with insurance at the moment, which I can assure you is rising, and there is a real attempt from us to reach out to the city in this respect, to help us think through the kinds of things that we should be doing.

Secondly, I will talk a little bit about things that I learnt as a researcher before joining DFID. In fact, I still am a professor in the University of Oxford, working on insurance and on risk and poverty. I want to share a few thoughts on why these things are important and also some of the challenges that we face building up insurance markets and learning from insurance in developing countries.

I want to talk about sovereign schemes and some of the challenges that we have with them, why we think they are really important and why they present us with many more challenges, including building up the evidence base around them as well as understanding whether they are really working.

In DFID, we have been supporting initiatives to do with insurance over the years: we have been supporting crop insurance in Malawi; we have been supporting the Caribbean Catastrophe Risk Insurance Facility (CCRIF).

In the past 2 years, we have been trying to scale up much more work on issues to do with insurance. It has been very clear that we have had very powerful backing from successive Secretaries of State who say, "Look, this is an agenda we should start exploring", and quite a lot of people in DFID from

different parts of the organisation (those working in the private sector and humanitarian sector) have found entry points and worthwhile topics on which to work.

So, by now, this is something of which we are doing more and more, and it is beginning to bear fruit in our organisation in terms of having more of these bigger and more important initiatives. For example, we have gone towards supporting the Africa Risk Capacity, which is Africa Union together with the World Food Programme, supporting a big pooled fund that is based on an index insurance product where payouts can happen to lots of member countries. But, in terms of our financial contribution, this is, for us, a much more scaled up attempt to contribute to issues like that.

Our country office in Kenya has been very involved in indexed-based livestock insurance schemes. It has been growing from what started as a research project to something of a much bigger scale and very importantly, the Secretary of State has been involved in trying to obtain private/public partnership via the work, in which she has been closely involved, trying to establish links with the private sector and, globally, with other donors and multi-lateral organisations.

We want to develop financing and investment strategies that will lead to a much more scaled up approach to insurance. We have now lots of interest from places like the Philippines, Kenya, Senegal, Bangladesh and Haiti, where we are building upon the original work.

I want to reach out to anyone involved in some of these countries. There are many opportunities for us to work together.

One of the areas I worked on as a PhD student was on problems to do with risk and poverty. A lot of research has been carried out in the last 15–20 years. There is a very strong causal relationship between living in a very high risk environment and downward cycles of impoverishment that people face.

The logic is quite straightforward. Most of the really extremely poor people in the world are self-employed, either as farmers or in the informal sectors. They have to bear all the risks themselves and try to manage these risks in their livelihoods. When things go wrong, they do not really have access to financial markets to any extent. Credit markets are not well developed, let alone insurance markets.

They can sometimes rely on informal systems, which are incredibly well developed within communities, but they tend only to be able to handle very specific idiosyncratic risks that happen to a few people in the community. They have very little integration across space, so once something happens like a drought, they can rely on very little support.

Typical ways of supporting themselves are to build up assets like buying cows and chickens, to insure themselves by starting selling when something happens. If a big shock happens, everybody is selling their chickens and cows, so prices collapse. You have serious downward cycles.

What I have described to you is a classic theory of how famines come about. Fundamentally, people do not really have ways of protection when something happens. Because of the asset strategies that they have to use and the markets not being able to sustain the prices, prices collapse. Amartya Sen (who won the Nobel Prize in economics) wrote a lot of things in the early 1980s about how, fundamentally, famines occurred because people did not have insurance.

One of the things in the past 10 years with which I have been very involved is in trying to see what can be done. We have done that in the form of experiments, literally going into very poor settings and trying to sell insurance to see: whether people buy insurance; who buys insurance; what does it do for them; and how does it change their lives? In fact, quite a lot of research has been taking place in that respect.

One of the big findings that we have on insurance is that nobody buys it. The uptake is extremely low.

One reason that we find is that even though they cannot afford to face a shock, they cannot quite afford to buy the insurance products. So we need to find ways to cut the costs of the products that we can offer.

A lot of people often said: “After we have sold micro-credit, we will start selling insurance – it will be easy”. Of course, it is fundamentally different.

When you offer micro-credit, you go and try to find people and say, “Please take my loan”. Then we pray that they will pay it back. The whole micro-credit industry is built on finding ways that, after you have given the money to poor people, you will get it back. Are these systems sustainable?

We find one of the big reasons why people are not buying the insurance product in these poor settings is because they do not trust us. They have absolutely no trust that we will be able to implement these products.

So it is a really tough battle. We will have to find mechanisms and ways so that the insurance markets can start being seen as a real alternative. In a context where it does not exist, it is one of these markets which will take a long time to develop, and maybe it will have to happen from more informal systems, such as people themselves setting up mutuals. For example, I work in Ethiopia quite a lot and I see people in poor communities setting up mutuals. They start paying in to a little pot, which they then draw on when something is happening. You see mutual companies emerging. They get bigger and bigger, and some of the most powerful civil society organisations in Ethiopia are mutuals, where people set up small insurance groups that start merging and getting bigger and bigger. So we have seen markets emerging, we have seen companies emerging, but for outsiders, it is incredibly difficult because they may not be trusted.

