AIDA Climate & Catastrophic Events WP

Catastrophic Events Mercosur Region

Mercosur Group

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Introduction

We are located in the year 1863, that is to say 154 years ago, Jules Verne invited to fly with the imagination in a balloon, with which it was arranged to cross the African continent during five weeks in search of the origin of the river Nile.

The aerostat commanded by Samuel Fergusson was able to sail off the coast of Zanzibar Island and began a journey stalked by storms, hurricanes, ferocious beasts and burning tribes.

Fergusson along with Dick and Joe, crewmates, had in mind to complete the scattered notions of African cartography, enjoy nature and observe the storms. In one of the elevations Fergusson described the beauty he saw at his feet "it is truly a magnificent region and one would hardly find in the world a more beautiful vegetation". This was the beginning of a debate between the clouds that advanced a century and a half to the massive emergence of environmental refugees.

Who knows if this region, will not someday be the center of civilization? Here the peoples to come will be established, when, exhausted, the regions of Europe can no longer nourish their inhabitants.

These intrepid crews glimpsed and considered the march of events that would take place, like the successive emigrations of the towns.

Verne's premonition in fiction today is correlated in pronouncements of Pope Francis, in his encyclical "Laudato Yes", the Pope calls to "take care of the common house urgently" and emphasizes the subject of the exiles "tragedy is the increase of The migrants fleeing the misery worsened by environmental degradation. "

Historically, variability and extremes cause negative impacts on the population, increased mortality and morbidity in affected areas. Extreme weather events have become more intense and / or more frequent during the last fifty years in southeastern South America.

Today, the five-week balloon ship will sail through the skies of the Mercosur Region and allow us to witness the latest catastrophic events that have occurred during the Southern Hemisphere's summer season.

Executive Summary

The research work on the catastrophic events that occurred in the Mercosur Region, during the summer season of December 2016 / January 2017, is divided into 5 Chapters and a first part called general considerations in which the term "natural hazards" is defined. Classify potentially dangerous natural phenomena and geological / hydrological threats. At the same time, it deals with reducing the impact of natural events, techniques and tools for the evolution of natural hazards.

Chapter I

Argentinian Republic

This chapter describes the geographic environmental characteristics of the country, the catastrophic events that occurred in the summer season 2016/2017. Catastrophic insurance is dealt with and the comparative law of catastrophic insurance in Colombia is mentioned as a model to follow.

Chapter II

Federal Republic of Brazil

This section describes the geographic environmental characteristics of the country, secondly catastrophic insurance and the work of Maria da Glora Faria and Pery Saraiva Neto, which describes the Rupture of the Fundão dam in Mariana.

Chapter III

The Republic of Chile

This chapter describes the geographic environmental characteristics of the country, its highly seismic and volcanic zones, mention is made of the 2010 earthquake / tsunami.

Chile, because of its experience of catastrophic events, has the catastrophic reserve of earthquakes and, in the future, the possibility of new risk transfer instruments is being studied to mitigate future catastrophic events.

In the end, this chapter deals with the fires that occurred in the summer season 2017.

Chapter IV

Republic of Peru

On the other hand, the events that took place during the month between January and March 2017 were catastrophic, as a result of the ENSO phenomenon "El Niño Southern Oscillation" that affects the coast of Peru and Ecuador called Niño Costero.

Chapter V

Eastern Republic of Uruguay

In this chapter, the geographic environmental characteristics of the country are developed. Uruguay has a low exposure to catastrophic events, however, in January 2017 there was a phenomenon of intense rainfall that caused considerable damage.

With regard to insurance against catastrophic events, they only exist for the agricultural sector and the dairy sector.

