

REFLECTIONS ON THE FUTURE

Climate Change and its impacts on the insurance industry

**A presentation to the
Institute for Catastrophic Loss Reduction**

By

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Reflections On The Future – Climate Change

And Its Impacts On The Insurance Industry(Slide 1)

I would like to thank the Institute for Catastrophic Loss Reduction for the opportunity to round off my circle in reinsurance with a certain symmetry. Shortly after I began in this business there was a huge storm on the other side of the Atlantic which both rocked the industry and piqued my interest in natural disasters. That storm, was Hurricane Betsy. And shortly before I finish my time in reinsurance, there were huge storms on the other side of the Atlantic which reinforced my belief that while mother nature teaches us lessons, we can at times be obtuse and slow learning students. These storms, were Lothar and Martin.

Today we know about El Niño and La Niña, but back in 1965, at the time of Betsy, a storm was a storm. Ever a curious person (and you can take that whichever way you want) I tried to find relationships between the frequency and severity of hurricanes and outside indicators. One which surprised me was the correlation of hurricane activity and the price of anchovies! It was not until years later that it became evident that there was a direct link to El Niño/La Niña. As the sea temperature of the coast of Peru changed, the anchovies thrived or dwindled in numbers followed closely by changes in hurricane activity. Nowadays, of course, we think we know far more about climate science.

That's really just a background aside to the main thrust of my presentation this afternoon. What I propose to do is to(Slide 2) go through some of the up to date science and projections, look at global impacts, Canadian impacts, how they will affect the insurance industry and finally look at the current loss occurrence definition and state of industry data. I think it is also important to note that for the insurance industry it is to a large

extent immaterial whether the climate is warming naturally or being affected by anthropogenic activities – we are hit just the same!

I will turn now to the science and observation of Climate change and begin by looking at how accurate the forecasting is. This map (Slide 3) shows a comparison of modeled and actual Global temperatures from last December, January and February in which you can see a very close relationship in most areas. I think this gives a fairly clear indication that the science of climate prediction is not totally out of step with what actually occurs. The next chart (Slide 4) is actual temperatures over the past centuries and projections into 2020. It is important at this point to separate out the natural causes and manmade impacts. And the extent to which it is a natural warming is shown on the next slide (Slide 5) which graphically indicates the positive heating impact of solar forces and the negative impact of volcanic activity. You can see quite clearly the effect of Mount Pinatubo in the late 1990's. And to what extent are humans affecting the climate? The answer is in the next slide (Slide 5) and following one (Slide 6) shows where we are going when these impacts are combined. If, we assume no change in the current trends of green house gas emissions nor in natural activity, by the end of this century we are going to be looking at a significant change in global surface temperatures, as shown here (Slides 8 to 10), with a major impact being the rise in global sea levels to the extent indicated here(Slide 11). I would comment that already we have seen the disappearance of the first small inhabited island, in Kiribati, through a rise in sea level. It is not surprising that there is a group called OASIS, which is the organization of small island states, who are all at risk if there is a noticeable increase in Global sea levels.

So on a Global scale the impacts we can expect include the following (Slide 12):

I have commented briefly on sea level rise and its impact will be felt from the Pacific to Europe. Low-lying areas, such as the Netherlands, London, parts of the US and elsewhere will be vulnerable to extreme flooding; rises in the saline water tables will render much land around the world unfit for cultivation. As we have seen in recent years (and I am glad to see the end of the 90's – the International Decade for Natural Disaster

Reduction – which has seen more and worse disasters than any other decade) there is definitely an increase in the severity and frequency of climate-linked natural disasters.

There are health impacts with unsafe water after heavy rainfall and the spread of diseases as insects move northerly with rising temperatures. Droughts will become more common and we are seeing this in Kenya, Ethiopia, and parts of the US (Florida). With droughts will come localized famines and the overall combination will be to create a huge increase in the worldwide number of environmental refugees. I don't propose to go into listings of catastrophes and frequency since much of that information is frequently published elsewhere but I think it is instructive to look at what we saw in the last year of the millennium (Slide 13) which was the largest annual number of natural catastrophes, the second highest insured loss numbers and the highest non earthquake induced economic losses. Is this going to be a foretaste for the next thousand years?