We cannot imagine the companies that we see emerging being able to become big enough quickly to allow them to start dealing with big covariate shocks such as big disasters.

The primary reflex we would have in the organisation, such as DFID or anyone working with government, is to say clearly there seems to be a role for government. So DFID, over the years, has invested massive amounts in humanitarian support, government to government, and then to try to reach people.

What we are looking for is how can we bring lessons from insurance and reinsurance into the systems? Can we, for example, reinsure the systems themselves by selling on the insurance of welfare systems in countries onto the market internationally? Can we develop public schemes that learn more from insurance, that use the principles? Can we make sure that we do not crowd out the private market systems when better state systems are developed? Can we learn all the lessons and work together with private insurance principles within sovereign systems, trying to get systems going that give support to people during disasters?

It is about getting markets to work, that respond in a disaster context and also at a local level, can we get systems, which are complementary to the market system, that can reach poor people?

There has been a first wave, which has focused almost exclusively on financing to the extent of putting the money in the pockets of the Ministry of Finance. However, that is not enough. The market being able to obtain some money internationally when a disaster strikes and put it in the Ministry of Finance is not a properly integrated disaster insurance system. We need systems to work so that there is an impact on the ground.

That is really the big challenge. Just as we have problems with insurance markets reaching the lowest level, can we get systems, which reach the people on the ground, that really have an impact?

This is something, DFID, in general, tries to think more about, to see whether we can learn from the expertise of others in that respect. Once we have the money there, in a disaster context, it is slightly different to, say, a health insurance product where the markets are still functioning well. Here we are talking about disasters when the infrastructure may be disrupted. Maybe markets and technologies are also disrupted. Can we find ways of effectively and efficiently delivering to people, and again building up from that point?

Something that we are working on in DFID is trying to see whether we can learn from those who know about mobile technologies, to get money into pockets quite quickly. We know that the M-Pesa banking system in Kenya is now very efficiently transferring money into poor people's pockets. Can we use that in disaster and insurance contexts as well?

Secondly, can we maybe use things like Google Earth, where we match mobile technologies with spatial imaging and try to develop technologies that link the financial instruments to the identification of where the money has to go with mobile phones to deliver the money, and can we obtain integrated systems?

What we are concerned with here are not just an insurance market as we would know it, but it is about insurance systems in really difficult settings where systems may be totally disrupted because of disasters. Thinking carefully about how we can reach people is really the litmus test for these kinds of issues. Will we have impact on the ground with the kind of systems we are trying to develop?

The key question is how we can bring the private and the public side to work together better, learn from each other and integrate systems?

Insurance has been long forgotten in the development agenda. It is very striking how forgotten it has been. Micro-credit has been on people's radar from the 1980s. Insurance is much more recent. It is something, in DFID, we want to think much more about.

On the disaster side, we want to find ways of efficiently learning and working with the private sector to reach this end. DFID is ready to partner with lots of institutions that understand these kinds of problems and may bring in expertise in the future.

**Mr Noel:** Thank you very much Mr Dercon for your inspiring words and presentation. I would like now to turn over the floor to Dr Clarke. Dr Clarke plays a huge role in our team because not only is he leading the project that we are discussing, the impact evaluation project for sovereign

disaster risk financing and insurance, but he is also leading a global agriculture and insurance development programme.

**Dr D. L. Clarke, F.I.A.:** I want to start by talking about what sort of programmes are we really looking at in this project. There are three examples of projects I have worked on through the World Bank in my time over the last 7 years. The first one has been mentioned a few times. This is the CCRIF where the 16 Caribbean Island states pay a premium at the start of the year, and they get money within 2 weeks of an earthquake or a tropical cyclone. The question that this project would ask is: is the premium that they pay at the start of the year worth it for them?

The second example is in Mexico, which is exposed to all sorts of disasters. Pretty much every natural catastrophe you could think of happens all the time and there is the risk of very big ones as well. The government has seen this in the way that it impacts their budget. Every single year, there is some public infrastructure which is destroyed from disasters. The government has been thinking about how to better finance the reconstruction of these public assets. At the end of the 1990s, they developed a fund for natural disasters, which started off just as a budget line. They had a certain amount of money that they could spend on reconstruction. Over the last 5 or 6 years, they have complemented this budget line with insurance mechanisms that if an extreme event occurred, they have additional financing to pay for the reconstruction of public assets.

The final example is Kenya, where they have a programme largely supported by DFID. There is also a \$250 million World Bank investment there. The project is the hunger safety net programme. This is a programme where every 2 months about 100,000 very, very poor individuals in the arid lands in Kenya are given about \$30. This is a cash transfer programme.

At the moment, they are working to try to make it a scalable cash transfer programme where, in the event of a very large drought, the current beneficiaries would get paid more money than the \$30 every 2 months. It might also reach out to additional beneficiaries. They have tried to make this so it can expand. In the bad years, when it expands, it needs more money.

All of these schemes have one thing in common: government has decided its contingent liability to disasters. They have decided that they want to do something. It costs more money to do that in a disaster year than in non-disaster year. That brings about the question: how do they finance it?

