

The Insurance Industry and Climate Change on the Prairies

A Status Report

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Table of Contents

Executive Summary	3
Introduction	4
Insurance: How it Works	4
Climate Change on the Prairies and its Effect on the Insurance Industry	8
Climate on the Prairies	8
The Effect on the Insurance Industry	9
Actions by the Insurance Industry to Mitigate Climate Change	11
Recommendations	11
References	13

Executive Summary

The purpose of insurance is to reimburse individuals for losses on property, health, crops, life, etc. Insurance can generally be defined as provision against catastrophe and is the pooling of risk. Climate change poses a unique problem in assessing risk for the insurance industry. Characteristically the assessment of risk has been based on the assumption that events in the past adequately reflect what can be expected in the future. Climatologists are not convinced that the results of climate change can be predicted with any certainty and are of the opinion that calculations of climate change related risk should be based on expectations of the future not the past. In this regard, good scientific knowledge, in combination with engineering and financial analysis techniques are necessary.

General circulation models (GCMs)—which look to the future—imply warmer temperatures and decreased soil moisture with a doubling of the concentration of atmospheric carbon dioxide for the prairie region. With a greater expected frequency of climate related disasters on the prairies such as hail damage to crops and property, or crop failure due to drought, pests or storms, as well as direct and indirect health effects (like an increased incidence of allergy disorders) demand for insurance will increase. This demand for insurance will only be met if the global insurance market has the capacity to underwrite all the risk. Thus, insurance in the prairie region is not only affected by local events but also by climate catastrophes in the rest of the world, which also impact on the health of the industry as a whole. Insurance companies both in the prairies and across the globe will attempt to reduce their losses - and thus increase their capacity to underwrite risk - by increasing premiums, withdrawing coverage altogether, or by making the underwriting of risk conditional on certain actions being taken by the policy holder. If climate catastrophes were to escalate to the degree that the global insurance industry were to collapse it would have ramifications for individuals, the economy as a whole and financial markets too. Individuals would have to bear the entire financial burden of recovery, local economies would take longer to recover than usual and world financial markets would collapse since insurance companies invest heavily in them.

In light of the above, the author has made the following recommendations for further research and analysis:

- Understanding of climate variables and how they interact to influence weather and climate in the prairies needs to be deepened,
- More study needs to be done on the kinds of risk that insurance companies can expect to incur when covering climate related damages in the prairies,
- The links between scientific, financial and statistical analyses and the use of remote sensing and other techniques need to be developed in order for insurance companies to accurately assess their risk and project future losses, and
- The possible effects of climate change on the health of individuals in the prairies needs to be thought through.

“Climate change could bankrupt the industry”

— Frank Nutter, President of the Reinsurance Association of America in (Nutter, 1996)

Introduction

The insurance sector will be affected both by natural disasters and health concerns resulting from climate change. Weather and climate change are of interest to the insurance industry because they inflict damage on people's property, crops, or health. Through the pooling of funds, insurance companies are able to help individuals and commercial companies recover from their losses. This is especially important where the losses are too great to be absorbed by these individuals and companies.

The insurance industry is in the business of risk and works in the realm of uncertainty. Insurance companies attempt to quantify the probability that an uncertain event (like a tornado) will occur. Hence, risk is uncertainty quantified. Since the insurance industry has experience in quantifying uncertainty, it is not unduly challenged by the fact that climate change is uncertain. Rather, the industry is concerned with how the frequency of extreme weather events might change as a result of climate change, as well as the degree of damage that will result. Risk associated with climate change has to be assessed differently from the way in which the industry characteristically does this. Currently past occurrences of an event such as a flood have been used to help assess the risk of this same event happening in the future. The insurance industry can no longer assess risk based on past experience but has to look to expectations of the future. Comprehensive and accurate scientific knowledge is necessary if the insurance industry is to assess risk related to climate change and variability reliably.

