OPTIMAL MODEL FINANCIAL SOLUTIONS REALIZATION OF NATURAL DISASTERS IN THE CZECH REPUBLIC

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Abstract
To maintain financial health and development of communities and regions is also important optimally configured model solution implementation risks of catastrophic range. In the article, attention will be paid only the impacts of natural hazards. By disposing of catastrophic damage occurs in the Czech Republic to the resulting moral hazard due to information asymmetry, which is the financial services sector – insurance – sensitive. Article aims to design optimal, fair, model of financial solution implementation of natural disasters in the Czech Republic.

Key words: *natural disasters, commercial insurance, role of the state, catastrophic risk*

INTRODUCTION

To maintain financial health and development of communities and regions is also important optimally configured model solution implementation risks of catastrophic range. To understand this issue is also important single definition of "disaster/catastrophe" − this issue will focus attention on the first part of the article. Most insurers based on the definition of disaster/catastrophe by Swiss reinsurance SwissRe that this definition specifies every year. Disaster/catastrophe, according to the causes can be divided into man-made disasters and natural catastrophes. In the article, attention will be paid only the impacts of natural hazards.

In the world there are many of models dealing with damage caused by the natural hazards realization. These models will be, using selected criteria, analyzed in the second part of the article. The third part of the article will be devoted to analyzing the impact of the implementation of natural hazards in the Czech Republic and will also focus attention on the methods, which help with the implementation of the insurance market settled or still coping.

By disposing of catastrophic damage occurs in the Czech Republic to the resulting moral hazard due to information asymmetry, which is the financial services sector – insurance – sensitive. From experience, it is clear that at the municipal level there to make payments to "help", e.g. for the demolition of a natural disaster disrupted estate, regardless of whether the property was insured or not. Solution for damages incurred in the Czech Republic is very unsystematic. There is no single model solution such damage. When realizing the extent of catastrophic damage, the Government − according to the financial possibilities of the state budget − the decisions regarding financial aid affected communities and regions, regardless of the role played in resolving claims handling commercial insurance.

In the last 15 years, the territory of the Czech Republic repeatedly hit by large-scale natural disasters. The cost of repairing the damage lies with the insurance company, and in no small part to the state. State aid there is always ex post, ie after the disaster and missing system solution. In a number of EU countries (e.g. Germany, France and Spain) there are sophisticated systems that could provide a solution in the Czech Republic. To use foreign experience missing professionally processed comparative study that would provide both professional as well as political circles enabled progress in solving the problem. Article aims to design optimal, fair, model of financial solution implementation of natural disasters in the Czech Republic.

METHODS AND DATA

In the research were particular used scientific methods: induction, deduction, comparative analysis and synthesis of partial knowledge. The searches were used mainly professional study from OECD, Consorcio de Compensación de Seguros, MunichRe, SwissRe and other important resources. Due to the nature of the article was used secondary data taken from SwissRe.

1. DEFINITON, DEVELOPMENT, IMPACT AND MODELS OF CATASTROPHES/DISASTERS (RISKS)

1.1 Definition of Man-made Disasters and Natural Catastrophes

Disaster/catastrophe, according to the causes can be divided into man-made disasters and natural catastrophes. Man-made or technical disaster is triggered by human activities, the definition by SwissRe is (SwissRe 2014): "*This study categorises major events associated with human activities as 'man-made' or 'technical' disasters. Generally, a large object in a very limited space is affected, which is covered by a small number of insurance policies. War, civil war, and warlike events are excluded. sigma subdivides man-made disasters into the following categories: major fires and explosions, aviation and space disasters, shipping disasters, rail disasters, mining accidents, collapse of buildings/bridges, and miscellaneous (including terrorism).*"

Natural catastrophes is caused by natural forces, the definition by SwissRe is (SwissRe 2014): "*The term 'natural catastrophe' refers to an event caused by natural forces. Such an event generally results in a large number of individual losses involving many insurance policies. The scale of the losses resulting from a catastrophe depends not only on the severity of the natural forces concerned, but also on man-made factors, such as building design or the efficiency of disaster control in the afflicted region. In this sigma study, natural catastrophes are subdivided into the following categories: floods, storms, earthquakes, droughts/forest fires/heat waves, cold waves/frost, hail, tsunamis, and other natural catastrophes*."

According to the Koukal & Pošmourný (2005), most natural disasters are caused by four main causes, such as rapid mass movements (landslides, avalanches), releasing the energy of the earth (earthquakes, volcanic activity), increased water levels (floods, tsunamis) and balancing the temperature differences in the atmosphere (cyclones, hurricanes). In addition, the rise and fall of the disaster extraterrestrial body, the cause of which is therefore in the cosmos.

Categorize disasters summarized in his article Lahnstein (2005). At first divided the risks into four basic categories:

- natural hazards;
- technological risks, including the risks of infrastructure (transport by road, rail or air);
- social and political risks;
- purely financial risks.

Then also divided the damage into four categories, as follows:

- the damage to the environment;
- damage to health;
- damage to property;
- purely economic losses.

Also distinguished and length of scenarios:

- short period (industrial accidents, terrorism, etc.);
- Long term (soil and water pollution, climate change, etc.).

There are combinations and fluid transitions: accidents, events arising in the short term, can result in long-term damage, almost unlimited in the case of nuclear accidents, for example. A large number of individual accidents – such as leaks in industrial plants – can be seen as the result of one continued risk operation. The causes of an industrial fire may be specific to that industry, but they may also be sabotage or terrorism.

Next, look at the development of selected indicators in the implementation of risk catastrophic impact.

1.2 Development of Selected Indicators in the Implementation of Risk Catastrophic Impact

Insurance and individual insurance tend to focus only on the three risks (earthquakes, hurricanes and winter storms), as they have the greatest potential to create major damage or casualties. But other risks are capable of producing damage to a large area. These so-called secondary risks include floods, flash floods, torrential rains, storms, landslides, hail, tornadoes, snow and ice storms, drought or fires of forest. These risks do not have a lot of damage (SwissRe 2010), but it will appear with relatively high frequency. On average, 33 appear secondary disasters per year, compared to an average 6 primary disasters. Thus, even secondary risks have a significant impact on the amount of insured damage in a given year, as shown in Figure 1. Here are insured loss for the year in the period 1970−2009 divided the damage caused by primary and secondary risks. Unfortunately, although recent data are available, but do not include this analysis. Therefore, the analysis focuses on the time frame. The amount of damage is converted to the prices of 2009.

SwissRe determines each year the lower limit beyond which it is a disaster. SwissRe (2014) changes in the amount caused by the fact that each year these criteria adapted to inflation. Below is shown the development these criteria over the past five years.

Disaster could happen in 2019. (SwissRe 2010), an event that causes insured losses in excess of USD 17.1 million in maritime disasters, USD 34.3 million in the case of aviation, or 42.6 million USD in the other events. In the event that the total damage exceeds USD 86.5 million, then it is also a disaster. In addition to the amount of damage that disasters can be determined using the number of victims. The disaster is if there is a death or disappearance of at least 20 people, was injured more than 50 people or 2000 people homeless. Criteria for loss of life (death), injured or homeless remain unchanged.

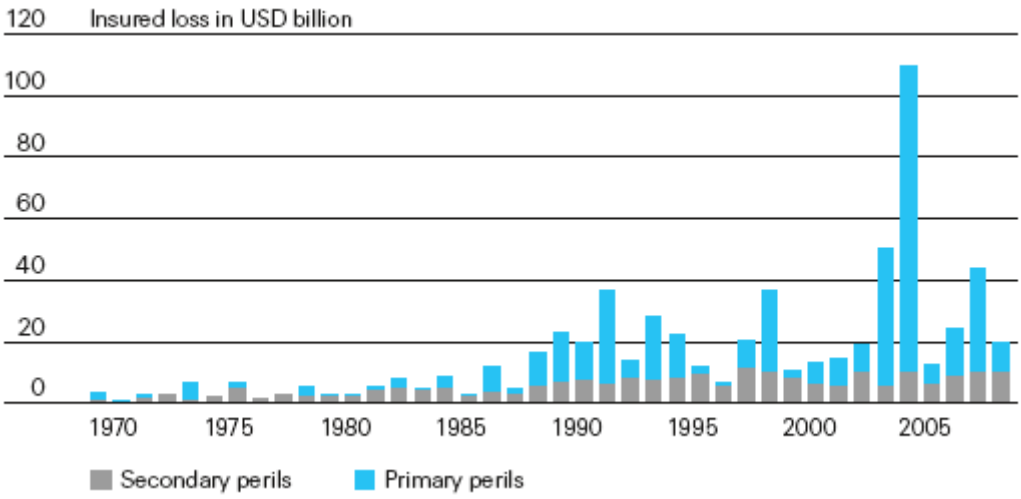

Figure 1: Insured damage by primary and secondary causes in the years 1970−2009

Source: SwissRe (2010)

For 2010 (SwissRe 2011), the threshold of disaster shifted upwards. In the case of insured damage to marine accidents must exceed the losses amounted to USD 17.4 million, the USD 34.8 million

aviation and other events of USD 43.3 million. Total damage must exceed USD 86.5 million. The boundaries of the perspective of the victims have not changed.