All of these schemes also bear some cost to the government. DFID spends something like £10 billion a year of UK taxpayers' money. DFID has a number of questions to consider such as:

- Should we be spending money on education?
- Should we be spending money on healthcare?
- Should we be spending money on financial protection for disasters, which may never happen?

This project is all about trying to get better evidence so that DFID can maybe say "I think it is good to invest in financial protection for disasters". Because disasters have such extreme effects on poor households, maybe it is good to do a little bit of that as well as some investments in education and healthcare. There is a need for better evidence and evaluation.

This is my favourite articulation of the strategy. We want evidence-based change and we want to carry it out after peer review. This project fits within that. How do we get better evidence so we are

able to better inform development institutions, like DFID and the World Bank, on how they should spend their money to try to achieve a development impact?

We are trying to come up with a way of quantifying the costs and the benefits of things like these programmes.

We are looking at the average cost that might be paid by government. Obviously, the cost may be higher in disaster years than in non-disaster years. On the benefits side, what could they be? We know that if there is a big food security crisis, this might lead in Kenya, for example, to malnutrition, which can have very long-term consequences for children. It could also lead to sale of livestock at prices, which are very, very low. We know if you have a herd above a certain size, then this is good and it generally tends to go up. If you have a herd below a certain size, then it tends to go down. Poverty traps, where you are stuck with herd size below the minimum herd size, how do you ever get out of that?

We are going to be looking at issues around what the actual impact of these programmes might be on poor people.

The cost side is something we have pretty much done. This is something that the World Bank has been working on for a very long time. Of our 16 papers that we have commissioned in the first phase of the project, one of them is on cost. You can think about different risk financing strategies with different combinations of instruments, budgetary instruments as well as financial instruments. You can try to work out what the opportunity cost is, and what the annual average cost is of that particular financial strategy. It may be risk transfer or reinsurance might be quite cheap if it is quite a low price. It may be other instruments might be more effective for different layers. It may be you want to insure the really extreme events, but for the things that happen every 1 or 2 years, maybe you just want to have a reserve fund or have a budget line or a line of contingent credit.

What about the impact side? The impact side is much more difficult. How do we know what the impact of these programmes might be on poor people? Ms Dana's paper that she contributed to the project was on pathways to impact this area. How can we think about these programmes having an impact on people?

The first potential pathway to impact is capital. If you are the government of Jamaica and you are exposed to a shock, which could cost 400% of GDP, having additional money after a disaster might be quite valuable. You might be willing to have less money before a disaster, pay your insurance premium and have more money after a disaster.

Speed might also be very important. If you are the government of Kenya and it currently takes 9 months from the early signs that there is an oncoming drought to respond to the drought, improving the speed from 9 months down to 2 months or 1 month might be very important, and having your finances sorted in advance can be one part of improving the speed of response to food insecurity.

Autonomy is important for many developing countries. Often what ministries of finance might complain about, particularly in countries where development agencies, like DFID and the World Bank, finance a large amount of their budget, is that after a disaster what they have to do is hold out their hand and wait for donors to give money. This can be very slow and can end up with a long



negotiation. These instruments can provide some sort of autonomy: they can empower governments to address these issues before they happen.

Next, we will consider market signals. The government of Mexico has been working on disaster risk financing for a long time and recently had its credit rating improved to AA. In the rationale for this, the fiscal fundamentals were mentioned. One of the contributors to this is they have their financing for natural disasters in order. They have been working on this for a very long time and they have a pretty good system.

Moving on now to knowledge, where the World Bank and the Global Facility for Disaster Reduction and Recovery have been working in the Philippines for a while. They have been working on disaster risk financing. Before the recent terrible typhoon, which afflicted the Philippines, there had been a lot of work on disaster risk financing. There was not an insurance policy in place. There has been a lot of work in developing an exposure database. The government had an exposure database of all the buildings in the Philippines. That is pretty useful, immediately after a disaster, for identifying what might have been hit and what the priorities might be. This improved knowledge about exposure, about the disaster risk, can lead to improved action.

Finally, let's consider discipline. If you are the government of Mexico, you might be concerned that, after a disaster, your post-disaster expenditures can be subject to negotiation and are not necessarily going to be rules based. You may have a facility like FONDEN (Mexico's fund for natural disasters), which is supposed to finance reconstruction of public assets. But, it may be that you can use financial markets to commit you to the rules that you want to commit to.

At the start of the year, you pay a premium to reinsurers, or whoever, and you will only get the money to spend on reconstruction if the loss adjustment procedure of the reinsurer says that you have had this particular amount of damage. It can instil quite a lot of market discipline in government.

These sorts of risk financing transactions can be quite complex. The process that you go through by thinking about whether you want to make the transaction, and to develop the capacity to make the transaction, can help in other areas of public finance.

So these are a number of different areas where these programmes can lead to impact. The challenge of the project is to try to put some numbers on some of these areas.

At the core of this project is going to be catastrophe risk models. If Mr Dercon is trying to work out if he should spend money on disasters or on financial protection for disasters, it is really important to know what the chance of a disaster occurring that might lead to particular damage and particular suffering. For example, you are a government and you are worried about drought. You buy a weather derivative, which is going to payout if the weather is sufficiently bad. A risk model might tell you the distribution of particular weather events and the probability of payouts of your instrument. From an insurer's perspective, you can work out the annual average cost and you can work out the different metrics for the products. It can help you put a price on instrument.