Climate change is a global phenomenon and insurance is a global, as well as a local, market service. Therefore, the effects of climate change on the prairies on the insurance industry cannot be looked at in isolation of the rest of the market and the world. This paper is a literature review of papers, articles and newspaper clippings relating to climate change and the insurance industry in general with some application to the situation on the Canadian prairies. So far very little has been written pertaining specifically to the prairie case. In light of this fact, the author has concluded with some recommendations that could shed more light on this topic.

Insurance: How it Works

The sole purpose of insurance is to reimburse the insured for losses on property, health, crops, life etc. Insurance can generally be defined as provision against loss¹ i.e. in the event that the system is no longer able to handle the loss by its own means. Insurance is the pooling of risk in order to spread the losses of a few (individuals/companies). A number of individuals contribute financially to a pool of funds that can be used to reimburse the contributors for damages incurred. The idea of insurance is based on the assumption that the risk that all contributors will incur damages at the same time is low. In other words, each contributor helps the other contributor to recover financially from a loss that they would otherwise be unable to cope with individually. This principle can only work if the insured risks of the individual members of the insured community are

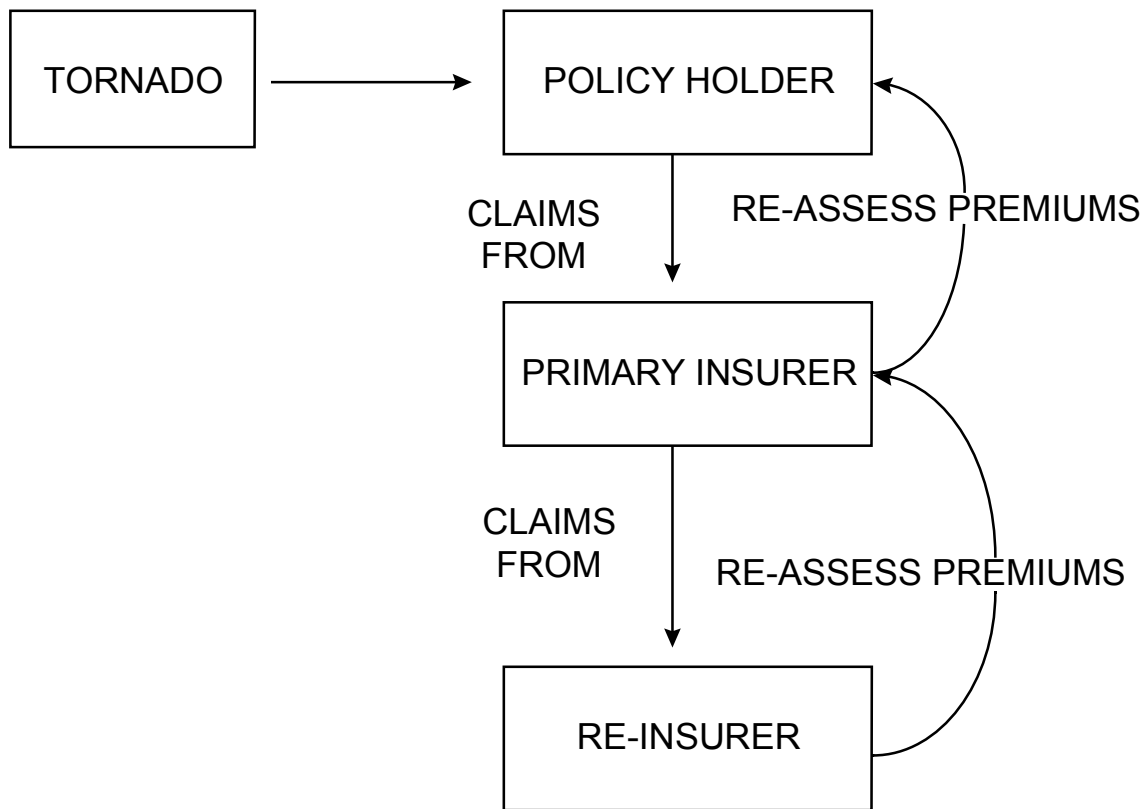
¹ Insurance effectively converts a loss into an expense consisting of a deductible and a premium. Hence, insurance is provision against any loss exceeding the deductible (Baker, pers. com.).

similar. The insurance industry maintains equity of risk by setting premiums accordingly (Baker, pers. com.; Greenpeace, 1996; Swiss Re, 1994).

