Weather and Climate Extremes 11 (2016) 70–79

Contents lists available at ScienceDirect

Weather and Climate Extremes

journal homepage: www.elsevier.com/locate/wace

Trends in weather related disasters – Consequences for insurers and society

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ARTICLE INFO

Article history:
Received 13 July 2015
Received in revised form
16 October 2015
Accepted 19 October 2015
Available online 31 October 2015

Keywords:
Disaster
Weather
Losses
Climate change
Economic impact

ABSTRACT

As extreme weather events affect the core business of insurance this industry has quite early addressed potential effects of natural climate cycles and global warming on natural catastrophe hazards. Munich Re's experts have been researching loss events caused by natural hazards around the globe for 40 years. These losses are documented in the NatCatSERVICE database currently documenting more than 36,000 single events. The analyses of the NatCatSERVICE data clearly show a high interannual variability, in some regions decadal oscillations, and a long term trend to an increase in the number of natural catastrophes around the globe, with ever growing losses. The trend curve indicating the number of loss relevant natural catastrophes worldwide reveals an increase by a factor of about three within the last 35 years.

As the rise in the number of natural catastrophes is predominantly attributable to weather-related events like storms and floods, with no relevant increase in geophysical events such as earthquakes, tsunamis, and volcanic eruptions, there is some justification in assuming that changes in the atmosphere, and global warming in particular, play a relevant role.

However, the main contribution to the upward trend of the losses caused by natural catastrophes comes from socio-economic/demographic factors such as population growth, ongoing urbanization and increasing values being exposed. Prevention measures, especially flood protection programs, on the other hand have a high potential to even reduce losses while the hazard has increased. Because of such factors influencing the loss trends a clear attribution of at least part of the effects to global warming is very difficult. There is, however, an increasing number of studies, which show significant increases in losses in some regions and for some perils even after they have been normalized to the exposed values today.

Looking at trends of extreme weather events and their effects, natural climate variability has to be considered. Short term oscillations such as ENSO as well as decadal oscillations in hurricane (Atlantic Multidecadal Oscillation) or typhoon activity (Pacific Decadal Oscillation) still play a dominant role on the variability of losses caused by weather extremes. As global warming will continue in the coming decades, its contribution to increasing natural catastrophe losses will become more prominent, a projection also given by the 5th assessment report of the Intergovernmental Panel on Climate Change (IPCC 2014).

As long as the risks from weather related disasters stay calculable and the insureds can afford a risk adequate premium there is no danger that such risks become uninsurable. Insurers, however, have to invest more resources into analyses of trends and have to assure that premiums for the risks they cover always reflect a dynamic hazard pattern.

There is no sensible way to interfere with natural climate oscillations influencing natural catastrophe losses. Humankind, however, still has the chance to avoid catastrophic increases of losses caused by global warming driven weather extremes by ambitious climate protection and adaptation measures.

1. Introduction

A disaster or catastrophe generally is defined as an event which is causing significant damages and losses to human belongings or humans itself. Therefore an extreme event like an earthquake or storm occurring in a region without human settlements never will be counted as a disaster. Some of the disasters cause primarily material losses, especially in the richer countries with precautionary life saving measures in operation, others in the poorer countries cause primarily human losses. In the emerging countries both material and human losses can reach significant levels as the exposed values

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http://dx.doi.org/10.1016/j.wace.2015.10.002

Table 1
Definitions of intensity classes of natural disasters as used in Munich Re NatCatSERVICE database in 2015. Monetary values are total economic losses in million US$. The factors between classes of different income groups are chosen approximately proportionally to the income group ratios defined by Worldbank.