For government, they need to know what is it going to payout and when the funds are going to be available. Also, how much does this relate to the need? Is it going to payout in bad years only or is it sometimes going to accidentally payout in good years? Is it going to miss some bad years? You need to know from a risk modelling perspective the joint distribution of both the need as well as what this financial strategy is going to give you in different disasters.

There is a whole line of work on the economic issues surrounding how we calculate this cost and the impact analysis. One of the things that we have been thinking about is this idea that if government does not get its house in order quickly after a disaster, it may be that the private sector does not have the incentive to invest. Government being financially prepared can stimulate and provide the incentives for the private sector to invest.

A very simplistic example is if government does not rebuild roads then it is not so much of an incentive for firms to reinvest in the capacity to export if they do not have the roads to get the goods to market.

Turning to fungibility, this is when the World Bank thinks it is financing an electric power station but it is really financing a brothel. If DFID goes to the government of Kenya and says, “We are going to help you finance this scalable social safety net”, it may be that the government was already going to pay that money, and so the money that DFID is contributing is going to give the government a bit more money in those years and maybe it is going to spend it on a brothel.

It is this issue of what you are going to spend the money on, what were you already doing and what is this additional money going to lead to? That is a key question for economists.

Finally, what would have happened without the set up of an insurance facility or some sort of risk financing and insurance mechanism? Often, it is very complicated. Government will have done some things after the disaster, but often they will cut money from the education budget and the healthcare budget and reallocate it to disaster response. So when thinking about the benefit of this additional money, the benefit is really going to education and healthcare as opposed to going to disaster response.

So, what is this project? It is a 3-year project. At the moment we are preparing a framework for how to evaluate these programmes. In the second phase, we are going to be doing it. We are going to be outsourcing some pretty large contracts to firms to write an actuarial report, do some analysis and say what the cost might be, and what the benefits might be of this programme. We are going to wrap up at the end with a methodology, which can be rolled out and used by organisations, like the World Bank and DFID, when making their decisions about risk financing insurance.

In answer to the question: is financial protection against disasters worth it? I can tell you what the answer from the project is going to be already: “It depends”. It is going to depend very much on how expensive is the protection and what are you using it for. It is going to depend on whether the money is just going into a slush fund within government, or is it going to be spent on things, which give you development impact? It is hoped over the next few years we are going to work through a lot of these details and come up with some numbers to indicate what the benefits might be for five or so examples of programmes, and from that, we hope, we can lead to better decision making.

And Mr Dercon will have the answer to the question of should we be spending money on financial protection against disasters or should he spend it on education and healthcare?

**Mr Noel:** I will introduce the members of the panel. First of all, David Bevan, Emeritus Fellow, St John’s College, University of Oxford. Mr Bevan was the Founder and then Deputy Director of the African Economies Study Centre at Oxford. He has been working a lot on macro-economic policies, fiscal policies and brings a lot of this dimension into our reflections today.

Julie Dana is a lead financial officer at the Treasury Department of the World Bank. Ms Dana has been working a lot on a wide variety of insurance products to protect the poor, and she has been doing so in a very wide variety of countries.

Robert Muir-Wood is the chief research officer in science and research technology at Risk Management Solutions. It is a global company developing probabilistic risk models over a wide range of countries and brings a lot to the design of products and systems.

**Ms S. P. S. S. Parikh (opening the discussion):** Is there anything in relation to risk reduction and disasters that you wish to discuss further?

**Mr Noel:** What we do in this area is embedded into a comprehensive disaster risk management framework. I mentioned the Global Fund for Disaster Risk Reduction Recovery. Essentially, the method is to work with governments to develop a comprehensive disaster risk management strategy, and within this strategy one of the elements is disaster risk finance and insurance.

**Mr Grenham:** I think within that, if you do set up any sort of insurance system, by the fact that you are putting a price on risk, it gives a benchmark for people to see that if we do take action to try to reduce risk, then we can reduce our premiums.

So, it is hoped by focusing to some extent on the insurance solutions, it then helps drive some of the risk reduction activities as well.

**Ms J. Dana:** In the World Bank Treasury, our clients are ministries of finance. What we are finding is all of these things matter to them. Some of these issues are more important in different places. They face a quite complex set of incentives, structures and issues.

Take access to capital as an example. We find many countries are really tying their own hands in terms of constraining themselves for access to capital by virtue of lack of a legal and regulatory framework that supports the use of insurance tools or access to global markets.

In Indonesia, we worked for about 4 years after the tsunami from 2008 to 2013, simply on one line of a budget law. Prior to that, the government was not allowed to spend any money for anything that did not result in a direct exchange of goods and services. The Ministry of Finance officials could not even buy car insurance. Government was prohibited from using federal funding for anything that did not result in something tangible.

So, they were very well aware that they were going to have some risks to the budget: commodity price risk, natural disaster risk, and they started thinking about risk instruments. But it took about 4 years to change the budget execution law that would allow paying a premium for an insurance contract that would be purchased by the government.