The insurance sector consists of three main players: policyholders (the insured), primary insurers (insurance companies), and re-insurers (the insurance companies that insure the primary insurers). The interaction of these three players can be observed in diagram 1. Policyholders are confronted with the possibility of a loss (a tornado for example) and they approach a primary insurer to spread their risk of this happening for them. The primary insurer agrees as long as the policyholder is willing to pay the premium. This premium is set based on the insurance company's assessment of the risk that a tornado will actually take place, as well as the eventuality that the policy holder will be unable to cover the loss themselves. The higher the risk, the higher the premium. The primary insurer also takes out insurance against the possibility of its policyholders claiming a loss by paying a premium to a reinsurance company. The reinsurance company also sets its premiums based on the risk it expects is associated with the primary insurers claiming losses². When a policy holder claims a loss from a primary insurer, who consequently claims from the reinsurance company, the policy holder's premium is recalculated (in accordance with the terms of the policy) based on the new information and a new estimation of risk.

² At times re-insurers re-insure their own risk through a retrocessionaire, adding a fourth dimension to diagram 1.

Figure 1. Relationship among the three players in the insurance sector.



The degree of risk that insurance companies face is influenced by two factors: the probability that an event will occur (e.g. a tornado) which results in loss to the policy holder; and the probability that the policy holder will not be able to cover the economic loss associated with the event. Traditionally risk is calculated based on observations of the past. The more observations that have been made in the past the more accurate the calculation of the risk is. The accuracy of the risk calculation is also influenced by how well the interaction of all the variables is understood (Nutter, 1996; Swiss Re, 1994). Climate change poses a challenge to the insurance industry on both these fronts.

Weather is what happens locally at a given time, while climate is a statistical average of weather, usually made over a period of 30 years, though depending upon the application, this time period can be varied. Meteorologists are able to forecast the weather over the next couple of days with reasonable accuracy but are unable to make long range forecasts because of the chaotic nature of the atmosphere, as well as the number of variables that come into play³. For this reason, while climatologists have a specific idea of how the climate variables interplay, they are as yet unable to accurately predict the outcome. The results of climate change in the future are thus based on speculation rather than certainty. Weather records have also only been kept for too short a period of time to be able to say

³ Variables include: precipitation levels, atmospheric winds, ocean currents, sea surface temperature, greenhouse gas concentration in the atmosphere as well as their radiative properties, among others.

with any accuracy whether climate change is in fact occurring (Nutter, 1996; Swiss Re, 1994).

If climate is in fact changing (and insurance companies are considering it prudent to assume that it is (Nutter, 1996; UNEP I.I.I, 1996; Swiss Re, 1994; Leggett, 1993)) then assumptions about possible catastrophic weather events cannot be made based on past experience. So, insurance companies can no longer calculate risk based on historical data but should look to the future in calculating and mitigating risk. Good scientific knowledge, in combination with engineering and financial analysis techniques, is needed in this regard. Given that weather cannot be arbitrarily influenced by our actions either, the only possibility remaining in dealing with losses resulting from climate change is to reduce the scope of the damage. Insurance companies reduce the “scope” of their losses by increasing premiums and/or deductibles, reducing or withdrawing coverage altogether, or by making the underwriting of risk conditional on certain actions being taken by the policy holder (Nutter, 1996; Swiss Re, 1994; Deering, 1994). If catastrophic weather events become more frequent and possibly less predictable, insurance companies may be faced with no other choice but to withdraw coverage. This is especially true for policy holders who are located in vulnerable areas like coastal belts because sea levels are expected to rise and frequency and intensity of storms is expected to increase.