I would like to move now from the global into a more regional ie North American and specifically Canadian view points, look at some of the projected changes which we will see in our part of the world. The next three slides (Slides 14-16) show projected changes in temperature over 30, 60 and 100 years followed by (Slide 17) the projected winter temperature changes and (Slide 18) summer temperature changes over the next hundred years. What is very, very clear from these slides is the greatest degree of change is going to be in the more northerly portions of our country which will bring about, as I will explain later, significant exposures to our industry.

With climate change come changes in precipitation and the next five slides (Slides 19-23) show projections for the annual precipitation changes between 1975-95 period and 30, 60 and 100 years from now with a further breakdown at the 100 years level of winter and summer precipitation. It is interesting to note that the projected precipitation changes overall in Canada are relatively limited in the earlier stages, although by the 100 years forecast we are looking at significant changes, but the extremes of precipitations will be quite marked.

What will also have an impact on our industry, and I mentioned it in the global impacts as well are the regional changes in sea levels (Slide 24) where the eastern Pacific, touching on our West Coast is projected to rise by over 60 cms within the next 100 years, the Northwest Atlantic by 40 cms and the Arctic Ocean by a little under 10 cms.

I mentioned the changes in extreme precipitations and it is interesting to look at the projected changes in not only precipitations but also in temperatures extremes as these will bring both benefits and deleterious effects. The next chart (Slide 25) shows projected changes in extreme minimum temperatures in Canada over the next 90 years from which you will note that what is currently a ten year extreme low temperature will become less than a once in 80 years occurrence by the year 2090. Not surprisingly we see an inverse effect in the projected maximum temperatures (Slide 26) where what is an 80 year maximum now becomes less than a 10 year return period. Similarly with extreme precipitation events (Slide 27) what used to be an 80 year event will now become somewhere between a 20 and 40 year event, which has substantial consequences for infrastructure design and insurance exposure.

What we, living down here in the South, sometimes do not realize are the massive changes which are taking place in our more northerly areas. The next slide (Slide 28) shows what changes on the distribution of permafrost around Fort Simpson a one degree increase in the average temperature would have. The white areas are permafrost and you can see from the right hand side of the slide that this would almost disappear with a single degree of warming. We are also seeing a major change in the Arctic sea ice melt season (Slide 29), where it is increasing at a rate of about half a day a year which is an incredible change in the length of the season. In 1980 it was about 60 days a year where melting would occur, by the year 2000 it is slightly in excess of 70 days a year. This is obviously having impacts on the Arctic sea ice cover (Slide 30) and NASA satellite data show a 3% decrease per decade from 1978 to 1996 in the area of Arctic sea ice and, if this trend continues by the year 2100 we will have about 40% of the current ice cover.

As we can see in the next slide (Slide 31) the loss in ice cover is not just in total area but also in the depth of ice where, going through from the Chuckchi Basin on an easterly

route through to the eastern Arctic we are seeing approximately a halving of the depth of sea ice in the period of 1993 to 1997 compared with the average of 1950 to 1976.

The implications of this, as you can see from the map on the next slide (Slide 32), are huge indeed for Canada. We are looking within the next thirty years at a probable opening of the North West passage as a trade route for shipping and, as you can see from the globe in the top left, the distance from Europe to Asia is about half of that currently forced upon vessels by having to go down through the Panama Canal and then back up again. It would be enormous savings in fuel but also enormous exposures when, as marine experts forecast, some thirty vessels a day would be transiting the Northwest passage. It also raises very serious concerns for Canada's sovereignty as the US has never recognized Canadian sovereignty over this waterway and also, if we take the precedence of the Malacca Straits by Malaysia, this is deemed to be an international waterway and Malaysia has no control whatsoever of the vessels going through that waterway. I will come back a little bit later to the insurance implications of this scenario.

I would like to move on now to what the result of these projected changes will be on Canada and Canadians. The impacts on Canada will be far reaching and will have both beneficial and harmful effects. They will also touch on almost every single area of our daily existence. The following slide (Slide 33) shows some of these impacts.

We can expect substantial changes in the Boreal forest and large areas of forest decline due to firstly increasing temperatures and secondly the impact of more frequent and more devastating forest fires.