That is an example of where access to capital is really critical. I can give examples of all of these and they are all in the paper. To bring to light another one, which relates to the question about risk reduction, when we think of knowledge here we think about not only having more information about the country's exposure to national disaster risk, but also what is the price of risk covered?

Mr Grenham said that pricing that risk really tells you something, and we agree. Recently, we did a transaction in Uruguay, where the state-owned hydro-power company, after losing about

\$400 million in 2008 and again in 2012 as a result of a drought, combined with high oil prices, purchased an insurance contract, which covered it for 18 months against that combined risk. If there is a drought and high oil prices, the state-owned power company receives a payout from the insurance contract.

In the course of long discussions, the first step was modelling the exposure, looking at how rainfall impacted the level of water in river basins, which impacted hydro-power costs. The second step was pricing the risk. When the government started looking at the cost of that coverage, they said, "We can do that for maybe 2 or 3 more years, but we really need to move faster on investment in wind and natural gas".

That was an example of where information about the price of risk coverage drove decisions in the direction of risk reduction.

Certain issues can be more relevant at different times, but we see all of these impacts being quite important to the minister of finance, who is making those really critical budget decisions.

**Mr Grenham:** Dr Clarke mentioned the importance of catastrophe models in this work. Are they up to it?

**Mr R. Muir-Wood:** As other speakers said, if you want to create risk instruments, first you need to understand what is the landscape of risk. If you are dealing with extreme events, what you have experienced over 50 years or 200 years will not be enough to tell you what is potentially out there, and you will need to build some kind of simulation model, which captures 50,000 or 100,000 years of potential events. From that, you will be able to understand what is the price of risk as well as what the potential is for extreme losses of different magnitudes. This is what we can call the whole landscape of risk. If you can evaluate this landscape, then clearly you can start designing instruments aimed to be optimal in terms of the functioning of an insurance or a reinsurance structure.

Everything depends on having this understanding of this landscape of risk. I think your question was: are we up to it in terms of developing catastrophe models? Catastrophe models are complex instruments. I come from a company that build catastrophe models around the world. We have 1,200 people developing models and servicing the companies that use these models, so big teams of scientists, statisticians and engineers. Catastrophe modelling is difficult because capturing the full population of extremes and how loss is generated requires a lot of diverse scientific knowledge. It requires a lot of information on that, which is exposed to loss and loss data by which to calibrate the models.

In a rich country like the USA, a lot of that data is available. As we start modelling in poorer countries, that data becomes more meagre and so the exposure data is going to be imperfect. There are ways round, some of this using satellite imagery, for example, for developing exposure data. There are new sources of information on very high resolution topographic data available worldwide for developing flood models.

So it is a challenge. Clearly, models for poorer countries are not going to be as refined through various stages of their generation as they would be for a first-world country, but such models would be a very important start. The frontier of catastrophe modelling is moving beyond the models for insurance in OECD countries to developing catastrophe models for poorer countries where there is, as yet, almost no insurance.

Part of the DFID vision is for a rich country to build catastrophe models and give them to poor countries and train people in national government agencies in using them, as well as how to sustain and support models long term. This will become the means for that country to help design its own instruments for insurance, for risk transfer, for risk reduction. Without understanding what this risk landscape looks like, you cannot really begin to plan the action that will help reduce it.

**Mr I. J. Rogers, F.I.A.:** I think Mr Dercon mentioned the idea of partnering with organisations. I am wondering what the extent is already of the involvement of the private sector, particularly thinking global insurers and reinsurers in the existing schemes, and maybe I could ask the question to what extent should sovereign risks be borne by such organisations?

**Dr Clarke:** There are a number of challenges on sovereign risk financing. The first issue is that of demand. For governments to want to engage in these sorts of instruments, they have to understand them. This requires a lot of building in capacity for a new function of government, training people within government to understand how to make decisions about this. This is something that the World Bank has been doing quite a lot.

When it comes to the transactions, typically the risk is borne by international capital markets through cat swaps or by reinsurance companies. International institutions can be involved in intermediation. Ms Dana is involved in intermediation in quite a lot of these deals. At the World Bank, we would typically outsource the development of risk models to people who understand how to develop risk models.

Even within our team, most people have quite a lot of private sector experience. We have maybe seven or eight actuaries who work with us who have been trained and worked in the private sector for a while and now obviously working on capacity building and helping governments to make informed decisions.

**Ms Dana:** Our philosophy at the World Bank is absolutely key to our approach, and so far in the deals we have intermediated, we have transferred that risk to the private sector when it is appropriate. Our approach recognises that there is a demand side constraint and a supply side constraint to growth. We work closely with a number of big insurance companies and they are very interested in helping to develop this market. The catastrophe bond market is really growing. There is a lot of new investor interest coming in and seeing that market as a nice place for diversification. But you still have a massive gap between the market and countries that have never used these products, countries that do not have the regulatory frameworks. The insurance companies are not going to be able to spend the kind of money that is needed for that long-term business development, developing the models, helping decision makers get better equipped to make decisions. We are always trying to stand in the middle and bridge that gap from the capacity perspective, and this involves intermediation and using our balance sheet when we can. Absolutely, the idea is to help the market grow and to minimise that gap over time.

