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Impact of Catastrophic Risks on Insurance

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Abstract: Like many other regions of the world, the European Union is vulnerable to almost all types of natural disasters. The damage history of each European country confirms this. Disasters not only cause loss of human lives, but also material damage that amounts to billions of euros every year, affecting stability, economic growth and economic relations between member states. In a much broader context, in 1996 the European Humanitarian Aid Service set up a disaster preparedness program for catastrophic risks, named DIPECHO (Disaster Preparedness ECHO). Since 1987, the European Council has established an agreement open to all European countries, including the Russian Federation, entitled Europe - major risks. This intergovernmental agreement is a vast platform for cooperation in the field of major natural and technological risks between all European countries. The Green Paper on insurance against natural and man-made disasters, which is a basic document in the actions of European countries to strengthen the management of catastrophic and non-catastrophic risks. The paper aims to present the main risks that have occurred in Europe, their intensity of production, the affected countries and their influence on the insurance market.

Keywords: insurance; insurable risk; catastrophe; international strategy

If we observe the evolution of the human society, we note that mankind has tried over time to control nature through various means. Regardless of the current development of the humanity, we notice that, unfortunately, controlling nature is not possible. Natural disasters that hit different regions are an example of this fact (hurricanes, catastrophic floods, collapse of mining galleries, earthquakes). Romania is not bypassed by them. We remember the catastrophic floods of recent years, followed by periods of prolonged drought. Also, many of us remember the strong earthquake of March 4, 1977³ that caused great material damage and loss of life.

Apart from these natural risks, there are all kinds of car accidents that occur on public roads. In addition, the media presents daily acts of robbery, theft, etc. that seem to multiply with the development of human society. Many companies go bankrupt, thus affecting other economic agents and at national level the country's economy. Also, with the development of science and technology, new risks appear, unknown until then, that affect our daily lives, property, or even economic life.

We enjoy some risks. We can win the lottery - risk of enrichment. We can have enviable health and live a long life - risk of survival. But we do not like all risks. We can get sick - risk of morbidity. We can die from various causes - risk of death. We can have an accident - risk of accident.

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³Known as the '77 Earthquake, it was an earthquake with a magnitude of 7.2 and a duration of 55 seconds. It caused, according to official sources of the time, 1578 human casualties, approximately 11,300 injured and significant material damage.

Therefore, human society is constantly faced with a diversity of risks, whether we want to or not.

1. The Stage of Knowing the Concept of Risk

These are the reasons why insurance services appeared or, which include insurance products and subsequently reinsurance products. These services are offered by specialized companies that cover various risks in exchange for a sum of money called insurance premium. Thus, the payment of this amount of money covers the insured person in the events caused by accidents, either by car or other nature, it can save his company from financial problems that could lead to bankruptcy or many other risks.

An argument that insurance products are useful is offered by their presence on a very large scale in the West, where there is a real financial and insurance culture among the population. Most people in Western countries have many individual and collective insurance, not only for motor third party liability, but for life, health, personal goods. We try to explain this phenomenon: because in the Western society the sense of personal property is very developed, there is an economic culture and everyone wants to cover their properties from different risks, but also because Westerners are very interested in their future and those around them. Let us not forget that, for example, France developed capitalism in 1789 (the French Revolution) and this produced changes in the behavior of every Frenchman. In Romania we can speak of capitalism in the true sense of the word only after the year 2000. Here is a possible explanation of how insurance is seen in the two countries, both at an individual level or a collective one.

Therefore, insurances represent a good tool for creating a secure and carefree future.

To understand the concept of insurance and its importance as a protection tool of individuals and legal entities threatened by random phenomena that cause damages, we must make a brief presentation of the notion of risk.

The risk to which people are exposed is generally defined as **a potential peril or a possible loss**. The perils materialize in unwanted events with serious material, spiritual and financial consequences, with bodily injuries or deteriorating health condition leading to death.

Insurance risk (R) is the result of the probability of occurring (p) and the expected loss (P).

$$\boxed{R = p \times P}$$

The insurance risk is used in a pessimistic way, often associated with an unfortunate (unwanted) event.

On the other hand, for insurance company to be able to take a risk, three conditions must be met:

- They need to be able to mutualize that risk. This means that the risks cannot be managed effectively individually, but at a group level, preferable as many as possible.
- They must have the financial capacity to cover it. In other words, the insurance company must be able at any time to respect the financial obligations arising from the insurance contract for optional insurance, respectively the law for the mandatory ones.
- They must respect the legal conditions to allow the insurance, mainly for the risk to be linked to a lawful activity.

French specialists, such as the French professor Yvone Pesqueux¹, appreciate risk as **a frontier object**, which can circulate in several communities. There is no insurance without risk!