For 2011 (SwissRe 2012), the threshold of disaster shifted upwards. In the case of insured damage to marine accidents must exceed the losses amounted to USD 18 million, the USD 35.9 million aviation and other events of USD 44.6 million. Total damage must exceed USD 89.2 million. The boundaries of the perspective of the victims have not changed.

The following year (SwissRe 2013) the criteria disaster in terms of damage again changed. U maritime disasters must be the amount of insured damage at least USD 18.3 million, USD 36.7 million for aviation, other events or USD 45.5 million, the total amount of damages above USD 91.1 million. The lower limit of disasters in terms of casualties in 2012 remained unchanged.

For 2013 (SwissRe 2014), the threshold of disaster shifted upwards. In the case of insured damage to marine accidents must exceed the losses amounted to USD 19.3 million, the USD 38.6 million aviation and other events of USD 48 million. Total damage must exceed USD 96 million.

According to the OECD (2005) takes place in the last 30 years to increase the frequency of disasters and their consequential damages. The trend of increasing number of disasters can be seen in Figure 2, where a graph displaying the number of natural disasters from 1970 to 2013.

However, the number of victims is subject to significant fluctuations (SwissRe 2014). Fluctuation in 1970 was mainly caused by storms in Bangladesh and the earthquake in Peru. Another big blip came in 1976, when a large number of victims caused primarily by the earthquake in China. In 1991 there was a further significant increase in victims of natural disasters due to Gorky cyclone that hit Bangladesh. The earthquake and subsequent tsunami in the Indian Ocean in 2004 have significantly affected the number of victims. The same happened in 2008 in Myanmar in the wake of cyclone Nargis. The last big blip appeared in 2010 in connection with the earthquake in Haiti.

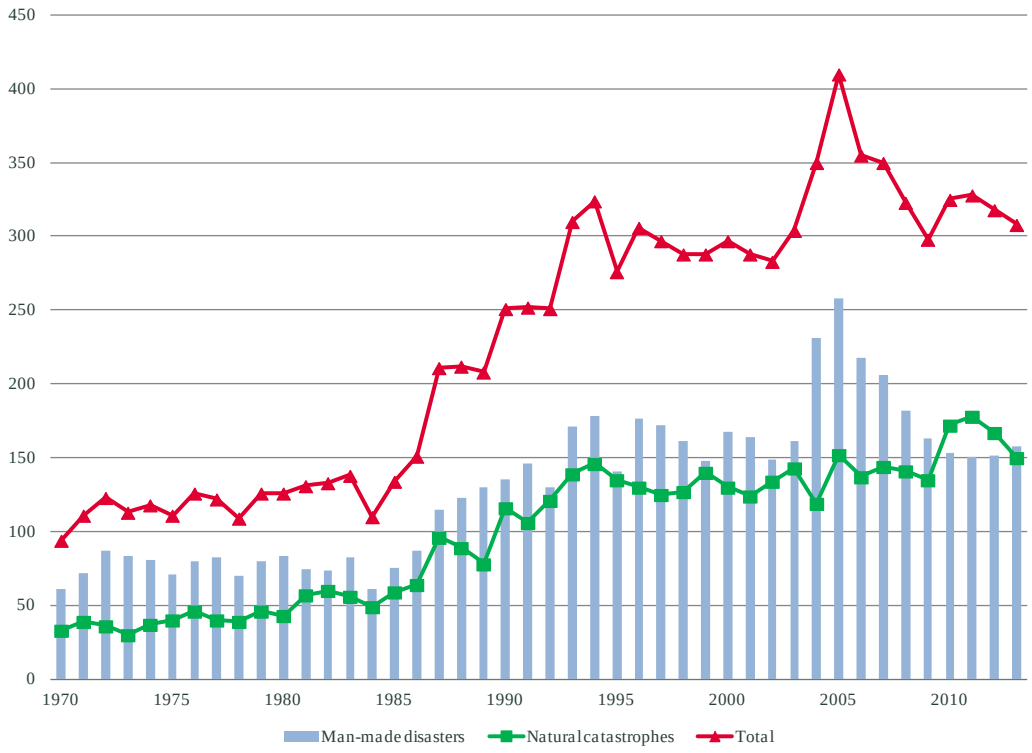

Figure 2: Development of the number of disasters in the years 1970−2013

Source: Own processing (SwissRe 2014)

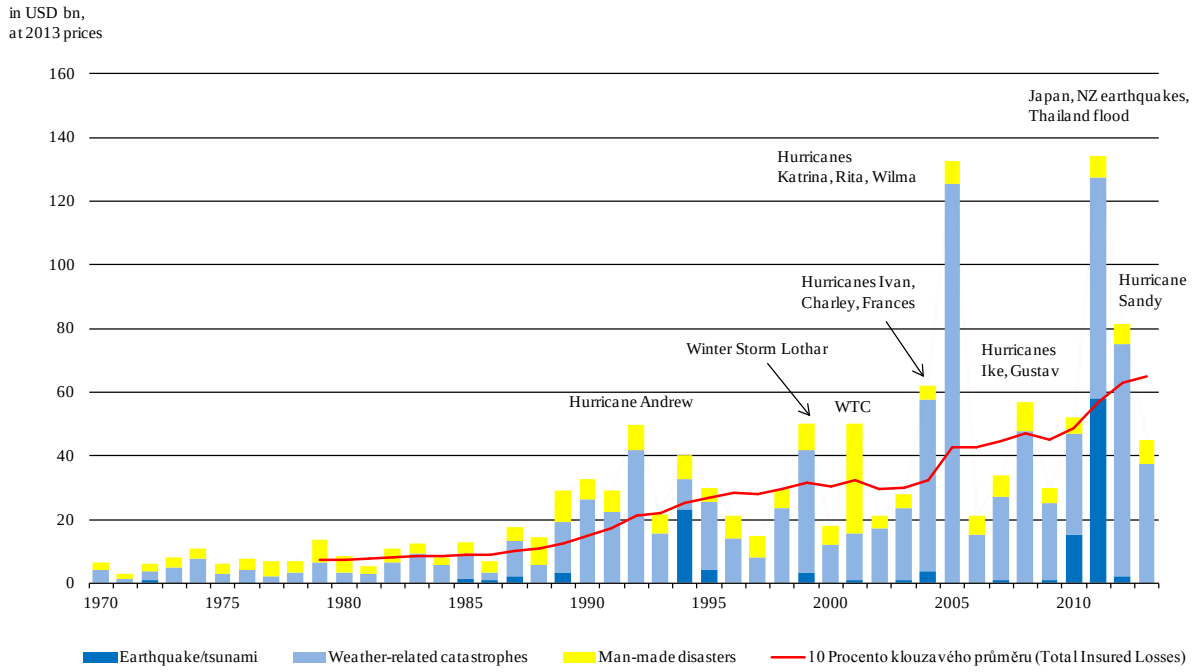

Figure 3: Development of insured catastrophe losses, 1970–2013

Source: Own processing (SwissRe 2014)

For subsequent analysis models cover catastrophic risks is an important analysis of the evolution of insured losses in different types of disasters (see Figure 3), and analysis of insured and uninsured losses (see Figure 4).

They also contain variations insured damage caused by natural disasters (SwissRe 2014), which can be seen in Figure 3 are natural disasters particularly divided on the disaster caused by an earthquake or a tsunami disasters related to weather. Significant jumps are caused by Hurricane Andrew in 1992, an earthquake in Los Angeles in 1994, a winter storm Lothar in 1999, hurricanes Ivan, Charley and Frances in 2004, hurricanes Katrina, Rita and Wilma in 2005, Hurricanes Ike and Gustav in 2008 earthquakes in Chile and New Zealand in 2010 and earthquakes in Japan and New Zealand and floods in Thailand in 2011.