The chapter develops the geographic environmental characteristics of the country, as far as catastrophic insurance is concerned, which only exist for low-income farmers**.**

Acronyms

AAA Rating Rated by S & P Global Ratings

BBB Rating adequate protection parameters by S & P Global Ratings

AACH Association of Insurers of Chile AG

CONAF National Forest Corporation

ESDA Environmental Performance Study

FOGASA Guarantee fund for agricultural field and insurance

IBGE Statistical Yearbook of Brazil

INALE National Institute of milk (Uruguay)

INDEX National Institute of Civil Defense

NCG General Standard Superintendency of Securities and Insurance (Chile)

MGAP Ministry of Livestock, Agriculture and Fisheries (Uruguay)

MINAGRI Ministry of Agriculture and Irrigation (Peru)

MSNM Meters above sea level

OPYPA Office of Agricultural Programming and Policy (Uruguay)

UNEP United Nations Environment Program

RTC Catastrophic Earthquake Reserve

SAC Catastrophic Agricultural Insurance (Peru)

GIS Geographic Information System

SOPA Compulsory Personal Accident Insurance

SVS Superintendency of Securities and Insurance (Chile)

General considerations

Natural Threats, Environment and Sustainable Development

Natural hazards are defined as "those elements of the environment that are dangerous to man and are caused by forces alien to him." In this context the term "natural hazards" refers specifically to all atmospheric, hydrological, geological (especially seismic and volcanic) phenomena and to fires which, because of their location, severity and frequency, have the potential to adversely affect humans, Their structures and their activities. The qualification of "natural" excludes all phenomena caused exclusively by man, such as wars and pollution. Nor are they considered as threats that are not necessarily related to the structure and function of ecosystems such as infections.

A natural threat has elements of human participation. A physical event, such as a volcanic eruption that does not affect the human being, is a natural phenomenon, not a natural threat. A natural phenomenon occurring in a populated area is a dangerous event. A dangerous event that causes fatalities and / or serious damages beyond the capacity of society to respond, is a natural disaster. In areas where there are no human interests, natural phenomena do not constitute threats or result in disasters. This definition differs from the traditional view that natural disasters are unavoidable havoc caused by the uncontrollable forces of nature. A disaster is not a purely natural process, but is a natural event that occurs in places where there are human activities.

Natural Hazardous Phenomena

Atmospheric	**Hydrological**
Hail	Coastal flood
Hurricanes	Desertification
Fires	Salinization
Tornadoes	Drought
Tropical storms	Erosion and sedimentation
	Cyclonic waves

Seismic	**Volcanic**

Failures	Tefra (ash, lapille)
Tremors	Gases
Side dispersions	Lava flows
Liquefaction	Mud currents
Tsunamis	Projectiles and lateral explosions
Seiches	Pyroclastic flows

Geological / hydrological threats

Gravel avalanches	Fire
Expansive floors	Scrub
Landslides	Forests
Rock detachment	Grasslands
Submarine displacements	Savanna
Ground Sinking	

Earthquakes

Earthquakes are caused by the sudden release of the tension energy slowly accumulated in a fault of the earth's crust. Earthquakes and volcanoes commonly occur in the shock zone of tectonic plates. Earthquakes in particular present a threat because of the irregularity in time intervals between events, the lack of adequate forecasting systems and the risks related to the following:

- The earthquake is a direct threat to any construction located near the center of the earthquake.
- The collapse of buildings causes many fatalities in densely populated areas.

Surface faults occur as a separation of the parent material along the surface.

- landslides occur due to earthquakes in areas of relatively steep topography and slope stability.
- The liquefaction of unbound material, slightly inclined, can be activated by earthquake. Flows and lateral dispersions (liquefaction phenomenon) are some of the most destructive geological threats.

- The sinking of land or surface depression is the result of loose or unconsolidated sediment settlement. Soil sinking occurs in flooded soils, embankments, alluviums, and other material prone to settle.
- Tsunamis or seismic waves, which are commonly generated by seismic activity below ocean floor, cause flooding in coastal areas and can affect other areas located thousands of miles from the center of the earthquake.