Globally, the insurance industry is dominated by four European and U.S. reinsurance companies. There are other reinsurance companies based in Australia and Japan but they do not play as large a role. The fact that the global reinsurance market is dominated by only four major companies is important for the industry as a whole regardless of where in the world primary insurers are located. The size of the global insurance market’s financial loss reserve is currently (US) \$160 billion a year. If the industry were to incur losses because of a hurricane in the Caribbean, mudslides in Mexico, and drought in the North American Great Plains simultaneously (i.e. in the same year), the chances are that the reserves would be depleted and the industry may not be able to cover all claims and could go bankrupt. Eugene Lecomte (in Deering, 1994), President of the Insurance Institute for Property Loss Reduction, states that two events could conceivably take away \$70-80 billion of the \$160 billion in surplus. If that happened, “you’d cripple the industry. It wouldn’t be able to take on new risks. It wouldn’t have the capacity to underwrite the future. We’d have massive, massive availability problems.” This is the kind of risk that the industry may be facing if climate change is happening, and especially if it were to happen rapidly (Knox, 1996; Greenpeace, 1996; Deering, 1994; Flavin, 1994; Leggett, 1993).

Climate Change on the Prairies and its Effect on the Insurance Industry

Climate on the Prairies

The Canadian prairies consist of the Manitoba lowlands, the Saskatchewan plains and the Alberta high plains. The soils in this region are highly suited to agriculture. For this reason, the region plays a major role in agriculture in Canada and international trade. Close to 40% of the prairie provinces' economic activity consists of primary agricultural production, with a large majority of other economic activity comprising the provision of inputs for agriculture, or transporting, marketing, or processing agricultural products. Thus the prairie economies are vulnerable to climatic conditions because agriculture is extremely vulnerable to climatic conditions (Cohen et al., 1992).

Prairie climatic conditions have always been varied and to a degree unpredictable. At its extremes the prairie climate is characterized by droughts and dry spells, early and late frosts, cold spells, excessive moisture and flooding. It is a climate of extremes with minimum temperatures dropping below -40°C in January and rising to a maximum of between 35°C and 40°C in July. Annual precipitation is between 250 and 450mm, with more than two thirds occurring during summer (May to August) months. Passages of cold fronts, depressions, and numerous storms generate strong winds throughout the year. Dust storms are frequent during drought years but have also been found to occur during relatively short-lived dry conditions (Jones, 1996; Cohen et al., 1992).

General Circulation Model (GCMs)⁴ scenarios for the prairie region all show an increase in temperature and reductions in soil moisture with a doubling of atmospheric carbon dioxide. Some models have shown an increase in precipitation and others have decreased precipitation. In both cases soil moisture is predicted to diminish due to high rates of evaporation over a longer period of time because of the large rises in temperature. During a typical summer, the prairies lose more water through evaporation than falls as rain making the region extremely dependent on winter snowfall to replenish losses. Droughts could become more frequent and severe as a result of lower soil moisture levels and lower precipitation levels (be it snow or rain). The loss of soil organic matter compounded by drier conditions will also lead to an increase in dust storms (Jones, 1996; Fosse & Changnon, 1993; Cohen et al., 1992).

⁴ GCMs most commonly used in Canadian studies are Environment Canada's second generation CCC GCMII, Princeton University's Geophysical Fluid Dynamic Laboratory (GFDL) GCM and NASA's Goddard Institute for Space Studies (GISS) GCM. Scenarios created using GCMs are usually based on a doubling of atmospheric carbon dioxide (Taylor, 1996).