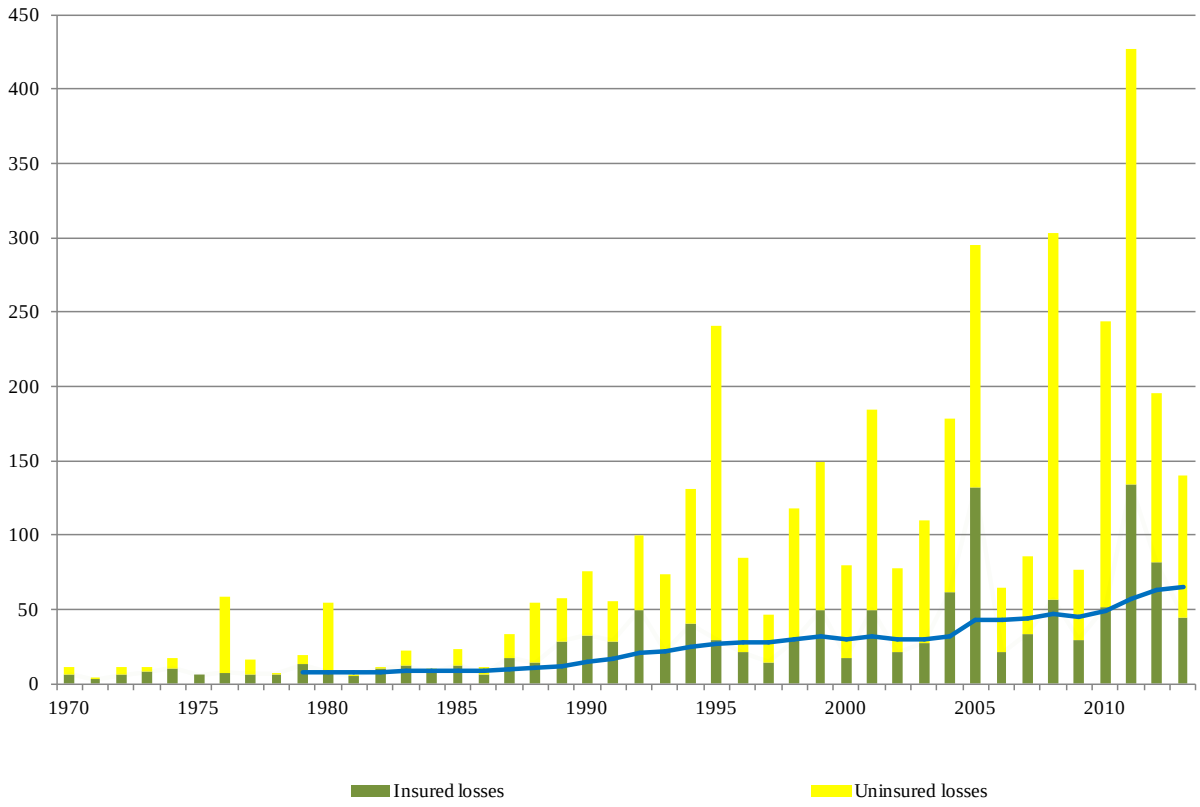

Figure 4: Development of the number of disasters in the years 1970−2013 (in USD bn, at 2013 prices)

Source: Own processing (SwissRe 2014)

Figure 3 shows that the damage resulting from the occurrence of disasters in recent years is increasing. This is especially true for disasters caused by weather. In addition to insured damage to similarly evolve and damage overall which implies an uninsured damage (see in Figure 4). Reasons to explain this growing trend are several. First, it increases the number of catastrophic events, which can also be caused by increasing awareness. This is affected by a sharp spike in towns, of which a relatively large part is located in risk areas. In addition (SwissRe 2014), construction of infrastructure, warning and defensive measures below the rate of increase in conventional construction. This is especially true in developing countries. Due to global interdependence in certain areas of production, increasing values of machinery and goods can have even greater impact disasters. In addition, the impact of disasters can be also affected by deforestation, changes in land use or land degradation.

Disasters can be classified by cause (MunichRe 2013), and the four main groups disasters: geophysical phenomena (earthquakes, tsunamis, volcanic activity), meteorological phenomena (storms), hydrological phenomena (floods, landslides) and climatic events (extreme temperatures, droughts, fires). The most common cause of disasters between 1980 and 2012 were meteorological events (39%), the second most common cause of disasters were hydrological events (35%) and geophysical and climatic phenomena are the source of 13% of disasters.

Most of the total damage (40%) is caused by the disaster coming from meteorological phenomena. A quarter of geophysical disasters caused damage type, 22% of the total damage came from hydrological phenomena, and 13% of total damage was caused by climatic events.

Most of insured damage is due to meteorological phenomena (72%), 11% of this damage is caused by geophysical phenomena, hydrological phenomena 9% and 8% climatic events.

Between 1980 and 2012, most victims succumbed to shock geophysical disasters (39%), 32% of the victims were caused by climatic events, 19% of meteorological and hydrological phenomena 10%.

From 1980 to 2012 was approximately 21,000 disasters, 32% of them took place in Asia, 24% in North America, 21% in Europe, 9% in Africa, 8% in Australia and 6% in South America. Over the same period, died as a result of disasters 2.300.000 people and 52% of them died in Asia, 27% in Africa, 12% in North America, 7% in Europe and 2% in South America and less than 1% in Australia.

Total damage occurred between 1980 and 2012 in excess of 3.800 billion USD. The total damage was 41% in Asia, 37% in North America, 15% in Europe, 3% in South America and Australia, and 1% in Africa. In contrast, the amount of insured damage as a result of catastrophic events closer to 970 billion USD. Of these, 64% occurred in North America, 16% in Europe, 14% in Asia, 5% in Australia, 1% in South America and less than 1% of insured damage occurred in Africa.

1.3Impacts Of Implementation Risks with Catastrophic Consequences for the Insurance Market

The main cause leading to the deterioration of the commercial insurance industry was technical and technological progress (Daňhel, Ducháčková & Radová 2007), which brought greater vulnerability, a large increase in wealth in developed economies.

Disasters act on insurance and other means, and that is the inability to forecast the occurrence of disasters or their range, along with growing frequency and magnitude of the disaster, these problems have led to the involvement and development of alternative coverage of catastrophic risks (ensuring the involvement of the state). This is mainly because the number of natural disasters has increased over the last forty years, three times and claims paid of natural disasters have increased its volume quadrupled.

Insurers generally do not want too insuring catastrophic risks (earthquakes, volcanoes, ...), mainly due to poor identification and quantification of risks. Another reason is the growth of the damage from them. The increase in insured damage can be caused by growing wealth in small areas or even climate changes are likely to occur. Now climate change may lead to the occurrence of such disasters, which is not too common for the region, while it is assumed that changes the intensity of some disasters. It is for these reasons; it is becoming more and more necessary to refine the estimates and forecasts of the occurrence of disasters.

Replies insurers, said the effects of disasters on the insurance industry, the change in policy conditions, or rather their exact definition. There was also a caution in the calculation of premiums relating to insurance, where it is difficult to calculate the probability of an insurance or reinsurance events. In addition, there is a slow reduction in the number of covered risks in exchange for better protection and greater emphasis is placed on prevention on the part of the insured. All of these changes are reflected in the increase in insurance costs.

At the same time there is also the possibility of finding alternative coverage of catastrophic risks (Mužáková & Štibrányiová 2013). One of these options is a partial transfer of these risks to the capital market through financial derivatives, such as futures insurance. This is mainly due to the larger capacity of the capital markets also provides them with a greater ability to absorb catastrophe risks. Insurance futures represent bonds that were issued by the insurer or reinsurer. The payment of a bond may occur in the event of a catastrophic event specified in more detail (the exact criteria are determined, the force of wind or earthquake, ...). In the event that the disaster does not occur, the insurer or reinsurer pays investors a predetermined yield.

Another possibility is the so-called CAT bonds (catastrophic) that provide investors with the money invested even in the case of large catastrophic damage. Nevertheless, these bonds are considered speculative. In addition to providing the invested funds are bonds for investors also interesting that depends only partly on the state of the capital markets and other investments. Thus, they can serve to diversify the portfolio.

For a similar purpose can be used and insurance swaps, which are based on the exchange of a block of policies (a million USD) between different insurers. This is incremented reinsurance capacity, but

there is a risk diversification. These include among others the pivot capital, which commits the investor to provide the resources to the insurer, if the predetermined event.

The purpose of these financial instruments is spread risks and eliminate fluctuations in the financial results of the insurer. In addition, they have a positive effect on moral hazard and adverse selection.

The need to develop new ways to cover catastrophic risks appeared after the huge loss (USD 21.5 billion) caused by Hurricane Andrew in the USA in 1992. Due to the enormous damage occurred to the decline of 11 insurance companies and at the same time also increased reinsurance rates. A similar effect (increase in reinsurance rates) was floods in Europe in the same year, which is reflected in the assembly of insurance products.

Another important year in terms of the size of the damage was, according Daňhel (2007), 2005, which saw the appearance of large quantities of hurricanes in the United States. Among them was Hurricane Katrina (SwissRe 2007), which results in the total loss incurred in the amount of USD 135 billion and insured losses totaled around 45 billion USD. Due to the series of hurricanes in 2004 and 2005, which hit the U.S., had to modify the models to evaluate the estimated amount of damage to match the current trends.

Since the release of respect fire and flood insurance in the UK Katrina (SwissRe 2008), the insurers since 2000 to eliminate the risk of flooding and inundation of newly concluded contracts concerning real estate and property in high-risk areas.

In the United States of America (SwissRe 2006) will provide insurers cover flood risk as part of the industrial risk insurance, which are built on the principle of All Risk. But in areas with high risk of floods or drought, the risk is very often excluded from insurance. Insurance of private property can be arranged, subject to conditions, through the National Flood Insurance Program.

In Switzerland, insurers are required to provide insurance of buildings for various natural hazards, earthquakes, except under conditions of insurance against fire.

1.4Models of Catastrophic Risks

Disasters such as floods, storms or earthquakes play in the insurance and reinsurance big role. Understanding these risks and impacts of climate change, it is important to assess the insurance and reinsurance markets and the structure of risk transfer solutions. For this reason and because of the increasing insured and total losses arising from catastrophic events (SwissRe 2014), insurers and reinsurers have begun to invest in the latest catastrophe models. In addition to investing in the models also began to collaborate with universities and scientific institutions. Insurers and reinsurers can monitor the construction, commercial activity and population migration in high-risk areas. Allowing them to remain at the forefront in terms of knowledge about the impacts of natural disasters and climate change.