Volcanoes

Volcanoes are perforations of the earth's crust, from which molten rocks and gases escape from the surface. The volcanic threats derive from two kinds of eruptions:
- Explosive eruptions: they originate from the rapid dissolution and expansion of the gas released by the molten rocks as they approach the earth's surface. The explosions impose a threat by scattering blocks and fragments of rocks and lava, at varying distances from the origin.
- Effusive eruptions: the greatest threat posed by these is the flow of materials, not the explosions themselves. Flows vary in nature (mud, ash, lava) and quantity, and their origin can come from different sources. Their action is determined by the gravity, the topography that surrounds them and the viscosity of the material.

Threats related to volcanic eruptions are lava flows, ash and shell drop, mud currents and toxic gases. Volcanic activity can, in turn, trigger other dangerous natural events, including local tsunamis, landscape deformation, flooding by breaking the walls of a lake or by clogging streams and rivers and landslides caused by earthquakes.

Landslides

The term slippage includes collapse, falls and flow of unconsolidated materials. Slips can be triggered by earthquakes, volcanic eruptions, soils saturated by heavy rainfall or by groundwater growth and by the undermining of rivers. A tremor of saturated soils caused by an earthquake creates extremely dangerous conditions. Although landslides are located in relatively small areas, they can be especially dangerous because of the frequency with which they occur. The different types of landslides are:
- The detachment of rocks characterized by the free fall of rocks from a cliff. These usually accumulate at the base of the cliff forming a slope, which imposes an additional threat.

- landslides and avalanches, which are the displacement of an overload due to a failure of cutting. If the displacement occurs in surface material without total deformation, it is called sinking.
- Flows and lateral dispersions, occurring in recent unconstrained material where the water table is shallow. Despite being associated with soft topographies, these liquefaction phenomena can reach great distances from their origin.

The impact of these events depends on the specific nature of the slip. The detachment of rocks obviously constitutes a danger to humans and property, but in general, it imposes a localized threat given its limited area of influence. Landslides, avalanches, flows and lateral dispersions generally cover large areas and can result in a great loss of human life and property. The muds associated with volcanic eruptions can travel at high speeds from their point of origin and are one of the most destructive volcanic threats.

Flood

Two types of flooding can be distinguished: (1) flooding of rivers caused by excessive runoff due to heavy rainfall; and (2) flooding from the sea, or coastal flooding, caused by cyclonic waves exacerbated by runoff from watersheds Higher. Tsunamis are a special type of coastal flood.

a) Coastal floods

Cyclonic waves are an abnormal growth of sea level associated with hurricanes and other sea storms. Cyclonic waves are caused by strong coastal winds and / or by very low pressure cells and ocean storms. The level of the waters is controlled by winds, atmospheric pressure, existing astronomical currents, waves and sea bottom, coastal topography and bathymetry and the proximity of the storm to the coast.

Generally, the destructions caused by cyclonic waves can be attributed to:

- The impact of waves and objects associated with the passage of the wave front.
- Hydrostatic / dynamic forces and the effects of water-loading pumps. The most significant damage often results from the direct impact of waves on fixed structures. Indirect impacts cause flooding and undermining of infrastructures such as highways and railways.

The flooding of the delta and other low coastal areas is exacerbated by the influence of tides, storm waves and frequent movement in the canals.

b) River Overflow

The overflow of the rivers occurs when the capacity of the channels to exceed the water is exceeded and therefore the river banks are overflowed. Floods are natural phenomena and can be expected to occur at irregular intervals of time in all watercourses. Human settlement in an area close to flood plains is one of the major causes of flood damage.

Tsunamis

Tsunamis are long-lasting waves generated by earthquakes, volcanic activities and landslides on the sea floor. The crest of these waves can exceed 25 meters in height when reaching shallow water. The unique characteristics of tsunamis (100 km or more in length, deep water speeds up to 700 km / h and small crest height in deep water) make them difficult to detect and monitor. The characteristics of the coastal floods caused by tsunamis are the same as when they are caused by cyclonic waves.