Indeed, the risk does not belong to a good or person. The earthquake affects not only a house, but the entire real estate near its epicenter. Disease is not a characteristic of a single person; a disease can affect several people, one at a time or at the same time. French theorists also enshrine a new concept, that of **risk economy**, which in their view represents all transactions between policyholders and insurers, to cover damages arising from the occurrence of risks insured by the insurance contracts.

The concept of risk is characterized by **two dimensions**: *the degree of uncertainty* and *the material and financial consequences* of a certain unwanted event.

In general, special attention is paid to events that have a high frequency of happening, those with low frequency of happening are often neglected. But there are events with very low frequency of happening that have catastrophic consequences. The category of rare or very rare accidents of this kind also includes those in the field of aviation or river and maritime transport. As their consequences are serious, awareness and risk assessment at both individual and social level is necessary.

To the two fundamental dimensions of risk is added a third dimension: *the risk perception*. This psycho-social component has a significant importance in analyzing and interpreting the risks to which we are all subjected, as well as in creating the means of protection against the risks.

Human existence cannot be thought of without risk; risks are part of our lives. Our only chance is to be aware of the risks we are exposed to, to try to assess them as accurately as possible and to find the most appropriate methods to control them.

One of the most remarkable definitions of insurance is given to us by Yvone Lambert-Faivre² who considers that:

“in its technical aspect, which is fundamental, the insurance represents the operation by which an insurer, organizing a large number of insured, exposed to certain risks, using the principle of mutuality, indemnifies those of them who suffer a claim, on account of the common fund obtained from the premiums received”.

The same French author states that *“unlike the insurance contract that takes the form of a bet or a game of chance, the insurance operation, viewed in its complexity, becomes an anti-random operation of collective fight against chance.”*

The risks accepted by the insurance companies are called *insurable risks*. The conditions that must be met to transfer the risks to the insurance companies are the following:

- 1) the production of risk must be possible, because if a certain good is not threatened by any risk, its insurance does not become necessary;
- 2) the occurrence of the risk must be of a random nature, the insurers will take care to select the risks they cover by insurance, to eliminate those with certain chances of happening and those with high possibility of happening;

¹ Yvone Pesqueux, French professor of management, specialized in business management techniques, honored in 2011 by the Danubius University of Galați with the title of Doctor Honoris Causa.

² Yvone Lambert-Faivre, French professor at the University of Lyon III, known for her studies and insurance work, such as: Insurance Law, Company Risks and Insurance, Personal Injury Law, etc. Creator of the Insurance Institute of Lyon and Rector of the Academy of Dijon (1980-1983).

- 3) the action of the phenomenon must be able to be recorded in the statistical records, to be able to calculate the probability of occurrence of the risk and, implicitly, the volume of the insurer's liability;
- 4) the occurrence of the event should not depend on the will of the insured or the beneficiary of the insurance.

2. The Research Methodology

In the present work, we have studied the opinions of different risk management specialists from the specialty literature, as well as the studies developed by them. International and national statistics confirmed these theories.

The time interval subject to this analysis is the period 1900-2020, considered sufficiently comprehensive for the evolution of catastrophic risks.

3. The Catastrophic Risk (Calamity). Human Perception of the Catastrophic Risks (Calamities)

The concept of catastrophic risk or global calamity, different from the risk presented above, was introduced by the Swedish philosopher Nick Bostrom¹ quite late, in 2008. He considered that a hypothetical event that disrupts a large part of humanity can be considered a catastrophic risk. The Swedish philosopher has thought since 2002 that we can talk about the existential risk, different from the catastrophic one, which can lead to the destruction of humanity. Therefore, we can now talk about broadening the scope of the concept of catastrophic risk with new elements arising from the destructive action of man on the environment as well as the increase of accidental risks produced naturally. Professor Nick Bostrom and other insurance specialists estimate that there has been an increase in catastrophic events in the last 30 years. On the other hand, according to a study conducted by Munich Re in 1998², the magnitude of catastrophic events in the twentieth century is confirmed.

Nick Bostrom considers the following risks associated with his sources of production to be catastrophic:

3.1. Risks arising from human action on the environment

- Global warming, a risk that has increased significantly today, which is manifested by large variations in temperature and increasing the average temperature. It has the effect of melting glaciers and raising sea levels.
- Overpopulation or population growth beyond natural limits, is associated with food problems, water supply etc.
- Large-scale wars (world wars). So far, there have been two world wars with serious effects on nature (the explosion of two nuclear bombs in Japan).

¹ Nick Bostrom is a Swedish philosopher at Oxford University, known for his work on existential risks, the anthropic principle, the ethics of human improvement, the risks of superintelligence and the reversal test. His main works are *Global Catastrophic Risks*, *Superintelligence*, *Human Enhancement* etc.

² There were 243 catastrophic events considered important, of which 38% were storms and hurricanes, 29% earthquakes and 27% floods. The cumulative amount of economic losses caused by these undesirable events is estimated at \$ 960 billion (Munich Re, 2013). Earthquake risk is estimated to be the most damaging (33% of total losses).