One of the benefits will be that there will be an overall decline in energy usage for heating and cooling as winters become much milder however this will have a serious effect on the profitability and employment aspects of the energy industry.

Agriculture will be affected by droughts and also by changes in the types of crop which farmers will be planting as they will need in some instances to switch to more drought

resistant crop and also crops which are capable of withstanding higher temperatures than those currently considered normal across the country.

With shorter winters there will be reduction in land-based transportation costs, the shipping season will be lengthened as the lakes and seaway have longer ice free periods but counterbalancing this we will see the impact of lower water levels.

Within the built environment we will have a much longer summer construction season, which should reduce costs, decreased snow load requirements but increased wind loadings as storm frequency heightens.

One of the most troubling areas will be in that of human health where we will continue to see an increase in respiratory disorders (particularly if little is done to address the smog issue which affects so many of our major cities already) there will be more water contamination through bacteria, protozoa and parasites as we saw last year in Collingwood with the cryptosporidium infestation and, more tragically, a month ago in Walkerton with the e-coli outbreak. We are also likely to see more environmental health refugees seeking asylum in Canada from other parts of the world which are becoming increasingly less hospitable to human habitation. We must also consider the Northward migration of tropical diseases which currently do not generally affect Canadians (other than travelers) and of particular concern was the incident last year when a Canadian who had never been out of the country contracted malaria from a mosquito bite in Western Canada.

We will also see significant changes in the fisheries with improved fishing in the north but lessened fishing in the Southern coastal and inland fisheries. John Fraser, a former Minister of Fisheries referred to this in an article in the Globe and Mail where one of the salmon run rivers in BC had seen the annual run drop from 2 million to three and a half thousand fish over the past decade.

Finally there will be a substantial impact on the recreation and tourism industry which is a major revenue generator for Canada. Diminished natural snow will affect both the

downhill and cross-country ski resort areas although to a certain extent that can be made up for by longer golf seasons. Mountain and coastal attractions are at risk – the former from reductions in snow pack, disappearance of glaciers and reduced river flows while the coastal attractions are threatened by increased sea levels. Changes such as this can put our tourism industry at great risk.

With all these changes what are the impacts going to be on our industry? There are many and I would like to look at a number of areas, some fairly obvious and some, perhaps, not so evident to a casual observer (Slide 34).

The first is severe weather which includes extremes of precipitation, tornadoes, hail etc. From the earlier slides you saw great changes in the return periods of what are currently considered extreme events (ie. with a return period of 80+ years), some dropping down to decadal events. This will mean increased rain fall and paradoxically increased drought. Unfortunately when heavy rain follows a lengthy dry spell the capacity of soil to absorb moisture is severely diminished and the result is extreme run off with floods and, at a minimum, sewer back-up. While flood is not covered under homeowners policies, it will become an increasing and more frequent threat to commercial property insurers.

We can also, with periods of greater heat and atmospheric instability, expect more tornadic activity as well as severe thunderstorms and hail. While these will be most evident in the historically active tornado areas – Alberta, across the Prairies and through Southwestern Ontario - with the increased heat we can expect tornadoes to occur in hitherto relatively tornado-free territory. It is not necessarily just the property side which will be affected by floods. After the Saguenay flood of 1996, water testing several months later showed very high levels of pollutants in the Saguenay river and field down into the St. Lawrence river. In the North Dakota flood, which preceded the major flooding in Southern Manitoba there were numerous oil, petroleum and chemical tanks torn away from their moorings or lifted bodily out of the ground and emptied into the water. What liability attaches to companies whose tanks are subsequently proven to have contaminated water supplies?

Still on the subject of water one of the phenomena that we have seen both in 1999 and also continuing into this year is extreme low water levels in most of the Great Lakes this year, only Lake Ontario being at above normal levels (and this is largely due to the closing of the dam near Cornwall) while the other four lakes are at levels which pose dangers to shipping. For those of you who write pleasure craft, I am sure that last year's experience in Lake Huron and Georgian Bay was not one you would wish to see repeated on a regular basis as levels some 40 to 50 cms below normal brought previously innocent rocks close enough to the surface that they became shipping hazards. I know a number of companies insuring pleasure craft who saw an incredible number of groundings by yachts and ripped off and destroyed motors on power boats. Unfortunately this year Lake Huron is even lower than last year. On commercial shipping there will be an increased number of voyages through the Great Lakes system in order to carry the same amount of cargo as the lower water levels force ships to carry lighter loads. With more voyages in shallower water again the likelihood of grounding incidents is vastly increased and it is highly likely that the loss ratio on Great Lakes hull business will increase.