Catastrophe models are used since the 80s of the 19th century, but is commonly used in the insurance industry began after Hurricane Andrew (1992), which were both insurers and reinsurers surprised by the extent odamage. Thanks to both insurers and reinsurers Bendimerad & Hom (1999) also found that their procedure for assessing catastrophic risk was adequate. Since then, the catastrophic models and constantly improve their use is rapidly increasing.

Most of the insurance and reinsurance business with renewed annually and even risk models are regularly improved (SwissRe 2014). The risks are usually covered by a 12 months insurance or reinsurance and up to years of catastrophic bonds. Since models provide estimates of today's risks and insurance or reinsurance still too does not reflect the long-term trend of expected damage. This should be gradually adjusted by updating these models.

Because of the clarity of the occurrence of catastrophic risk maps were created for the greatest and most common disasters in which areas are marked with different sizes of risks. On this map are highlighted risks of earthquakes, tsunamis, tropical storms, storms and volcanic activity. Tropical storms have highlighted here as the most frequent direction in which they move. The darker the colour

of a natural disaster, the greater the risk in the area at risk. In addition to these risks, create risk area for tornadoes, hail, winter storms and fires.

Because of the disastrous consequences of the earthquake in Haiti in 2010, which will affect Haiti and in future years, SwissRe (2011) decided to create a map of the area where they are painted risk of seismic activity. This map will be an important tool to build infrastructure, which should withstand possible future earthquakes and thus protect not only property, but also the lives of residents. Haiti Highlighted areas with high seismic risk will help local governments with the adjustment of standards used for the construction of buildings, bridges, roads and other structures so that they can withstand earthquakes.

Even with regard to the enormous damage done by the tsunami, caused by an earthquake in Indonesia and neighboring countries in 2004 (SwissRe 2012), this risk was not included in the calculation of insurance related to the earthquake. The risk may be counted only for the possibility of earthquakes and other catastrophic risks. And this despite the fact that various scientific models tsunami were available. In 2011 began SwissRe modify their models of earthquakes and included them in the risk of tsunami.

The importance of the inclusion of secondary hazards (tsunami, soil liquefaction) in risk assessment proved by earthquakes in 2010 in Chile and New Zealand. In Chile earthquake occurred after the subsequent tsunami (SwissRe 2011), which caused enormous damage and number of deaths. In the same year there was an earthquake in New Zealand, where it later emerged the so-called soil liquefaction, which lies in the fact that after the earthquake, the soil becomes unstable and loses its strength and then starts to behave like a fluid. If this happens in an urban area, so there are serious structural damage to buildings and infrastructure. The rebuilding and rehabilitation of land is so needed a large amount of funds with which the earthquake risk model planned.

Until recently in Australia (SwissRe 2008) floods occurred in the exclusions of insurance for most insurers. And for this reason that the funds were not available to assess the risk of flooding. Another pressure to create flood insurance was poor visibility of the damage caused by wind and storms, which were insurance against storms normally covers. This began to change with the creation of the National Flood Information Database (NFIP), which allows insurers to assess the level of risk of flooding and to determine the appropriate premium. With some insurers have begun to offer flood insurance.

The long-term trend of increasing number of floods and damages incurred as a result thereof, forcing insurers to adapt the models used current trends. This is mainly because most of these models based on statistical data from the 60s and 80s, when the flooding witnessed in Europe below average. Hence the probability of flooding in these models underestimated.

Another issue cover flooding was also an assumption that floods occur individually. Models (SwissRe 2008) therefore do not count the fact that the floods may appear depending on each other and could cause more damage than originally anticipated. That happened in 2000 and 2007 in the UK and in 2002 in floods in Europe. This is another reason for manipulating models used to assess the risk of flooding. Due to the high insured losses arising from these floods insurers trying to get the government to improve protective measures against flooding. Similar situation is in the Czech Republic. In detail these issues will be analyzed in the third section of this article.

2. SELECTED MODELS ADDRESSING THE IMPACT OF THE REALIZATION OF CATASTROPHIC RISKS IN EUROPE

In the world there are many of models addressing the impact of the implementation of catastrophic risks with the different role of the state in solving them. On the one hand there is a whole range of catastrophe scenarios. On the other hand, the same scenario may affect many countries, but in different ways.

The role of the State in the implementation of government insurance programs may be (OECD 2005):

- government acts as insurer: The Government expects that bears direct responsibility for the losses without private insurance sector bearing a part of the loss. The program is designed to fill the gaps in private insurance. (E.g. Spanish program and the National Flood Insurance Program in the U.S.).
- government acts as a reinsurer: The government provides financial support to the private insurance market. Private insurance market can be left on some risk (e.g. as in Japan) or can volunteer to keep the risk (e.g. as in France).
    - One of the possible negatives of both types of government insurance programs may be the fact that both approaches tend to rely on the private sector just to provide the necessary administrative support. The private sector is then paid a commission or fee for providing the necessary administration.
- government acts as an underwriter: For a number of man-made hazards is one of the roles of the government to set the terms of liability, so that risks are insurable. There are two general issues relating to insurability or risks: the ability to identify risk and the ability to set premiums for each potential customer base. Often, government plays an important role in determining the conditions relating to the risk that it provides as insurable: sets underwriting standards, which allows the private sector to develop insurance products.

Extent of the program is:

- It is partially dependent on the degree of risk.
- Countries with low levels of risk tend to have these programs with a broader scope.
- Countries with high levels of risk tend to have programs that focus mainly on specific risks.

State support in dealing with catastrophic risks entails the possible negatives. Possible problems with state support in dealing with catastrophic risks can be categorized:

- asymmetric information in insurance markets;
- moral hazard;
- cost of the entire system;
- legislative framework;
- etc.

In the context of the optimal solution model implementation impacts of catastrophic risks in the Czech Republic were chosen for comparison only European countries that are threatened by similar risks as the Czech Republic, namely: Germany, France and Spain.

2.1 Germany

Natural events that cause the most damage in Germany (CCS 2008) are: floods, floods and hailstorms. Studies and simulations point out that in the near future in Europe will increase due to climate change risk storm. Germany is among the countries where the risk is most intense.

2.1.1 Risk Coverage of Natural Disasters

There is no system in Germany, which somehow guarantees compensation for victims of natural disasters is not mandatory under private insurance. There is involvement of the public administration (the Government or the Federal Government of the Land) to safeguard against natural disasters is provided voluntarily and under certain circumstances, according to the severity of disaster. Public financial intervention has proved to be a very important means to compensate for losses reduce the number of insurance compensation due to the limited scope of coverage against this risk.

This type of aid, on the other hand, quite a few may discourage people from seeking insurance protection and risk reduction implementing measures.

The right to indemnity is conditional on respect for and implementation of preventive measures in case of floods, earthquakes and heavy snow depending on the area, the property and the particular circumstances. In general, given the nature of the risk premiums are calculated individually and the final cost of coverage is subject to the insurance value, participation and level of flood risk.

The risks identified in natural solutions risk premiums received on the German market to cover flooding is the most important because of the high loss rate, stresses the need for a specific approach. Since 2001, under the auspices of the German Insurance Association (GDV) for the German insurance market applies a system of flood and rainfall using zoning known by its acronym Zürs (for risk assessment).

The system establishes four risk zones: from a smaller to a larger degree by hazard, according to the probability: more than 200 years (zone I), between 50 and 200 years (zone II) between 10 and 50 years (zone III), and between 0 and 10 years (zone IV). In zone IV subjects are uninsurable, while in the zone I cannot meet with the issue of insurance coverage.

Participation may be 10% of the total losses and the percentage of the premium amount or amounts generally range from a minimum of EUR 500 up to a maximum of EUR 5000.

2.1.2 Proposals for the Establishment of a System for the Protection of Natural Disasters

Below are some reasons for the lack of demand for disaster insurance:

- First systematic underestimation of the risk of rare disasters on the part of those who could be affected.
- Second the availability of assistance from government and private charities ("charity hazard").

Immediately after the flood in 2002, the economist's generally compulsory insurance, all basic natural disasters (wind storms, floods, earthquakes, etc.) would be covered by a single insurance contract. Stacking approach would increase the effectiveness of coverage. In the event of a disaster in uninsurable zones would be implemented budget method. In Figure 5 below outlines the proposal to establish a system for the protection of natural disasters. For small businesses and urban real estate are set out four flood zones with different levels of participation. For damages in excess of EUR 8 billion would cover natural disasters government interference.

For industrial enterprises by insurance was conceived as voluntary.

2.1.3 The Reasons for the Failure of the Proposal

One of the reasons, why the request failed, is failure to recognize the role of government guarantees. Rate guarantees, as required by German insurance companies, the German Insurance Association (GDV) Treasury argued that it is possible to obtain coverage in the amount of EUR 8 billion, with the expectation damages to EUR 30 billion per year, would regularly there were losses of EUR 22 billion.

Another reason was the legal challenge against compulsory insurance. The main legal argument against natural disaster insurance was that it would be constitutionally impermissible as excessive interference with the general freedom. Mandatory insurance actually constitutes a serious violation of individual autonomy, which is permissible under the German Constitution only if it is in the public interest and intervention is appropriate and proportionate, it means that there is no "gentler way to achieve the goal." Other reasons for the failure of the proposal can include distribution federal conflicts and political considerations reassessment.