**Mrs K. A. Morgan, F.I.A.:** I was really interested to hear that local communities are setting up mutual insurance companies. I wondered if anyone was looking at what we could learn from past experience on mutuals? The impression I have is that quite a few were set up in the Victorian age. Are there any good or bad things that we can learn from that experience? Is this just developing in a completely new way, and they may make new mistakes and have new good experiences?

I wonder what kind of mechanisms are there for combating policyholder fraud? I imagine in a natural disaster there may be more scope for that. Also, what kinds of regulation will there be to combat the risk of insurance companies defrauding policyholders, which could also happen?

**Mr Muir-Wood:** One thing that I gathered from a conference I attended in the USA was that natural selection had been at work, in that there were a lot of small mutuals in the centre of America, but as you go towards the coast, especially towards the East Coast, they start to disappear. Close to the coasts they get hit by hurricanes, and get put out of business, because their exposures are too concentrated, while in the centre of the US, you only have tornadoes, and even a mutual of ten houses in a village is typically able to withstand a tornado.

So you do need to watch mutuals in terms of what is the landscape of risk. What causes highly correlated losses?

**Mr Dercon:** With ones I see emerging in Ethiopia, we are talking about really embryonic entities. Something that is quite well developed in Ethiopia is funeral societies. People at a time of a funeral put a bit of money together to pay for the funeral of any of the family members.

The way they seem to be developing as some kind of embryonic mutual company is that rather than doing it at the time of the funeral, they start paying it monthly and they start contributing and building up some of these funds.

Within these communities that we are seeing is they get quite big. What is quite interesting in this respect is that I do not think necessarily they are going to be building, growing and being the solution to everything. They are not very good for drought, which is what we definitely have in Ethiopia. In fact, we see them experimenting with trying to give protection to all kinds of things that they should probably not try to give protection for. There are groups that disappear.

What we have found from some research in which Dr Clarke and I have been involved is we can sell insurance to them. They start understanding insurance better because they are used to asking for premiums from each other, and they begin to have some basic understanding. Dr Clarke wrote us a beautiful mathematical model to show that was the case. They can overcome some of the problems because the products that we were offering had a lot of basis risk. A group could defuse some of that basis risk.

We saw in experiments (this was a randomised control trial) that offering this to these groups around the idea that you can defuse some of that risk better, they were buying much more insurance than any of the control groups we had.

Will I say that in due course we will have them like in the middle of the USA? I am not sure, but I see at least something emerging, which is quite interesting. The indigenous institutions that emerge are definitely an entry point for insurance activities.

**Mr Grenham:** There is also an issue of the capacity of the insurance regulators in these countries to regulate. So, maybe there is an educational piece of work that the PRA could do elsewhere.

**Question from a member of the audience:** Is there any role for an insurance company equivalent of the World Bank? Is there any role for some sort of premium matching, perhaps funded from the

charitable aid budgets of the major sovereigns, as an incentive to those third-world countries not having sufficient understanding to purchase insurance or not sufficiently valuing the protection offered by insurance?

**Dr Clarke:** This issue of a World Re or some sort of global reinsurance company for development has been kicked around for a very long time in the disaster field, and also in the agricultural insurance sphere. Something like it has been done on a country level basis, where you might have some risk retention that is financed by donors. An example would be Mongolia, where 16% of herders have insurance against really extreme winters. There the government bears some risk. Originally, it was financed through the World Bank who supported this risk retention.

This issue of premium subsidy is, in general, reducing the cost of insurance. It is something that we think an awful lot about. I have done a lot of work in India on agricultural insurance. There, the government pays 50% of the premiums and carry out the investment in the data. They also make it compulsory if you take out a loan for agricultural production purposes. That is how they get their scale and that is also how they stop people from being angry at having to pay 10% and add it on to their loan.

The government of Turkey have set up a system for insurance for home owners. They do not provide support for premiums, but they have made all sorts of investments such as in data and in systems that do ultimately reduce the cost. The issue of reducing the cost is both interesting and tricky.

There are also related discussions on climate change as to whether there should be some sort of reinsurance type facility for implementing the mechanism to redistribute to people who have been hit by climate change as opposed to people who have caused climate change.

There are lot of discussions but at the moment there is no World Re. We have been doing a lot of work on risk financing, data, reducing the ultimate cost to policyholders as a way of stimulating markets and trying to ensure people are covered.

It is all very well designing an insurance programme, but if no one is buying it, then no one is protected and ultimately, there is not much point. We need to try to ensure people are protected.

**Mr Grenham:** Mr Bevan, what do you think the impact would be if someone promised that if you buy insurance they will pay half the premium (so subsidised by half say from someone external to the country) from the point of view of a sovereign state's budget, and how it would perhaps allocate its budget?

**Mr D. Bevan:** I guess the same calculation would have to be made as in the absence of that offer. Is half the premium worth paying, given the benefits you are going to obtain? If you subsidise the premium sufficiently, a point is bound to come at which it is worth accepting. Half sounds pretty good but maybe they might bargain for more.