I will return to an area of shipping concerns a little later but, still staying with water, I think we have to face the very strong possibility of liability claims arising out of farming activity, the run off of cattle feces, either dropped into the fields or spread as manure, entering water courses after heavy rains, and polluting streams, rivers and wells used for drinking water purposes. It is certainly a possibility that this is one of the root causes behind the tragic event in Walkerton. With the greater likelihood of extreme precipitation events I think it is inevitable that we will have our attentions directed towards liabilities which, until recently, were probably far from everybody's mind.

I would like now to return to the issue I raised earlier related to the probable opening of the Northwest passage as a frequently used waterway. We are looking at as many as 30 vessels a day going through the passage and, realistically, Canada will have little control over the state of vessels going through. Can you imagine the devastation that could be caused by a pollution incident in these Arctic waters where, as we saw with the Exxon Valdez in the even warmer waters spilled oil quite simply will not break down in an Arctic climate and any pollution incident, which might be considered small in more open

waters, will have a devastating effect on the fish, wild life and native people in the area. The cost of clean-up would be absolutely phenomenal.

Talking of oil spills leads me quite naturally to the next area which is the oil and gas industry. Again going back to an earlier slide on the Changes and the Distribution of Permafrost, one of the major impacts is going to be on oil and gas pipe line installations running into the Northwest Territories where existing lines have been built on permafrost that has now become discontinuous. Permafrost is quite simply that – permanent frost which does not have a freezing thaw cycle. What we are seeing with the warming temperatures is a freezing and thaw cycle which creates frost heave and is likely to have an extremely damaging effect on pipe line installations. Exacerbating this problem and adding to the cost of repairs, one phenomenon that has become evident in the last five years is the disappearance of the ice highways which are used in the winter for transporting an enormous amount of material to remote oil and gas installations. The almost absence of winter that was seen last year meant that the ice roads could scarcely be used and much material had to be brought in by aircraft at substantially higher cost. In the event of insurance claims due to frost heave, the cost of repair could be multiplied to a level unanticipated by innocent underwriters. The extent to which this is already visible can be seen in Yellowknife where up to 30% of all buildings are suffering from dislocation and cracking because their foundations were built on permafrost and not taken down to bedrock which is approximately 30 feet below the permafrost. The cost of putting in foundations originally reaching down to bedrock would have been excessive and in any event many of the structures were built prior to these dangers of climate change being realized. Again for personal lines, this is not coverage which is normally given but I am quite sure that under many of the all risks policies written for commercial property, there will be coverage for events such as frost heave and damage caused through the changing climate up north.

Moving into a totally different area altogether, I believe that we will see increases in exposures on certain credit risks, particularly for export credit risks to many of the developing countries which, unfortunately, seem to be first in line when major disasters strike. The ability of many of these countries to service debts loads without the added

burden of increased frequency and severity of natural disasters is already limited. It would not take a very great stretch of the imagination to consider what would happen if these disasters continue unabated. We would almost certainly see quasi bankruptcies being declared by some countries, their ability to service debts having disappeared. In some instances, back to OASIS - the organization of small island states – the countries themselves might have disappeared!

I would also like to comment on a couple of aspects affecting land transportation which will have an impact on insurers and reinsurers but, I suspect, many of us do not think about. One example would be motorcycle coverage. The usual basis for rating motorcycles, certainly in Ontario and Eastern Canada, would be to charge an annual premium that reflects a realistic exposure of about 7 to 8 months motorcycling season. As we saw last winter and with the very warm weather that we had earlier in the year, this assumption is not necessarily realistic. I even saw motorcyclists out on the streets in Toronto late in February when normally you would expect the motorcycles to be stored away for the winter. If we are looking at one more month of motorcycling becoming the norm then you are probably looking at an increased exposure of 12.5 to 15% without any additional premium. This is an issue which reinsurers writing motorcycles treaties might like to take up with their ceding companies!