Hurricanes

Hurricanes are tropical depressions that develop like strong storms characterized by centripetal winds. These are generated on warm oceanic waters at low latitudes and are especially dangerous given their destructive potential, their area of influence, spontaneous origin and erratic movement. The phenomena associated with hurricanes are:

- Winds exceeding 64 knots "hurricane power" (74 mi / h or 119 km / h). The damages are caused by the impact of the wind on fixed structures and by objects that fly as a result of it.
- Heavy rainfall of several days before and after the hurricane. The level of precipitation depends on the humidity and the speed and magnitude of the hurricane. Rainfall can saturate soils and cause flooding as a result of excess runoff (flooding of soils); Can cause landslides as a result of overweight and lubrication of surface materials; And / or can damage crops by weakening root support.
- Cyclonic waves, especially combined with high tides, can easily flood low areas that lack protection.

Natural Threats in Arid and Semi-Arid Areas

a) Desertification

Desertification, the degradation of natural resources in arid lands that create desert conditions, results from a set of interrelated and interdependent actions, usually caused by droughts combined with the pressure of human and animal populations. Droughts are prolonged dry periods in natural climate cycles. The dry and humid periods impose serious

problems for those cattlemen and farmers who bet on them. They increase their herd and extend their plantations to dry land during humid periods. In the future the drought will detract from activities that had been extended beyond the capacity limits of the region.

Overgrazing is very common in rainfed lands and is the activity that contributes most to desertification. Tillage in dry land is carried out in semi-arid regions where water is one of the main limiting factors of agricultural production. The most used crops are grains and cereals. Rainfed agriculture is a risky practice if special conservation measures are not taken, such as the use of summer fallow stubs, row crops and suitable tillage. In Latin America, desert drylands can in general be attributed to some type of soil exploitation and variations in the natural climate.

b) Erosion and Sedimentation

Soil erosion and its consequent sedimentation are the natural events that cause the most economic and social losses. Erosion occurs in all types of climatic conditions, but is considered more harmful in arid zones since its combination with salinization is a cause of desertification. Wind and hydraulic erosions occur on any type of slope. The threat of erosion is greatest when there is overgrazing, when the forests are exploited, with some agricultural practices, roads and trails and urban development. Erosion has three main effects: the loss of supports and nutrients needed for crop growth; The damage caused by sediments accumulated by erosion in downstream currents; And the reduction of the water storage capacity due to the loss of soils and the sedimentation of the basins and reservoirs, which results in the reduction of the natural flow of the basins.

Sedimentation in basins and reservoirs is often the basis of many water management problems. The movement of sediments and their resulting deposition in reservoirs and riverbeds reduces the shelf life of water reservoirs, increases flood damage, impedes navigation, degrades water quality, damages Crops and infrastructures and causes the excessive use of turbines and pumps.

c. Salinization

Salt waters are common in dry regions. Soils with marine chemical deposits (such as shale) are generally saline. However, saline soils receive salts transported by water from other places. Salinization in most cases occurs on irrigated land as a result of poor water control. The main source of salts are surface or groundwater. Salts accumulate due to lowland

flooding, evaporation of depressed soil and groundwater growth to the surface. Salinization reduces soil fertility and can cause total loss of land for crops. In some cases, cropland abandoned by man due to salinity problems may be subject to wind and hydraulic erosion and end up in desert areas.

Low water costs cause too much watering. In dry regions, salty groundwater is a major source of water. Setting a low price for water in irrigation projects can generate a high demand for such projects and result in misuse of available water, causing flooding and

Salinization

Although humans can do very little to alter the incidence or intensity of most natural phenomena, they can play an important role in ensuring that natural events do not become disasters caused by their own actions. It is worth mentioning that human intervention can increase the frequency and severity of natural events. For example, when the lands are removed at the base of a landslide to give rise to a settlement, they can move again and bury it. Human intervention can also lead to natural threats where they did not exist before. Volcanoes erupt periodically, but until rich soils formed by their ejection are not populated by humans, they are not considered dangerous. Finally, human intervention reduces the mitigatin.