The real issue is trying to assess what they would do otherwise. The problem, essentially, is that governments are very, very imperfect institutions. While economists very often talk about best practice, best practice is very often a long way away from what happens.

If there is not an insurance arrangement in place, and the country is hit by disaster, what tends to happen is not that the fiscal deficit increases or foreign borrowing takes place. The bulk of the

response tends to be reallocation of existing expenditures. The problem with that is that the way in which these reallocations take place is systematic but it is very far from being optimal.

Government wage bills are pretty incompressible. Short of outright default, government debt service payments are pretty incompressible. The part of the budget that is compressible is expenditures on goods and services. Essentially, what tends to be reallocated away is the capital budget or the operations and maintenance budget. This may be extremely costly to growth prospects.

It is very likely that the costs that are associated with not having some sort of premium in place is that we have really rather random and very expensive cuts in other forms of expenditure. The trouble is the information on what happens is very, very poor, so it is very hard to reconstruct what happens.

The short answer is exactly the same calculation will have to take place, looking at what else you would be doing and how damaging those other actions would be. And set that against whatever the net premium would be.

It seems to me very unlikely if anything approaching an actuarially fair premium, let alone a subsidised one, could be engineered, then it is very likely to be a good buy because the damage done by reallocations is almost certainly very high indeed. You are not just able to say, there is a component of public expenditure, which is on the margin of not being worth doing at all and so that is the one I will cut. It does not work like that. What you may be cutting may be exactly the things that are going to underpin the future performance and growth of the economy. So there may be a very serious downstream cost to having to reallocate to meet the disaster expenditures.

**Mr T. J. Llanwarne, F.I.A.:** I am very pleased that GAD has been able to support DFID in these initiatives, and to support the World Bank because, I am very much a fan of this sort of thing. I want you to do really well and to succeed. I wish you the best.

What is it you would like from the actuaries to make this even more of a success, particularly in relation to, say, the actuaries working in insurance in the private sector? That is something, which might provoke some further questions or give some real value to your particular initiative here.

**Dr Clarke:** There are three phases in this project. In the second phase, we are going to be choosing five countries, five programmes and doing appraisals. The World Bank is going to be commissioning somebody to do this work. As it stands at the moment, I do not know who is going to be bidding for these contracts. As I see it, it could be led by a risk modelling firm, which brings in economic and actuarial expertise. It could be led by a research consortium, which brings in risk modelling and actuarial expertise. It could be led by an actuarial consultancy or a brokerage firm, which brings in risk modelling and development economics expertise.

My sense is that actuaries have a key role to play. Whether actuaries are leading or whether actuaries are providing advice is something that we should like to try to experiment with and find out over the next couple of years.

Some of our issues are very actuarial issues, and I would be very interested to hear from members who are interested in looking at these issues a little bit more. There are some issues which might be of technical interest to actuaries and we would welcome input from the actuarial profession and from members more generally.



**Mr Dercon:** Let me be a little bit more general in terms of, say, from the point of view of DFID. My experience in dealing with actuaries makes me hopeful that there are many more that can help us. We should never underestimate, as seen from the point of view of developing countries, how limited the capacity is for them to be able to judge the value and the quality of what is being offered to them.

There is a real case here that help can be offered (and thinking also from private insurance companies) to these countries. There is a real capacity problem in terms of judging properly what comes into these places. Are the markets being developed? Are the markets being developed in the right sort of way? What is it in terms of regulation? What needs to be done, and so on?

I think actuaries bring honest and clear judgement. Very precise and very clear expertise in judging the value of a proposition. Hopefully what we can build more on is actuaries helping us to judge some of the positions that are being made for these countries.

What is the value for money of some of these propositions at this time of their development? I cannot be more concrete, but there seems to be many cases where we are being asked from governments in certain countries if this a good idea? It is so clear that they found it extremely hard to judge some of the things. Anything that can help in that domain would be very helpful.

**Mr P. J. H. Smith, F.I.A.:** I can see very clearly that DFID needs a sensible way of deciding how to allocate money between health and disaster relief. I am very impressed by the scope of what you are doing.

I have some insight into the issues involved in catastrophe modelling. But I can see the other side, which is modelling organisational response and human response, may be far more difficult.

I can see that you might find that you have such a wide range of feasible parameters that you can almost justify any resource allocation.

Are you at this stage reasonably confident that you will be able to develop some credible modelling, not least with issues surrounding outsourcing and model building?

If you have a thing, which you believe is credible, do you think that you will be able to explain sufficiently clearly, the modelling and issues involved to the decision makers?

**Mr Muir-Wood:** I think you are making a distinction between two kinds of modelling.

**Mr Grenham:** Out of all of the papers, the Government Actuary's Department did a couple, and one was precisely on this idea of how do you report the results of this sort of analysis to government, because they are the ones who have to make the decision. They are not experts in the details of catastrophe models.

This is one of the areas where actuaries can bring skills and communicate complex issues and uncertainty in a way that it is hopefully non-experts are able to understand.

As regards the modelling of behaviour, that is a good point.