In similar vein, milder winter weather tends to mean that there will be a greater amount of driving done, albeit in better driving conditions. However with the swift changes from warm winter days back to more normal temperatures and precipitations the likelihood of increased accident frequency becomes quite apparent. This was certainly very visible in the Alberta statistics for the first three months of this year when accident frequency went surprisingly high in comparison with other years but a check on the comparable temperatures showed that driving conditions were generally far more favourable than to be expected in a normal winter which meant heightened driving activity. And you probably all thought that regular winter driving conditions gave you more accidents!

The final item that I will look at with respect to direct insurance impacts is agriculture. I believe that there are a number of climate change related impacts which will have

significant effects on agriculture across the country; we can expect a greater frequency of drought with the deduction in crop yields; we can expect greater extreme precipitation events both in damaging rainfall which could very well prevent the crops from being put in the first place or potentially that crops would rot out through excessive moisture while growing, and also the likelihood of more frequent hail events. As the temperatures generally warm up, crops which currently do well in a Canadian climate could find themselves under stress and there will be a gradual switch into some new and untested crops for the Canadian market with the risk to insurers and reinsurers of not getting the rating right on untested crops. There is also exposure to the northward migration of pests that currently do not appear in Canada and finally we will have, with the temperatures warming, an expansion of the growing area further north in Alberta, Saskatchewan and Manitoba where the potential exists for greater extremes of temperatures at the beginning and end of the growing season with possibly damaging frost.

Coming towards the end of this presentation, there are two topics I would like to touch on (Slide 37) wordings and statistics. I would first like to move to an area which I think needs addressing as the events which we will be seeing under climate change scenarios that I have outlined are such that existing contract wordings probably do not fully take them into consideration. Specifically I would like to look at the standard “hours clause” which we see in every single catastrophe contract – certainly every single catastrophe contract that I have on my books. I am not asking you to study this entire clause but as you can see from these two slides (Slides 38-39), the definitions of 72 and 168 hours events do bring some challenges with the new types of climate induced events that we will be seeing. As an example I would look at the wildfires in Los Alamos, New Mexico although these were man made – an oxymoronic “controlled burn” - they could equally have been caused by lightning strike. Speaking as an individual and not as an exposed reinsurer, I think it is very clear that from the start to the finish of the Los Alamos wildfire, which took somewhat over two and half weeks, you could very clearly state that this was one single continuous event. If you look at the frequency of wildfire and forest fire activity across Canada over the last few years, it is very clear that this is a growing problem which, at some point, is going to have to be addressed within our contracts in a fashion which will meet both the expectations and needs of ceding

companies without necessarily driving reinsurers into bankruptcy. As it stands now the Los Alamos fire would be limited to a 168 hours event.

Moving much closer to home we have the timely example of the 1998 ice storm affecting Ontario, Quebec and the Maritimes. This again was an event which stretched out over a period of two weeks (or even more in certain instances), but which could be allocated essentially to a single cause. I think it is fair to say that there was not equal treatment by all reinsurers of all ceding companies; and there was not equal treatment of reinsurers by all ceding companies. There were problems with the time definition of the event, with what was covered and what was not, although the Reinsurance Research Council did attempt to clarify some of these issues and the bulletin which they put out was generally well received.

In this problem of the definition of event we are trying to bring in into reinsurance contract language ideas of space and time which suffer from inexactitude and absence of formal definition. I think the industry would be well served to take a look at a proposal which was originally put forward in a Round Table study entitled Coping with Natural Hazards in Canada, (pages 111 – 119). I will not go into the proposal in detail here but one benefit was that, unlike our existing clauses, the catastrophe would be either one event or two events – it could never be both one and two as we saw in the Leamington and Barrie tornadoes.

This then leads me on to the final element in my presentation today and that is the absence of accurate industry catastrophe data and definitions. It is probably accurate to say that the only catastrophe which has occurred in the last thirty years in Canada where a realistic estimation of insured losses has been made is the Ontario/Quebec ice storm. This was of such magnitude that efforts were made to bring in all players in the market to find out the total extent of the damages. This included getting data from non IBC members and, to the best of my knowledge, this was the first time that this had ever been tried.