2. Reducing the impact of natural events

Experiences in Latin America, the Caribbean and other regions show that mitigation of natural hazards is improving. The installation of warning systems in several Caribbean countries has reduced the number of fatalities caused by hurricanes. At the same time, the permanent establishment of these systems in flood areas has significantly reduced the damage caused by floods in vulnerable areas.

A study in New York State (USA) on landslide mitigation showed that improvements in highway construction between 1969 and 1975 reduced the cost of repairing roads by 90% landslides. Another experience, in the city of Los Angeles, California, shows that proper leveling and soil analysis can reduce landslide losses by 97%.

On the other hand, a study conducted after the 1971 earthquake in the San Fernando Valley, California, indicated that out of 568 old school buildings that did not meet the requirements of the Field Act (which stipulates design standards), 50 had suffered so many Damage that had to be demolished. However, all 500 buildings that met seismic resistance standards

were not damaged in their structures. Similarly, in the 1989 Loma Prieta earthquake, the most costly natural event in US history, the provisions of the local zoning and construction codes helped to make the damage not even more severe. In the San Francisco Bay area, constructions after 1960 rocked but remained intact, while older buildings were damaged. Brick constructions and unreinforced concrete blocks endured the worst consequences. Buildings built on firm ground were, in general, less likely to withstand damage than those built on embankments or on gentle slopes.

Mitigation techniques can also extend the alert period to a volcanic eruption, making it possible to evacuate the population. Today, monitoring mechanisms can detect the increase in volcanic activity even months before a rash. Every day, more sophisticated systems are available for the evaluation, monitoring and warning of volcanic eruptions, hurricanes, tsunamis and earthquakes.

In sectoral evaluations of natural hazards conducted by the OAS on, for example, energy in Costa Rica and agriculture in Ecuador, capital and production savings have been demonstrated that can be achieved by modestly investing in mitigating natural hazards through reduction Of vulnerability and better sector planning.

Threat management in Latin America and the Caribbean has not been entirely satisfactory for a number of reasons, including lack of awareness of the issue, lack of political incentives and a preconceived idea that disasters are "natural". At present new techniques are available, experiences are being analyzed and transmitted, developing countries are showing their interest in the subject and financial agencies are contemplating their support.

Techniques and tools for the evaluation of natural risks

Geographic Information Systems (GIS)

A GIS is a systematic method of geographically ordering information about a unit of space that can facilitate the storage, retrieval and analysis of data expressed in the form of maps and tables.

The system can be done manually, in most cases it is computerized given the large amount of information needed for the management of natural risks.

Use of remote sensors in natural hazard assessments

Sensing refers to the process of recording information by means of sensors mounted on aircraft or satellites.

These sensors are used to reveal the location of natural events occurring in the past and / or identify the conditions under which they are most likely to occur. The technique makes it possible to distinguish areas potentially at risk and mitigation measures may be introduced.

Special techniques for mapping

Multi-hazard maps combine assessments of two or more natural hazards on a single map.

The maps allow the analysis of vulnerability and risk, determining the combined effects of natural phenomena in an area and identifying the most appropriate mitigation techniques for each risk.