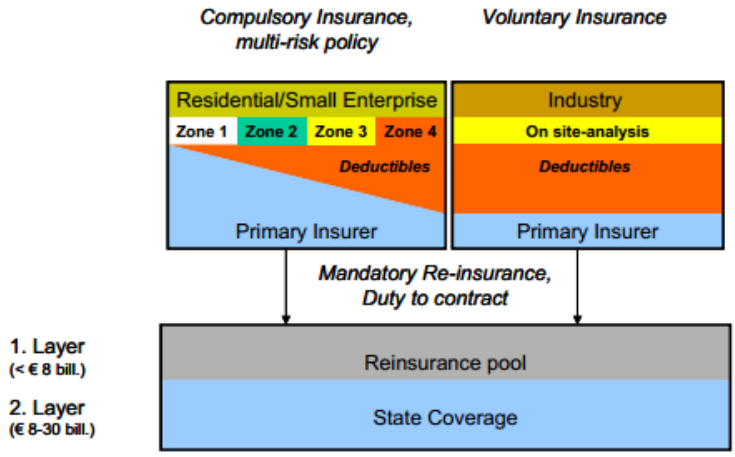

Figure 5: The proposal to establish a system for the protection of natural disasters

Source: Schwarze & Wagner (2006)

2.1.4 Internal Stabilizers

German insurance company has in catastrophic coverage does not necessarily create a buffer. The amount is calculated as 4.5 times or 6 times (depending on the type of risk) standard deviation of the claims ratio to gross premiums written. To reserve exempt from tax, subject to the following conditions:

- arithmetic average of the premiums for the last three years must exceed EUR 125 000;
- standard deviation of the claims ratio, calculated on the average of this indicator at a specified time (generally 15 years and 30 years for hail) must be greater than 5%;
- loss must be higher than 100%, at least once during the defined period.

2.2 France

France is a country in which there is probably the most advanced system to ensure a work of natural catastrophic risks. The French system has a great history and a significant development, which he passed. In addition, the solution catastrophic risks addressed, therefore there is a continuing debate on improving existing schemes, since no system is absolutely perfect.

2.2.1 The Legislative Framework

Solidarity (Bidan, 2008) plays an important role in France and is already guaranteed in the Constitution itself. It's not only a general proclamation, but also specific utterance citizen's right to equality and solidarity in relation to the consequences arising from the calamities that threaten the country.

The main law governing the system cover catastrophic damage is Law 82−600 of 13th July 1982 relating to compensation for damage caused by natural disasters, which combines solidarity resulting from the reciprocal nature of insurance and the equivalence of the same Institute (consisting of the payment of premiums for certain risk) together with the principle of national solidarity arising from state guarantees guaranteed by the government.

This law was created in response to the huge floods in the valleys of the rivers Saone and Rhone. It includes three basic pillars of the system: the generalization guarantees through the institute of insurance, state guarantees insurance companies through the provision of State-owned Caisse Centrale de Réassurance (CCR) and a policy of prevention of natural disasters.

In France, working compulsory insurance (insurance) catastrophe risks under voluntary property insurance inhabitants. All financial compensation under the Act of 1982 must unconditionally meet two previous conditions (CCR 2011): the fact that a natural disaster has occurred; it must be recognized by the inter-ministerial decision ministries; damaged property must be insured by property insurance.

In 1990 (June 25th) was a law Nr. 90−509 (CCS 2008), which extends the territorial scope of the scheme outside the territory of France, most of the overseas departments. Government Decree of 19th April 2000 and then adds the Wallis-et-Futuna islands. Outside the area of systemic risk coverage remain overseas territory of New Caledonia, French Polynesia, etc.

Along with this main law that covers most of the natural risk exists in France for a generalized system to cover storm damage (mainly wind risk) (Bidan 2008). Law No. 2002-276 of 27th February 2002 minutely regulates other compensation possibilities of catastrophic risks.

In the area of prevention is a law on decentralization of January 7th, 1983, the Law on Urban Planning from July 22, 1987, the Coastal Act in January 1986 (the "Loi Littoral") and especially the law on compensation for the effects of catastrophic damage from the February 2nd, 1995 (the "Barnier Act").

2.2.2 Risk Coverage of Natural Disasters

The exhaustive list of the risks that are covered there (Bidan 2008) (CCR 2011). Risks to the country are found to be due to catastrophic decision interdepartmental committee of three ministries. The criteria for the attribution of catastrophic range are primarily a "supernatural strength", which is assessed primarily in terms of the severity and extent of the damage.

This setting works by the initial setting of the 1982 de facto existed classic division of the insurable and uninsurable risks (Bidan 2008). This setting was therefore adjusted after the experience of the coming years. In the resulting situation was possible, for example, that some storm (insurable risk) were included in this scheme because of the enormous damage which it operates. However, as was subsequently found to be risk storms, hurricanes and cyclones (wind effect) as insurable Act of 1990 is excluded from the scheme Cat Nat. In 1992 it was decided that the system will cover only material damages arising from uninsurable risks, and therefore was excluded even risk weight of snow and ice and hail.

List of major risk categories thus includes (CCR 2011):

- flooding (surface runoff, overflow, raising the water table, etc.);
- mudflows;
- earthquakes;
- earth movements (including movements due to drought);
- tidal wave;
- avalanches.

The damage must be direct, ie due to abnormal functioning of the natural influence on the subject of insurance.

2.2.3 Subject of Insurance

Insurance of natural disasters is compulsorily arranged to standard commercial property insurance population (households and businesses), as well as insurance for business interruption (which is not automatically tied to property insurance). State property is not included in the system. The insurance assets held in the basic agreement and may be a (CCR 2011):

- dwellings and their contents;
- industrial and commercial buildings and premises and their contents;

- buildings owned by local authorities and their contents;
- agricultural buildings (including crops, machinery or animals located inside the building);
- greenhouses, which are considered as plant and equipment (excluding crops, which contain);
- vehicles;
- accessories and equipment for motor vehicles, if they are included in the basic cover;
- fences, retaining walls or beams have been included in the policy;
- forests (in some cases), if included in the insurance contract of the relevant property insurance;
- the cost of excavation, demolition work, pumping and cleaning.

As part of the business property scheme allows the inclusion of business interruption risks, which builds on property insurance. It covers the gross profit (net profit + fixed costs) and additional operating costs associated with downtime (penalties, etc.). Apply time franchise as an additional form of insurance. All other parameters are related to the closure of statutory insurance contract.

2.2.4 The Price of Insurance

For covering the risk of the policyholder must pay an additional premium (beyond the basic contract), which is determined by the government. The premium is uniform, without regional differentiation, includes all the above risks and distinguishes the level of risk the client. Calculated as a proportion of the basic premium at the following rates:

- property damage 12%;
- damage to road motor vehicles:
  - fire and theft 6.0%;
  - other damage 0.5%;
  - as insurance for business interruption 12%.

Throughout history, the contribution rate changed with the increasing extent of the damage that natural disasters seemed. For the system level, it was necessary to obtain additional resources into the system. Development rates are summarized in the following table.

Table 1: Development of rates

1982	5,5 %
1983	9 %
From year 2000	12 %
2003	5 % to technological risks

Source: CCS (2008)

Commercial insurance companies collect and manage additional premiums, and manage and administer the policies, as well as arrange disposal − collect claims and paid claims (always in accordance with the statutory insurance contract).

2.2.5 Exclusions from Insurance

Among the excluded objects are (Seguros 2008):

- damage to corn and not stored crops (greenhouses or volume), no livestock housing and agricultural land (forests are not included);
- damage to the chassis air, sea, lake and river transport equipment, as well as damage to the cargo which transported;
- damage resulting from compulsory insurance against industrial accidents;
- damage to property in the overseas departments (DOM), which fall outside the scope of the Act of June 25th, 1990;
- damages excluded from basic policies (This may include fences, walls, swimming pools, etc.).

Indirect damage (Bidan 2008) such as travel, accommodation costs, lost rent, damages from loss of energy, etc. are also covered. Likewise, any "personal loss". Interruption of service may be arranged in the basic contract, that may be paid under these circumstances.

In contrast, the direct property damage shall be treated as salvage costs reasonably incurred and assets vanished (except demonstrable theft).

Among the excluded risk in the Cat Nat under the Act of June 25th, 1990 include wind damage as a result of storms, hurricanes and cyclones. Damage caused by hail or ice and also the weight of snow. This risk, however, is dealt with under a separate scheme.

2.2.6 Co-insurance Claims

Co aims to motivate other stakeholders − municipalities − the conceptual process of prevention of catastrophic risks. Another reason is the target schema adequate direction, i.e. to cover the consequences of incidents large and exceptional damage.

Table 2: Limits of co-insurance claims

		Most of the damage	Ground motions due to drought
Business properties	direct damage	€ 380	€ 1 520
Non-business properties	direct damage	10 %, minimum € 1 140	€ 3 050
	interruption of business	3 work days, minimum € 1 140	

Source: CCS (2008)

Participation sets out the administrative government. It is applied for each case a contract is required, the non-cancellable and are not indexed.

For regions is advantageous to apply preventive measures, as this will avoid the possibility of increasing participation. With more than twice the incidence of natural disasters are applied in the following multipliers:

- 1−2 occurrences: deductible is applied to the normal rate;
- occurrences: participation is multiplied by 2×;
- occurrences: participation is multiplied by 3×;
- or more occurrences: participation is multiplied by 4×.