- Biotechnology, closely linked to the biological weapons of the world's superpowers, the development of viruses and other toxic compounds. Biotechnology is closely linked to the risk of a pandemic.
- Accidents of experimental technology are often found in various forms in all fields of activity.

3.2. Accidental Hazards

- Global pandemics, closely linked to the violence of the contagious agent, have occurred many times, even in modern times. The pandemics that had the highest number of victims are: smallpox 300 million dead, measles 200 million dead, Spanish flu 100 million dead, black plague 75 million dead, HIV 25 million dead, etc.
- Climate change, that changes the climate in a sustainable way, it has occurred several times affecting the evolution of life on earth.
- Volcanism, the eruption of a super volcano or the activation of many volcanoes can change the climate and life on earth.
- Cosmic hazards (impact with cosmic bodies) have occurred on a small scale so far, but it is possible that the Earth will be hit by larger bodies.
- The emergence of extraterrestrial civilizations on earth. Although there are places on earth with constructions that cannot be explained even with contemporary technology, no contacts have been registered with them.

However, there is no common point of view of insurance specialists to identify, for all countries in the world, what are the calamitous or catastrophic risks. In many countries around the world, there is a view that a risk can become catastrophic if it significantly affects the national economy and causes numerous loss of life on large areas of land.

Therefore, economists consider that the countries affected by these risks suffer significant material damage closely related to their level of economic development (directly proportional relationship). Also, the human sufferings, materialized in the large number of victims, wounded, homeless people, the mentally ill, etc., are not to be neglected.

According to Sigma Magazine no.1 / 2018, at international level there have been numerous catastrophic risks caused by various natural factors, but also resulting from the destructive activity of humans, from which we have selected the following:

- 1992 Hurricane Andrew hit the US and Bahamas coasts, causing more than \$ 17 billion insured losses;
- The 1994 6.7 magnitude Northridge earthquake caused more than \$ 15 billion insured losses in the United States;
- 2001 terrorist attack at the Pentagon and WTC with losses of \$ 31 billion;
- 2011 9 magnitude earthquake followed by tsunami in Japan, losses of over \$ 34 billion. Romania has not been spared of such destructive risks either, the most important in the last decades are the followings:
- the earthquakes of 1802, 1812, 1829, 1838, 1908, 1940 (it produced approx.1200 victims and over 4000 injured) and 1977 (which produced approx. 1700 victims and significant material damage) that made Bucharest to be considered as the European capital with the highest risk of earthquake;

- landslides in 1971- Certej disaster, Hunedoara County, which caused 89 dead, 76 injured, the destruction of 6 blocks of flats of 25 apartments each, 7 houses and 24 peasant households;
- the floods of 2001, 2005 and 2007 with serious effects on Romanian agriculture.

A clearer position is held by the global reinsurer Swiss Re, which divides disasters (e.g. the unwanted effects of catastrophic risks) into two main categories: *natural disasters* and *man-made disasters (technical catastrophes, “man-made catastrophes”)*. According to Sigma publication no. 2/2007 / Swiss Re, the term **natural disaster** means *an event caused by the forces of nature*. Such an event often results in many individual losses within several concluded insurance policies. The scale of losses resulting from a catastrophe depends not only on the severity of the forces of nature, but also on a number of human factors such as the design of the building or the efficiency of control activity during the disaster in a particular region. Therefore, the main features which result from natural disasters are namely the following:

- o large losses are produced;
- o losses occur at long intervals between events;
- o the severity of the losses cannot be known in advance.

Technical disasters are categorized by the global reinsurer as those major events associated with human activities. The occurrence of technical catastrophes in the U.E. it is a reality; in 2001 in Toulouse - France, there was a strong explosion at the AZF¹Chemical Plant, resulting in significant damage that could not be covered by the insurer; plane crashes (Balotești 1995 Romania), derailments of passenger and freight trains, explosions of means of transport, etc. Practice has shown that in case of technical risks (technical catastrophes) with high value damage, there is the possibility of not covering the damage caused.

Events such as war, civil war are usually excluded from the insurance of catastrophic risks.

In Romania, earthquakes, floods, and landslides are considered catastrophic risks. All other risks are not accepted by the legislator as catastrophic, even if their intensity of production leads to significant material losses and loss of life. This legislative approach is specific to Romania².

Reacting to the diversification of catastrophic risks, observing the frequency and high degree of destruction produced, the governments of the countries of the world have founded institutions and issued laws leading to better management against these disasters.

Thus, in Romania, the authorities have implemented a mandatory house insurance scheme which aimed to cover three catastrophic risks: earthquake, floods, and landslides. These insurances are administered by PAID (Disaster Insurance Pool). Despite the obligation imposed by the law, from a total of 8.9 million homes³, only 1.7 million of them had concluded mandatory house insurance policies against natural disasters. Therefore, the penetration indicator of house insurance is low, below 20%.