The Effect on the Insurance Industry

As was mentioned above, the local insurance industry is part of a larger global market. So the insurance industry on the prairies will not only be affected by the effects of climate change within the region but also by climate catastrophes all over the world which will result in changes to their reinsurance rates and availability. As natural disasters such as windstorms, hailstorms and drought become more frequent and severe (as is conjectured), more and more policy holders on the prairies will be claiming from their insurance companies. If insurance companies have insufficient surplus funds to service the claims and insufficient insurance coverage of their own then they will go bankrupt. Smaller insurance companies are at greater risk of this happening. As smaller companies go under there will be fewer companies paying premiums to the re-insurers who are then able to underwrite less future risk of climate damage due to smaller reserves. In other words the industry as a whole becomes incapable of supporting more damage.

With a greater frequency of climate related disasters on the prairies such as hail damage to crops and property or crop failure due to drought, pests or storms, demand for insurance will increase. The 1988 drought is an example of this where demand for “rain insurance” in the northern Great Plains of the United States rose sharply as agricultural producers realized that it was going to be an unusually dry summer. This situation is also a good example of how insurance companies lost money - Federal Insurance Company lost \$20 million and CHUBB Corporation lost \$48 million in claims - because claims exceeded the amount that the insurance companies had been underwritten for (Changnon & Changnon, 1990). Despite rising demand for insurance which would result from an expectation on the part of individuals that climate change will lead to greater losses to property and crops, smaller insurance companies and policy holders may be unable to afford the higher premiums which will accompany the higher risk. Underwriters (re-insurers) may also be less willing to accept this risk (given that risk assessment relating to climate change is still in its infancy). Some companies may refuse to cover certain eventualities and others will increase the deductibles that policyholders have to bear before the insurance company will pay out a claim. In other words, the amount of insurance in comparison to the premium paid will decline (Fosse & Changnon, 1993). Crop insurance in the Canadian prairies is administered and supported by the three provincial governments. As such, producer premiums may increase, or taxpayers will be expected to carry the increased state expenditure on crop insurance. Alternatively, the increased expense may be shared by both the producer and the taxpayer.

An as yet little discussed sphere of insurance that could/will be affected by climate change is health and personal liability insurance. Direct health effects of climate change are anticipated to be increased mortality and illness due to expected increases in temperatures and duration of heat waves (Wheaton & Wittrock, 1992). Temperature induced death in colder regions should also lead to fewer cold-related deaths. Indirect health effects would be aggravated respiratory and allergic disorders spurred on by dust storms, the presence of air pollutants, pollens and moulds. Cancers (such as skin cancer) associated with ozone depletion and indirectly related to climate change are also expected

to increase in incidence (IPCC Working Group II, 1996; UNEP III, 1996). Health insurance will cost Canadians more in the future, either as taxpayers or as individuals. If the health safety net in Canada becomes a two tier system then those who can afford their own medical care and have any of these ailments can expect to be paying very high health insurance premiums (Baker, pers. com.).

The whole economy can be expected to suffer as a consequence of the effects of climate change on the insurance industry. Insurance companies invest their funds in the financial sector. If funds in the insurance industry decline due to bankruptcy or having to pay out large amounts of money in claims, less will be invested in the local and global financial markets. If the insurance industry were to collapse due to more than one major catastrophe the financial markets will collapse too as trillions of dollars are removed from the system (Knox, 1996; Nutter, 1996; Flavin, 1994; Leggett, 1993).

The economy is affected at a more local level too. If the insurance industry decides to solve its risk problem and vulnerability to climate change by refusing coverage then disaster victims will have to be carried by the taxpayer or individuals will have to pay the price themselves. In many cases this could mean the loss of everything. The unavailability of insurance coverage also makes it difficult for an economy to recover after a disaster as witnessed by the situation in Florida following Hurricane Hugo. Insurance coverage was withdrawn and lenders were unwilling to make the loans necessary for reconstruction without the availability of insurance. Even if insurance is available but the premiums have become exorbitant, then many new and existing business ventures will no longer be feasible because of high costs (IPCC Working Group II, 1996; Knox, 1996; Nutter, 1996; Deering, 1994; Flavin, 1994; Swiss Re, 1994).