**Ms Dana:** It certainly is quite hard but I do not think that it is a completely lost cause. We have been working with a number of mostly middle income countries over the past 20 years, which have

rapidly scaled up capacity in debt management and in asset management. Ministries of finance and central banks know how to assess risk and how to implement risk management strategies. They know cost/risk trade-offs. Certainly, the catastrophe risk part of it is quite technical and adds a new dimension.

However, when we talk to ministries of finance and say “The principles of this risk management issue are fundamentally the same as what you are doing when you are modelling interest rate shocks”, there are some synergies there. When those functions come together, it is an easier conversation.

So I do not think that it is completely hopeless, although it is very, very hard in countries with a much lower capacity. There obviously is a scale that runs across countries, somewhere capacity is quite low, and others where it is high. Over time we look to strengthen that capacity across the board.

**Mr Dercon:** I see it from the point of view of my organisation, from DFID. We have multiple layers of people involved in decision making. We have advisers at various level that advise other levels, all the way up to ministers and secretaries of state.

In the experience that we have had in trying to assess the value proposition of the Africa Risk Capacity initiative, it was something that we had to start thinking through. We have to start thinking through the impact that it will have throughout and whether it is worth it from an actuarial point of view, it is a reasonably sensible model and, at the same time, what about the impact.

If we have to use quite a lot of parameters and the data is not very good, we have also to try to educate people to think about the problem properly. In a way, it has proved to be extremely useful to those who were more technically inclined, to make sure that they were focusing on the really serious technical issues so that they could inform those who are less technical in other layers of the decision-making process to say that there are a couple of key issues.

Some of the results of quite difficult modelling work, ended up all the way up to the Secretary of State. We had to find a way of articulating what were the kinds of likely value for money propositions that were implied by this work.

Mr Grenham is implying that this is quite hard work but very important work, doing the modelling as carefully as you can with the assumptions that you have, but then helping to translate it upwards to help the decision makers.

Those at the top say, “It is always going to be too difficult, so ignore it. Let us not do it”. I think that it is really worthwhile doing. There are lots of reasonable people who really want to make decisions on real evidence-based grounds and finding ways of translating models to people who use them. There are definitely many opportunities.

So I am positive that we can use it. Let us not say that in the end we are going to get the Secretary of State to read all these kinds of reports, but we will use it to inform the decisions and the advice that goes up.

**Mr Bevan:** The question had a lot of different parts to it. The panel has already talked about the technical modelling side. The behavioural side was mentioned.

For the behavioural side, there are really two different components to be considered. One is the modelling of the behaviour of private agents on which we have a lot of evidence. It is incomplete but there is a great deal of evidence available on how private agents jump in these sorts of circumstances, and we can construct a certain amount of evidence as to how they jump in the event that things are different because they are insured.

There is quite a lot of material there. What is more difficult is the modelling of the government. As I said before, we like to pretend that governments are benign agents acting on behalf of us all, taking the technically most informed decisions. Obviously, that is not true. They make all sorts of mistakes. They get the wrong end of the stick and are not coherent. It usually consists of quite a lot of different bits, which are sometimes in conflict.

So we have this rather awkward double business of trying to think of ways of setting up an institutional framework and advising a government on how to use it, while also recognising that they are flawed institutions which, in some sense, we need to model in a positive way as well. That is more difficult. There is much less evidence on how governments jump, partly because their own reporting systems are very inadequate.

**Ms Parikh:** I was intrigued by your comments in relation to people self-insuring in very poor countries by means of having cows and chickens.

I am not sure whether there has been any research on it to say whether that is an efficient use of their limited resources because animals will need feeding and that is a very indirect way of having some kind of insurance if, say, there is a famine, particularly if the animals need veterinary care and any other kind of looking after.

I am also interested in any research on herd size that was mentioned.

**Mr Dercon:** We should first make a distinction. When Dr Clarke was talking about the pastoralist or semi-pastoralist environment, we talk about their productive assets. Obviously, there is going to be something almost biological in that we have to have a minimum herd size for the animals to successfully procreate, helping to build up a herd in the usual way.

On the other hand, their productive assets are their livelihood. They are their capital goods, which they need for their production.

Your first intuition is totally right. This is a very inefficient way of trying to deal with risk if you have no insurance and if you have terrible credit markets.

My PhD in the 1980s was working in Tanzania. This is basically traditional, in the context where there was no credit market development, there was no insurance market development. Assets were not just productive assets, they were fundamentally used as a way of saving because there was no postal saving – there were no savings whatsoever. There was a saying in that particular community in Tanzania “Shillings do not breed”. They were working in a very inflationary environment. The animals were the only savings product that they had.

It is a very inefficient way of doing it, and it leads very naturally to trying to think about what are the efficiency gains from developing markets, both initially and also for the livestock market and of course the financial market and the insurance market.

**Dr Clarke:** People who have to be good at risk management are often pretty good at risk management. They will think about these things and they will do very clever, very complex, things in terms of risk pooling. They cannot really do very much against these big disasters involving everyone in the community at the same time. This is where formal financial sector products, government and financial markets, can really add a lot of value. There are not really any other ways. They can send children to cities or send them overseas, but sending people geographically away and into different industries is probably the only thing that they can try to do to reduce their dependence.

There were no further contributions and Mr Grenham declared the meeting closed.