In the event of a preventive plan (Plan for the Prevention of Natural Risks Foreseeable) is increased participation. Compliance with the plan, however, is subject to review every four years.

2.2.7 State Intervention

The French government enters into the system very significantly. It acts not only as a regulator of the entire environment, from the initial setup of the individual responsibilities of all actors schemes to the specific adaptation of system parameters depending on the development of real damage. A key feature of the French system, which is different from most other countries, the existence of state reinsurance, which significantly affects the economic equilibrium of the whole system.

French reinsurance CCR is a joint stock company fully owned by the state. It works essentially as a commercial entity. Provision is in the French system is based on voluntary basis (of course, insurers may choose competing private entities), but it is very widely used. CCR is a very low rate premiums and unlimited guarantee from the state.

The use of state guarantees, however, the insurer must cede at least 50% of the risk reinsurance. CCR then basically ensures that risk again in the state. States for the CCR obtains reinsurance, then again everything works as in the standard market process to ensure (and subsequent retrocesse) with the difference that the private operators do not have the competitive advantage of the unlimited state guarantee.

The whole scheme leaves management disposal to primary insurers, as they are in the best experience. CCR provides proportional (quota-share) and monospaced (stop-loss) reinsurance. U proportional to the amount of retention varies between 40 and 60 percent. It is clear that insurers would prefer to use CCR for stop-loss contracts and the remaining collateral purchased by private entities. State reinsurance thus bound together both types of collateral and allows the use of stop-loss order only if it is agreed quota and ensures a minimum share of primary insurers of 40%. It follows that, in essence, for each occurrence of catastrophic damage to state reinsurance CCR (and hence the taxpayer) contributions to cover the damage.

CCR also manages funds that operate under a system of compensation for natural disasters (and go out scheme Cat Nat).

The system has emphasized the role of prevention, thanks to the aforementioned construction co. Another important element is the implementation of "Barnier Act", which allows expropriation of assets in case of catastrophic events. Everything works on the basis of cost-benefit analysis, which is evaluated by experts, whether it is better to buy the property (compensation comes from the fund), or build preventive measures in the region.

2.2.8 Reform of the System

Changes in the current system are discussed for several years. The aim is to ensure economic continuity and strengthen the link between compensation and prevention schemes.

Discussion led to the preparation of the reform proposal, which is now subject to public discussion and will soon be presented to Parliament.

2.3 Spain

Floods (CCS 2008) are a natural phenomenon that causes most of the disasters in Spain (compensation paid for damage to property of a total of EUR 2 472.6 million, while 93.5% of them were caused by floods). Among other catastrophic risks to Spain include earthquakes, tsunamis, tornadoes and hurricanes.

The complexity of factors that are part of the phenomenon of urban flooding and the division of responsibilities between the three administrative levels in Spain (national, regional and local) means that the adoption of different measures and cooperation between the different administrations are conditions that must necessarily be met in order to generally prevent flooding and that was the plan for regulating water flows and prevent flooding successful.

CCS (Consorcio de Compensación de Seguros, Insurance Association) is a national organization with its own resources, which acts in the insurance market as a reinsurer (under the control of the Ministry of Economy). Provision for CCS is required.

After authorities received information, and after that the necessary studies and evaluation, enclose the field offices at risk of flooding, and the degree of risk that threaten individual populated areas. In order to implement these measures effectively, can the authorities of Water Resources to work with the Government of Andalusia, where they can do so on the basis of relevant agreements and conventions.

Participation CCS is supported under the agreements. Legal status Association of Insurance Companies has been ratified by Article 4 of Law No. 21/1990 dated 9th of December, who managed to integrate into Spanish law Directive 28/357/CEE, which deals with the freedom to provide non-life insurance and legislation related to private insurance.

The current system of protection of natural disasters has its origins in the CCS (to the approval of Act No. 21/1990 of 19th December 1990 held a monopoly on coverage of catastrophic risks). Consorcio is directed by a board chaired by the Director of Insurance and pension schemes, whose members are appointed by the Minister of Economy and Finance, on an equal basis between the leading private insurance lobbyists and public institutions. Consorcio includes coverage of both natural disasters, but also political and social factors (terrorism, insurrection, riots, etc.). Consorico gradually excelled in other positions in a number of areas of the Spanish insurance sector (crop insurance, export credit insurance, compulsory insurance of motor vehicles, etc.).

Other activities associated with CCS are promoting prevention. Consorcio has its own legal personality and full capacity to act, has its own assets separate from the state and its activities are subject to private law (subject to the rules contained in the legislation establishing the legal regulation and supervision of private insurers, as well as managing insurance contracts).

Cover extraordinary risks included in the compulsory accident insurance, life insurance and some insurance property damage. The pillar is a Spanish cover system whose principles are: compensation, solidarity and cooperation.

In property insurance is a risk of fire and other natural events, damage to road vehicles, rail vehicles, other damage to property (theft, sheet glass, machinery, electronic equipment and computers) and business interruption. In personal insurance coverage is included in the event of natural life and accident insurance (even though it is additionally contracted another type of insurance, or in the pension plan).

2.3.1 Exclusions from Insurance

The basic exclusion from insurance includes:

- precipitation or rain water that collects on rooftops,
- the weight of snow and no extreme winds (below 135 km/h)
- rupture of dams, drainage channels or artificial,
- landslides,
- ordinary waves or currents,
- the mere passage of time or lack of maintenance of the insured property,
- if the damage is caused by defects in the property concerned,
- consequential damages or any losses derived from direct.

2.3.2 Price Protection

Surcharges for Consorcio are collected by insurance companies with their insurance and are billed monthly. Consorcio add 5% withdrawal fee (plus applicable tax). Below are the rates of CCS to cover extraordinary risks in terms of insurance assets, people and business interruption.

In the case of property insurance:

- housing and housing flats owners: 0.09 percent;

- offices: 0.14 percent;
- business, shopping centers, warehouses and other simple risk: 0.18 per thousand;
- industrial risks: 0.25 percent;
- motor vehicles: fixed amount per type of vehicle (passenger car € 5.41 per vehicle);
- works: different rates according to the type of construction, ranging from 0.34 per thousand for highways, roads, railways and pipelines, up to 1.95 per thousand for no holiday ports.

In the case of personal injuries (life and accident insurance):

- the general rate of 0.005 per thousand, except in special cases.

In the event of interruption of business:

- apartments and owners: additional rate of 0.005 per thousand, to be applied to the main insurance for property damage.
- rest of risk: the rate of 0.25 per thousand, which is to be applied to the main insurance for business interruption. Additional charges are collected by the Consorcio insurance along with their insurance and are billed monthly for the preservation Consorcio-sustaining 5% withdrawal fee (plus applicable tax).

2.3.3 Compensation

Reports claim must be filed within seven days after the occurrence of loss. That the insured was entitled to compensation, it is a prerequisite that the damage must have been previously identified as a contingency to determine the Consorcio. Compensation includes the cost of repair or replacement of damaged property with respect to the contractually agreed sum insured

In pecuniary damage in case of direct damage, liability shall be borne by the insured (7% of the amount of the claim for damages). Cover extraordinary risks identified by law as a minimum protection, which in the case of risk transferred to the insurer.

2.3.4 Internal Stabilizers

Apart from the technical reserves and solvency margin, the law provides that Consorcio should create a buffer. It is commonly used backup solution for certain risks (it is tax deductible up to a certain limit, legally established). Due to the particularities of this activity, which is particularly high loss potential, as well as the public nature of the Consorcio is absolutely necessary for Consorcio rely on state guarantees.

3 NATURAL DISASTERS AND PROPOSAL OF OPTIMAL MODEL FOR THE CZECH REPUBLIC

In the last 15 years, the territory of our country repeatedly hit by large-scale natural disasters. The cost of repairing the damage lies with the insurance company, and in no small part to the state. State aid there is always ex post, ie after the disaster and missing system solution. In a number of EU countries (e.g. Germany, France and Spain) there are sophisticated systems that could provide a solution in the Czech Republic. To use foreign experience missing professionally processed comparative study that would provide both professional as well as political circles enabled progress in solving the problem.

3.1 Natural Disasters in the Czech Republic

Among the risks that the Czech Republic is one of the most endangered risks: floods and flooding, heavy snow and windstorm and hailstorms.

Basic analysis of the number of claims and amount of damages in natural hazard insurance for the last six years for members of the Czech Insurance Association (CIA) in the Czech Republic in Table 3.

The above data for the last six years shows that the greatest damage occurred in 2010, the largest share of these damages should damage from flooding. The most significant natural disaster in the Czech Republic and the associated burden of claims is:

- 1997 − floods in Moravia (paid CZK 9.7 billion);
- 2002 − floods in Bohemia (paid CZK 33 billion);
- 2006 − heavy snow (shame CZK 2.5 billion), 100-year water Thaya (paid CZK 1.1 billion);
- 2007 − orcan Kyrill (paid CZK 2.25 billion);
- 2008 − windstorm Emma (total damage CZK 1.24 billion);
- 2009 − floods in the Opava, Olomouc and South Bohemia (the amount of damage CZK. 1.8 billion);
- 2010 − snow calamity Daisy (the amount of damage CZK 1.1 billion), floods in Moravia and Northern Bohemia (the amount of damage CZK 3.7 billion), hail in Prague (the amount of damage CZK 2.6 billion).
- 2013 − floods (paid CZK 7.4 billion); orcan Xaver (payout of CZK 8.6 billion).