Further socio-economic implications of climate change and its effects on the insurance industry are that the collapse of the insurance and financial sectors could lead to the loss of jobs (Nutter, 1996). Without adaptation on the part of all concerned it is possible that such a scenario could occur. Some hold even more drastic opinions of what will happen if we do not adapt and the possible effects of climate change are not built into the insurance industry's assessment of risk. Rudolf Kellenberger, a member of Swiss Re's executive board wrote in a Swiss Re report: "The more quickly and radically the global climate changes, the more extreme weather patterns could cause damage which not only pose a threat to individual citizens, families and enterprises but could jeopardize whole cities and branches of the economy—on a global scale—entire states and social systems." (Swiss Re, 1994). Economic devastation in general will lead to loss of livelihoods, poverty and in extreme cases homelessness.

Actions by the Insurance Industry to Mitigate Climate Change

The insurance industry is not taking the possibility of climate change lightly. In November 1995 the United Nations Environment Programme Insurance Initiative was launched with a Statement of Environmental Commitment by the Insurance Industry. This has been followed up by a position statement submitted by the industry to the Climate Change negotiations in Geneva, 9 July 1996. In this statement the industry calls for early and substantial reductions in greenhouse gas emissions; further scientific research that establishes what level of greenhouse gases is likely to be dangerous; the establishment of a transparent framework of political, social, and economic measures that will promote sustainable development while taking into account the risks of climate change; and the position of the insurance and reinsurance sector to be represented when discussing or negotiating possible solutions to the problem of climate change (UNEP III, 1996).

On less of a policy level and more of a practical level, some insurance companies have invested and are investing in environmentally safe technologies⁵ thereby creating a kind of climate venture fund. Another possibility is to disinvest in companies that contribute to greenhouse emissions. A precedent has been set for dumping stock in oil and coal companies for instance by health insurers who've sold their stock in tobacco companies. The industry is also lobbying for tighter building codes that improve energy efficiency and enable buildings to withstand the ravages of the weather (Deering, 1994; Flavin, 1994; Howard, 1995; Leggett, 1993).

Recommendations

As can be seen from the discussion above and the reference list, literature on the insurance industry and climate change on the prairies (especially the Canadian prairies) is limited if not non-existent. Also, the vast majority of the discussions focus only on property insurance. Since agriculture is one of the most important economic activities on the prairies, a greater understanding of the implications of climate change for the crop insurance industry is required. There is also very limited information about the interaction between health and climate change/variability. Impacts on health will inevitably be passed on to the insurance industry too. The greatest problem facing insurers right now - regardless of where in the world they operate - is that of assessing risk related to climate change.

Thus the author makes the following recommendations:

- 1) Understanding of climate variables and how they interact to influence weather and climate on the prairies needs to be deepened. This understanding needs to be differentiated across the region in recognition that weather and climate varies across the region and that different parts of the region will be affected differently. The resolution of

⁵ The Prudential has set a precedent in this regard. They invested US\$200 million in Lutz of California, the largest solar-thermal operator in the world before it became bankrupt in 1991 (Leggett, 1993).

current GCMs is still too coarse to be able to provide insurance companies with the kind of information that they need for setting fair and realistic premiums in the face of climate change.

2) More study needs to be done on the kinds of risk that insurance companies can expect to incur when covering climate related damages on the prairies. Can insurance companies expect to cover more hailstorms? Will drought become a more frequent factor to contend with? Are crops more susceptible to pests as a result of warmer weather? Will health ailments increase with higher temperatures and more dust storms etc.?

3) Scientific, financial, and statistical analyses and the use of remote sensing and other techniques have already been used individually by insurance companies in assessing risk related to weather events. However, developing the links between these methods and using them in conjunction will enable insurance companies to more accurately assess their risk and project future losses.

4) The possible effects of climate change on the health of individuals in the prairies needs to be thought through. This information should be built into any decisions that are made with regard to reforming the health system.

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