All other catastrophes which are listed in Insurance Facts contain either data purely from IBC members or from IBC members with an extrapolation made for the percentage of business which is not written by the IBC membership. At a time when the Insurance Bureau of Canada is making real headway in trying to persuade the Federal, Provincial and Municipal governments to put money into infrastructure projects which will reduce the cost of natural disasters in Canada, I find it ludicrous that we do not as an industry have an accurate measure of the past disasters which have taken place. I would very strongly urge there be a central repository for catastrophe loss information - and the most obvious place would be the Institute for Catastrophic Loss Reduction - to which all insurance companies licensed in the country would have to report gross and net losses following a named catastrophe. The individual data could be kept confidential and only aggregate data released. In this fashion we would be able to provide totally accurate numbers to the government and indeed back up the push for greater government involvement in the reduction of catastrophic losses. Allied to this is the absence of catastrophe naming. In the United States when a disaster exceeds I believe it is \$25 mn then it is designated a catastrophe and at that point loss information starts to be provided.

I believe that we can go somewhat further than that and set up a body which would not only identify the catastrophe but also define it. Such a group would probably consist of meteorologists, seismologists, representatives from the insurance industry and representatives from the reinsurance industry so that within a short time of a catastrophe occurring we would be able to designate the exact time period for the catastrophe, whether or not it was one or two events, and subsequently to total the insured losses from the event. I think we would all benefit from the establishment of such a committee.

I would like to thank you for your attention during this presentation and also the contributors to the slides (Slide 40) which have illuminated my address and I look forward to try to answer any questions you might have.

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Angus was born in India sometime during the first half of the last century and received a modicum of education and enlightenment in the Channel Islands and England. Seduced in 1964 by the glamour of “The City” he joined the M & G (when Swiss Re first owned them) in London and was transferred (some say “deported”) temporarily to Canada in 1967. On returning to the UK the following year, he found that England paled in comparison with the vast natural diversity of Canada and moved back here permanently at the beginning of 1969 with M & G Toronto. Three years later he forsook underwriting for a spell of broking Canadian and international reinsurance with BEP in Montreal before returning to underwriting with the National Re of Canada, where he turned down much of the business he had held out as being so attractive in the previous four years.

In 1978 bright lights beckoned again and he moved back to Toronto to open a new underwriting office for the National Re and remained there until the purchase of the portfolio by SOREMA S.A. in 1992 when he became their Chief Agent and subsequently Chief Agent for the US branch, SOREMA N.A., in 1998.

Over the years he has taken a keen interest in environmental issues and their impact on the insurance and reinsurance industries, ranging from pollution to climate change and has not been backward in putting his opinions forward in spoken or written form. Occasionally he has even been proved to be correct! The result of this publicity was more work. IBC called on him in 1993 to chair a special policy committee on environmental liability whose report was adopted by IBC in August of 1994 as “Improving the Climate for Insuring Environmental Risks”.

The following year, and notwithstanding his political beliefs, he was appointed by the Prime Minister to the National Round Table on the Environment and the Economy where he chaired a Financial Services task force examining contaminated site issues. This resulted in a State of the Debate Report entitled “Greening Canada’s Brownfield Sites” being published in 1998 and it is the top-selling NRTEE report. He was subsequently re-appointed to the Round Table for a further two-year term and is a member of the Economic Instruments Committee which makes “green” budget recommendations to the Minister of Finance. In 1998 he was also appointed to the Canadian Climate Programme Board, which is the coordinating mechanism for climate related activities in Canada. In June 2000, Angus was appointed to the Canadian Public Health Association’s steering committee to examine the impact of climate change on Canadians.

With plenty of time left over the years, he has also been very involved in the industry, including almost four years as Chair of the Reinsurance Research Council and a Director of IBC as well as a frequent speaker and author on industry and environmental topics. These include a presentation to the United Nations Environment Programme 3rd International Round Table on the role of financial institutions in effecting environmental change, and a briefing on climate change to the Federal and provincial ministers of the environment..

On June 30th this year he says goodbye to many of these activities and will switch to spending even more time with the family, sailing, canoeing, cross-country skiing and working on a number of environmental projects.