The insurance market in the Czech Republic with catastrophic risks and their impacts compared with the following instruments (Mužáková & Kubová 2013):

- construction of flood maps (even exclusions from insurance);
- limits of claims (reduction);
- new reinsurance contracts;
- introduction of a "flood tax" in 2011;
- one-time assistance from the government (non-systemic solutions).

Most of the damage from natural disasters is dealt with insurance, those who have no insurance, so damages paid from private funds. Be the greatest extent, contributed to solving flood damage especially in 1997 and 2002. More details on this subject with the publication prof. Ing. Dahlias Jílkové, PhD. and Ing. Lenka Čamrová "Flood damage and tools to reduce" from 2006. Implementation of catastrophic extent of the damage − floods in 2002 − however, entail a significant and positive and to establish a system of risk flood zones that CIA developed in cooperation with Intermap Technologies from 2002−2003 (the creation of flood maps in part by reinsurance SwissRe). Originally, the flood maps available since 2003 for a fee, from January 2009 are already available for free.

As a possible solution aspect of natural disasters in the Czech Republic can mention the introduction of a "flood tax" in 2011, which appeared in the form of reductions in tax payer, by CZK 1 200 per year, CZK 100 per month.

Table 3: The number and amount of claims adjusters in natural hazard insurance in the Czech Republic as members CIA

Indicator	2006		2007		2008 [1)]	
	Number of claims (pieces)	The amount of damage (in thousands CZK)	Number of claims (pieces)	The amount of damage (in thousands CZK)	Number of claims (pieces)	The amount of damage (in thousands CZK)
Damage from heavy snow	68 690	2 564 492	1 677	20 603		
Damage from floods	31 262	1 340 848	12 121	386 892		
Windstorm and hailstorms	17 990	685 606	108 024	3 134 566	35 990	1 259 479
Total	117 942	4 590 946	121 822	3 542 061		
Other damages	1 733	10 857	33 740	33 589	0	0
Total CIA	119 675	4 601 803	155 562	3 575 650		
Indicator	2009		2010		2011	
	Number of claims (pieces)	The amount of damage (in thousands CZK)	Number of claims (pieces)	The amount of damage (in thousands CZK)	Number of claims (pieces)	The amount of damage (in thousands CZK)
Damage from heavy snow	17 183	309 790	55 417	1 212 759	11 622	264 944
Damage from floods	25 010	1 508 902	38 367	3 994 437	10 107	326 850
Windstorm and hailstorms	35 375	1 936 736	52 097	2 706 853	21 603	1 033 530
Total	77 568	3 755 428	145 881	7 914 049	43 332	1 625 324
Other damages	834	53 697	1 037	15 489	0	0
Total CIA	78 402	3 809 125	146 918	7 929 538	43 332	1 625 324

[1)] data from the CIA only to claims caused by the storm, 31st of May 2008.

CZK – Czech crowns

Source: own elaboration from statistics of CIA (2007−2012)

To better estimate the likelihood and severity of floods in the Czech Republic use statistical models that divide the area into four risk zones (CIA, 2010). The first zone is an area with little danger of floods, the second zone is a low risk of flooding, the third zone itself contains the central danger (approximately coincides with the area of the 50 year flood) and fourth zone includes a high risk of flooding (similar to the so-called 20-year-old water).

The flood maps and in particular their distribution in high-risk zones are used in determining the size and risk of entering into the calculation of premiums in the territory.

Property located in zone 1 are not normally vulnerable to flooding, hence it is possible to insure. In the 2nd and 3rd zone already at greater risk of flooding, and it is reflected in the increase in premiums in the case of property insurance against flooding. In the fourth zone it is flood risk so great that property here lying mostly cannot insure.

Czech Insurance Association (hereinafter CIA), with Swiss Re and Intermap Technologies, established in 2002−2003 flood map of the Czech Republic, which is used to capture the flood risk in the area.

Flood maps that insurers may use in the Czech Republic are two to one the flood map is available from web of CIA. This flood map showing the location with the highest risk of flooding in the Czech Republic. The darker the colour indicates the higher the risk of flooding in the threatened area. With websites Cap is possible to determine the degree of risk of flooding for a specific location by typing the exact address or directly to the place name on the map of the Czech Republic.

After marking the selected location, which is determined for flood risk, automatically generates a report about the dangers of flooding. In this report can be seen not only flood map of the area, but there is also a clearly identified risk zone in which the site is located. In addition, there are various zones briefly explained.

The findings of flood risk therefore takes place quite easily and understandably. Unique is the final output. The disadvantage is that these maps apply only to the risk of flooding.

The second option is to use the CRESTA maps. CRESTA divided into 61 regions of the Czech Republic, and those in turn divided into 3 369 sub-regions, which are assigned their own risk. Each point on this map represents a region that is denominated risk.

In order to generate the map of the site, you need to find the identification number of areas of interest. Then download several documents and fill out complicated place, type of risk, type of installation, materials and other information. Then you need to re-upload this document on a website CRESTA, which ultimately generates the desired map.

CRESTA has over maps of the CIA several drawbacks, a very complex handling, system complexity, ambiguity risk groups and not too much clarity. In addition, also the entire area to judge one degree of risk, although for different locations in the region has different risks.

Apart from a few disadvantages also have its obvious advantages. Not focus only on one risk, but you can choose what risks we want to evaluate the area. Moreover, it also comprises a significant portion of the world. Dark red colour is the area where the available areas and sub-areas. U pink marked areas are only available sub-region. Availability in the areas marked in dark gray. States that are divided into risk areas or sub-areas are highlighted in dark gray.

3.2 Optimal Model Proposal

Design of optimal solutions implementation model catastrophe risks in the Czech Republic takes into account the specificities of the insurance market in the Czech Republic and also the nature of the risks being in his presence on the territory of the Czech Republic Most common.

3.2.1 Covered Risks

Proposal of the optimal solutions implementation model catastrophe risks in the Czech Republic takes into account the specificities of the insurance market in the Czech Republic and also the nature of the risks being in his presence on the territory of the Czech Republic Most common.

Among the risks covered would include the risks caused by natural events (disasters). For proper operation of this model will be very important to define a disaster. Definition of criteria will not be easy, it will have to include financial criteria (also made as to the optional or mandatory), physical − even including the frequency and institutes who will measure and how and whether to include the definition and activation of the integrated rescue system.

Another important question will be answered, one that is a disaster, announce the ministries, institutions or determined by the Commission.

3.2.2 Subject of Insurance

The insurance will only public property − state property and its restoration in the event of damage is covered from taxes − it's cheaper than insurance. For entrepreneurs and non-entrepreneurs will only cover real property (movable would be covered on commercial basis). The existence of non-insurable areas within the commercial insurance will be maintained (outside the coverage of catastrophic damage) − and in the fourth (uninsurable) zone, the property was insured, but only to damage from disasters. The existence of a premium for the risk areas should also be maintained − the price of office shall determine tariff (which the system intervenes only if the property no one wants to insure).

3.2.3 Principles of Insurance

Criteria for the insurance of such risks would be as follows:

- liability insurance − would attest, payment of property taxes (The easiest would be if the insurance, or tax paid directly within the payment of property taxes.);
- percentage rate (0.08 to 0.010%) of the premiums received or promile of the asset (0.08 to 0.010 ‰), the insurer pays to the state fund that pays for private and public property (regulation of rates by state); The question is whether there are limits to the definition of disaster by SwissRe, for such a small insurance market, which the Czech Republic, too high.;
- the existence of a maximum compensation limit in state funds (from a certain limit total damages and compensation shall be proportionately reduced); this limit will be calculated model − price per m^2 compensation;
- liquidation fund would be carried out using the liquidators, with which it had a contract;
- the amount of the insurance − construction similar to the rate of property tax; may be reflected in the size preventive measures;
- classical layer of commercial risk would be natural, but non catastrophic range;
- no state guarantees in Czech Republic;
- co-existence (excedent a percentage) − the motivation to prevent
- ensuring: no need to deal with − is a matter of commercial entities within their systems; u catastrophic is solved proportional cuts.

DISCUSSION

As mentioned above, the correct settings are strategically important for the smooth functioning of the model. The above solutions were analyzed models of catastrophic risks three selected European countries: Germany, France and Spain. The results of these sub-analyzes indicate that none of these models is not perfect, but it cannot be, because in a dynamic environment is not possible or create the perfect model. Certainly, however, is about much needed, system solution that was missing in the Czech Republic. The gradual introduction of this model would to his tune.

Our insurance market is closest to the German insurance market. Solution catastrophic risk is at a similar level as in the Czech Republic, but even so, the German government tried to set up a system of dealing with the risk of catastrophic impact. If it can be said, and probably the best system solution implementation catastrophic risks a French insurance market, but also damage their solutions in the implementation of catastrophic risk also has its own specifics. As already stated, insurance and real estate is under the compulsory insurance of catastrophe risks and the insurance provided by the state reinsurance.