Category	Cat-Class	Worldbank Income Groups				Number of fatalities
		High income	Upper middle income	Lower middle income	Low income	
		The threshold depends on the different stages of development				
Catastrophe	4	≥ 3.000	≥ 1.000	≥ 300	≥ 100	≥ 1,000
Major loss event	3	≥ 300	≥ 100	≥ 30	≥ 10	100 - 999
Medium loss event	2	≥ 30	≥ 10	≥ 3	≥ 1	10 - 99
Small loss event	1	≥ 3	≥ 1	≥0.3	≥ 0.1	1 - 9

are already high while precautionary measures have not been implemented yet. The loss data (both material and human) of natural disasters provide an independent source of information complementing the natural scientific data of meteorological or geophysical services. Especially for smaller and regional weather related events like thunderstorms they can provide additional information, when they have not been detected by the wide grid of routine meteorological measuring stations. This is not valid for the geophysical events as the seismic activity today is monitored in a worldwide network and every event, even below the threshold of a damaging level, is detected.

In countries with a high insurance penetration like in the ones in North America, Europe and parts of Asia losses caused by natural disasters have been documented for several decades. This is an important information and basis for the risk assessment process of the insurers and reinsurers. The data of insured losses are the most reliable natural catastrophe loss data available. The assessment of direct total economic losses, i.e. the costs to reconstruct, repair and replace the damaged infrastructure and private material losses, normally is based on assessment tools which comprise quite some uncertainties. The uncertainties rise even more when secondary economic losses occur like business interruptions, people leave permanently the region of the catastrophe (loss of labor) or tourists avoid the affected areas.

Munich Re, founded in 1880, is a leading global reinsurance company. The business model of a reinsurer is to cover parts of major risks from primary insurers which they cannot cover totally themselves because of lack of enough risk capital or because being confined to regional business activities they cannot diversify these with other risks in other regions. A relevant part of the risks covered by global reinsurers are the risks caused by natural perils. They have the potential to cause so called accumulation risks, which means that they can affect different insurance business lines at a time and thus generate very large insured losses. Munich Re has a long tradition to be a market leader in providing insurance cover for natural catastrophe risks and thus has built up unique expertise in assessing and managing these risks.

For more than 40 years natural scientists at Munich Re have been analyzing natural hazards and the losses they are causing. For this purpose, Munich Re has set up the NatCatSERVICE, the most comprehensive of the three existing global natural catastrophe loss databases (the other two are Sigma/Swiss Re and EmDat/CRED). The Munich Re NatCatSERVICE database currently comprises about 36,000 data sets of loss events caused by any kind of natural peril. It documents on a global level major events starting in 1950 and all loss relevant events from 1980 onwards, providing information on their effects on national economies, the insurance sector and the population. A stringent quality control system assures a high reliability of the data.

This paper has the objective to share insurance industry data on natural disaster losses with the scientific community and thus feed the scientific discussion on their trends and the processes behind them. Such knowledge is the basis for risk mitigation and prevention measures.

2. Methods

2.1. Datamanagement at Munich Re NatCatSERVICE – methodology

2.1.1. Event data

All loss events caused by natural hazards resulting in property damage and/or bodily injury are recorded in the NatCatSERVICE. The objective of an entry in the database is to describe a catastrophe as detailed as possible. A full entry record consists of up to 200 attributes. The following are the most important: Date and duration, categorization of peril, geographical information, humanitarian and monetary impact.

2.1.2. Catastrophe classes

Depending on their monetary or humanitarian impact, the documented events are classified into four classes, ranging from a natural occurrence with small economic impact (1) to a major natural catastrophe (4). The upper end of the scale includes the formerly used class of “great natural catastrophes”, which are part of event class 4. In line with definitions used by the United Nations, a “great natural catastrophe” clearly overstretches the affected region’s ability to help itself and interregional or international assistance is consequently required. As a rule, this will be the case when thousands are killed and hundreds of thousands are made homeless or if the overall loss reaches extreme dimensions, depending on the economic capacities and conditions of the country concerned. These great natural catastrophes can be used for long-term analyses starting in 1950 as such major disasters have always been reported in detail and the analysis is not distorted by a reporting bias. In Table 1 the four classes of loss events are defined, an additional class “0” for natural extreme events without noteworthy losses exists but these events are not considered in all further number statistics. The threshold values between classes 1 to 4 listed in this table are in million US$ and somewhat arbitrarily chosen and prone to potential further changes. More important are the ratios or factors between the same classes in countries with different income groups. Only by consequently applying these factors one can account for the fact that for example a 100 million dollar loss event in a developing