¹On September 21, 2001, at the AZF Chemical Plant in Toulouse, a powerful explosion resulted in the death of 29 people and the minor injury of another 2,500. The ammonium nitrate explosion produced a crater 7 m deep and 40 m in diameter.

²See Law 260/2008 on the mandatory house insurance against earthquakes, landslides, or floods, with further amendments and completions.

³See the reports of the National Institute of Statistics, Bucharest, 2019.

The following figure shows an evolution of the number of mandatory insurance contracts concluded in the last 5 years and of the compensations that were paid for the occurrence of catastrophic risks (according to the report prepared by the Financial Supervisory Authority-ASF).

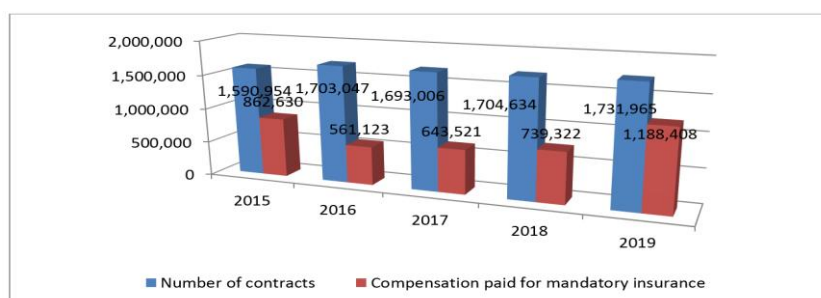


Figure 1. Number of Contracts and Indemnities Paid for Mandatory Insurance (Euro)

It can be observed that although the number of insurance contracts concluded was about 1,591,000, the compensations were quite high, reaching about 870,000 euros. In the period 2016-2018, the compensations were between 560,000 - 740,000 euros. The year 2020 is notable for increasing the level of compensation to over 1,100,000 euros, but also the number of contracts to approximately 1,732,000.

In a much larger context, ever since 1996, the European Humanitarian Aid Service has founded a disaster preparedness program named DIPECHO (Disaster Preparedness ECHO). Since 1987, the European Council has established an open agreement to all European countries, including the Russian Federation, entitled Europe - major risks. This intergovernmental agreement is a broad platform for cooperation in the field of major natural and technological risks between all European countries. DIPECHO is currently open to other countries in the world, including Latin America and the Caribbean, Central Asia, South Africa., etc.

At the level of the United Nations (UN), the consensus on international prevention of catastrophic risks has been strengthened, by launching UN instruments, for the protection of the population and the environment. The International Strategy for Disaster Reduction (ISDR) has been developed, with the participation of all institutions that are part of the United Nations.

Like many other regions of the world, the European Union is vulnerable to almost all types of natural disasters. The history of damage in each European country confirms this. Disasters not only cause loss of life, but also material damage amounting to billions of euros each year, affecting stability, growth, and economic relations between member states.

Thus, the Green Paper on Insurance against Natural and man-made disasters was developed, which is a basic document of European countries to strengthen the management of catastrophic and non-catastrophic risks. This document provides an overview of the incidence of natural and man-made disasters in EU countries. It has been found that the market for insurance against natural disasters is reduced in all European countries. This document identifies a major concern for EU countries, as catastrophic risks can have cross-border effects, affecting the economies of other countries as well.

The Green Book on Insurance against Natural and Man-Made Disasters presents EU member states as highly exposed to the risks of disasters. One possible solution to improve the public's perception of catastrophic risks is the state's intervention in insurance. Thus, public authorities may be involved as

insurers or may sponsor insurance pools willing to do so. Public authorities can act as (re) insurers by taking risks that exceed a certain level of damage caused by disasters, namely stop loss reinsurance¹.

4. Conclusions

Insurance specialists consider the classification of risks into catastrophic risks and ordinary risks as being particularly useful in the economy and not only.

It is found that both in Romania and in other countries of the world, the number of catastrophes that occur and that affect the economic and social life in general is increasing; due to the different level of economic development of the countries, a polarization of the technical catastrophes produced in the economically developed countries is observed. On the other hand, it is considered beneficial to develop and include catastrophic risks in reinsurance.

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Internationally, there is a sustained concern to amend national legislation to introduce insurance against catastrophic risks. The results so far are modest, even though the world economy is currently suffering from the catastrophic risk of a pandemic.

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¹See information sheet no. 208/2013 on the Green Book on Insurance against Natural and Man-Made Disasters. Responsible: Michel Barnier, European Commissioner for the Internal Market and Services Co-responsible: Kristalina Georgieva, European Commissioner for International Cooperation, Humanitarian Aid and Crisis Response.