In the Czech Republic we have no state reinsurance, but if you would like to include this aspect in our model, it would be the financial health of the Czech state budget to another level and not in deficit. Although due to the fact that the French model is the sole owner of the undertaking, and partly on the settlement of claims of catastrophic participates extent, however, this model is very effective and still maintains the health of the financial system.

CONCLUSION

Catastrophic events have very important implications, not only for human society and the environment, but their presence also affects the insurance and reinsurance sector, which aims to reduce the financial consequences of disasters. Especially in recent times the size of the insured for damages incurred implementation of disaster increases. Over the last 40 years has increased the amount of disaster more than 3 times compared to the amount of insurance benefits increased 4×. This is mainly due to the higher concentration of people in one place and also due to the fact that some of these cities lie in an area which is threatened by catastrophic events.

Not clearly define the specific types of risks that have catastrophic consequences. More or less any risk has the potential to enable the implementation of the disaster. However, disasters can be divided according to cause, in four groups. Natural disasters can be caused by geophysical, meteorological, hydrological, climatic phenomena.

To cover the damages of natural disasters is used property insurance. Insurers can then be reinsured to better manage the payment of claims. In addition, insurers and reinsurers have to cover the catastrophic damage to hit the state. State may engage in multiple roles, either as an insurer, reinsurer or underwriter.

Most of disasters among the most catastrophic events since 1970 is due to the hurricanes. The highest numbers of deaths are caused by earthquakes. In the most common disasters include floods. Not the greatest catastrophe of the highest insured losses in this period was Hurricane Katrina, which hit the region in 2005, the Gulf of Mexico and coast of USA in 2005, and caused insured losses of USD 80.373 million. Disaster with the highest number of victims in the same period the storm and subsequent flooding in Bangladesh and the Bay of Bengal region in 1970, which claimed more than 300,000 lives.

Insurance responds to the increase in insured losses resulting from catastrophic events, stricter definition of insured risks, thus trying to reduce the number of covered risks in exchange for better insurance protection. Insurers are also trying to transfer some of the risk to the capital market, such as futures, CAT bonds or insurance swaps.

In addition, they also invest in the development and refinement of catastrophic models that could help them in the estimation of insured damage in the event of catastrophe occurs. Of these models can then construct risk maps that will enable that State or territory, edit, construction standards and infrastructure in order to prevent possible loss of life and property.

Due to more precise risk areas are, to determine the flood risk in the Czech Republic, better flood maps available on the website of the Czech Insurance Association. Not only are the risk areas more accurately divided, but also the control and collection locations in these maps easier. Moreover, the final output is accurately and clearly given.

The experience with the implementation of catastrophic risks in the Czech Republic has been a key year 1997, when the modern history of the Czech Republic were caused enormous damage caused by the implementation of flood risk. Speaking Czech citizens cope with the consequences of that risk, and five years after the catastrophic events in the Czech Republic was affected by the second wave of devastating floods, which caused the highest damage. These damages reinsurers responded lower limits of indemnity and also creating flood maps, which was divided into four areas of flood zones, with assets in the fourth zone is uninsurable. This fourth − the uninsurable zone − is supposed to have intended to act strictly precautionary impression. Until June 2013 was the fourth zone a total of 5% of households, but after further flooding in June 2013 was extended to these areas, 11% of households that are currently uninsurable.

The expansion of these areas uninsurable items occur within the rules of Actuarial Sciences (which is filled with one of the characteristics of risks − randomness), but not indefinitely expand these areas. He also thanks to this aspect, it is clear that the current system of dealing with natural disasters in the Czech Republic is unsustainable. Therefore, the optimal design − system − the model solution implementation catastrophic risks are so important.

The proposed model should permanently secure the inhabitants cover damage to property caused by the realization of the risk of a catastrophic scale.

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References

Bendimerad, F & Hom, S 1999. Catastrophe modeling. ProQuest Databasis. New York, *Risk management*, 1999, Ed. 5, No. 46. ProQuest Document ID: 226993992. <http://search.proquest.com/docview/226993992?accountid=17116>.

Bidan, P 2008. Natural Catastrophes Insurance Covers (A diversity of systems). Madrid: Consorcio de Compensation de Seguros.

CCR 2011. Site Institutionnel: Plaquette Cat Nat 2011 Angl. Acquired 10. 11 2013, z Caisse centrale de reassurance, <http://www.ccr.fr/index.do?aid=2094981368466376508>.

CCS 2008. CCS (Consorico de Compensación de Seguros). Natural Catastrophes Insurance Cover. A Diversity of Systems. Depósito Legal: M.25.246-2008.

CIA 2007. Cezch Insurance Association (CIA), Statistické údaje. Published 2008, <http://www.cap.cz/statisticke-udaje/zivly>.

CIA 2008. Cezch Insurance Association (CIA), Statistické údaje. Published 2009, <http://www.cap.cz/statisticke-udaje/zivly>.

CIA 2009. Cezch Insurance Association (CIA), Statistické údaje. Published 2010, <http://www.cap.cz/statisticke-udaje/zivly>.

CIA 2010. Cezch Insurance Association (CIA), Statistické údaje. Published 2011, <http://www.cap.cz/statisticke-udaje/zivly>.

CIA 2010. Povodňové mapy. Czech Insurance Association (CIA), 2010, <http://www.cap.cz/Item.aspx?item=Povod%C5%88ov%C3%A9+mapy>.

CIA 2011. Cezch Insurance Association (CIA), Statistické údaje. Published 2012, <http://www.cap.cz/statisticke-udaje/zivly>.

CIA 2012. Cezch Insurance Association (CIA), Statistické údaje. Published 2013, <http://www.cap.cz/statisticke-udaje/zivly>.

Daňhel, J., Ducháčková, E. & Radová, J. 2007, *Analýza globálních trendů ve světovém a českém komerčním pojišťovnictví*. Oeconomica, Praha.

Kukal, Z & Pošmourný, K 2005. Přírodní katastrofy a rizika: Příspěvek geologie k ochraně lidí a krajiny před přírodními katastrofami. PLANETA, Praha: Ministerstvo životního prostředí, 2005, roč. XII, č. 3/2005, <http://www.mzp.cz/osv/edice.nsf/3974fda531ea66b3c1257030001e709f/$file/planeta_katastrofy_2korektura.pdf>.

Lahnstein, Ch 2005. Industrial, Technological and Other Catastrophes. In OECD: Policy Issues in Insurance Catastrophic Risks and Insurance, 2005, p. 31-40.

MunichRe 2013. Natural catastrophes worldwide 1980–2012, Number of events, Münchener Rückversicherung-Gesellschaft, 2013, <https://www.munichre.com/touch/naturalhazards/en/natcatservice/significant-natural-catastrophes/index.html>.

Mužáková, K & Kubová, P 2013. Polluter Pays Principle in the Czech Republic in the Context of Public Environmental Protection Expenditures. *In European Financial Systems 2013, Proceedings of the 10th International Scientific Conference*. Brno, Masaryk University in Brno, 2013, pp. 181–188.

Mužáková, K & Štibrányiová, L 2013. Complexity of the Regulatory Environment of Financial Markets in the Eu Focusing on Insurance Market. *In Sborník příspěvků z mezinárodní vědecké konference MMK 2013*.. Hradec Králové, MAGNANIMITAS, 2013 pp. 731–740.

OECD 2005. Policy Issues in Insurance Catastrophic Risks and Insurance. ISBN 92-64-00994-9. 424 p.

Schwarze, R & Wagner GG 2006. Discussion paper Nr. 620. The Political Economy of Natural Disaster Insurance: Lessons from the Failure of a Proposed Compulsory Insurance Scheme in Germany, German Institute of Economic Research, Berlin, 25 p.

Swiss Re 2006. Sigma. Natural catastrophes and man-made disasters. Zurich, Swiss Reinsurance Company, Ltd., 2006, <http://www.swissre.com/sigma>.

Swiss Re 2007. Sigma. Natural catastrophes and man-made disasters. Zurich, Swiss Reinsurance Company, Ltd., 2007, <http://www.swissre.com/sigma>.

Swiss Re 2008. Sigma. Natural catastrophes and man-made disasters. Zurich, Swiss Reinsurance Company, Ltd., 2008, <http://www.swissre.com/sigma>.

Swiss Re 2010. Sigma. Natural catastrophes and man-made disasters. Zurich, Swiss Reinsurance Company, Ltd., 2010, <http://www.swissre.com/sigma>.

Swiss Re 2011. Sigma. Natural catastrophes and man-made disasters. Zurich, Swiss Reinsurance Company, Ltd., 2011, <http://www.swissre.com/sigma>.

Swiss Re 2012. Sigma. Natural catastrophes and man-made disasters. Zurich, Swiss Reinsurance Company, Ltd., 2012, <http://www.swissre.com/sigma>.

Swiss Re 2013. Sigma. Natural catastrophes and man-made disasters. Zurich, Swiss Reinsurance Company, Ltd., 2013, <http://www.swissre.com/sigma>.

Swiss Re 2014. Sigma. Natural catastrophes and man-made disasters. Zurich, Swiss Reinsurance Company, Ltd., 2014, <http://www.swissre.com/sigma>.