CHAPTER I

Argentinian Republic

Environmental Characterization

The Argentine Republic is the eighth largest country in the world and the second largest in South America, behind Brazil. The 2,791,810 Km2 of continental surface extends from the 21º 46' of latitude north to the 55º 58' of latitude south, and from the 53º of east longitude to the 73º of west length. In general, its relief is mostly flat, formed by plains in the center and north of the country (Chaco, Mesopotamia and Pampa), and plateaus in the south (Patagonia). However, it is worth noting the presence of the Cordillera de los Andes located in the extreme west of the country. In this mountain range, three sectors can be distinguished: the north and the central (or cuyano) that reach heights of 4000 to almost 7000 m while the southern sector or Patagonian that is lower, reaches heights of about 2000 m. The relief determines a hydrography that mostly belongs to the slope of the Atlantic and runs from west to east, except for the great rivers of the Plata basin, originating in tectonic faults, running north-south. Within the American continent, Argentina is distinguished by its enrollment in the terminal sector of the Plata basin, shared with Bolivia, Brazil, Paraguay and Uruguay, with an area of about 2.6 million km2, of which 37% belongs to it. The major rivers of the basin, the Paraná, Paraguay and Uruguay, receive copious rains of the tropical zones and drain in the River of the Silver. Because of the low basin of the second hydrographic system in South America, the territory depends hydrologically and sedimentologically on the countries of the middle and upper reaches: Brazil, Paraguay and Bolivia (Morello and Matteucci, 2000). Although on a general scale the country belongs to the subtropical - temperate zone, its latitudinal amplitude confers an unusual and advantageous climatic diversity, ranging from cold climates in the south to tropical in the northern ecoregions of Chaco, Tucumano - Oran and Missionary.

This extensive latitudinal development and the differentiation of the relief determine the presence of three large well-differentiated climatic domains (Min. Health and Environment, UNEP, 2004): - Atlantic: it develops in the center-east, from the northwest to the south of the Buenos Aires province. It is a humid zone with precipitations of between 500 and 2000 mm. Annual and a developed hydrographic network, which coincides practically with the possibilities of summer culture. - Diagonal arid: it covers almost the whole of the rest of the

country. It is characterized by its rainfall below 500 mm per year. It includes extensive desert and semi-desert areas with even scarcer rains, below 200 mm. Water courses tend to be depleted or infiltrated, with the exception of some important flows of cordillera origin that allow the development of irrigation zones. - Pacific: affects the Andes in its southern section, a lower altitude area that allows the passage of humid winds from the South Pacific. These, after leaving their humidity in the Andean zone (where they produce precipitations that surpass 3000 mm annually), sharpen their dry Patagonian aridity. These domains show remarkable internal heterogeneities, due to their great latitudinal extension and their position in relation to the oceanic masses and the Cordillera. - The territory is asymmetrical with respect to the regional water balance, with areas of very strong relief towards the west and others, in the east, without the sufficient slope so that the water moves always in the same direction, reason why they are subject to floods Periodicals. - Temperatures fall from annual averages greater than 20º C in the Northeast to annual mean lower than 10º C in the Southeast.-The Mediterranean sector, located to the north of the Rio de la Plata, falls under the influence of the Atlantic winds And gives rise to a strong gradient of precipitation decreasing from east (wet) to west (arid). In contrast, the southern sector is subject to the Pacific winds, whose characteristics are altered by the presence of the Andes.

This regional heterogeneity is reflected in the variety of ecoregions and provides broad possibilities for diversification of production, both in resource types and in their management practices. However, the mode of occupation of the territory and appropriation of these resources gave rise to the most notable of the asymmetries: a hegemonic region in the central-east zone, with a monopoly of economic and social advantages, and an interior far from the development of Central power. An example of this contrast is evident in the fact that 90% of the agricultural exports come from the pampas production, inserted from its beginnings in the international market. Outside the center-east, settlements and productive areas have developed.

Catastrophic Insurance

The socio-economic impact of an event of nature can be mitigated by economic instruments of risk transfer. Disaster insurance is common in more developed countries, thanks to the

action of the State, access to these coverages in Latin America is virtually limited to large corporations.

In the Comparative Law, it is possible to mention the experience in Colombia, the authorities contract a collective policy, designed to protect the private properties of the damages caused by natural catastrophes.

The Argentine Republic ceased to belong partially in non-catastrophic territories. The risk is increasing, hailstorms are more frequent and intense and in the last 5 years on average there was a loss of 75%, last season this number doubled and the insurance market ended in 2012/13 With an average of 160% of accidents.

Hail

The biggest risk is climate, hail damage first, frost, winds, droughts, lack of floor or excessive rainfall. There are specific risks depending on the area in which the field and the crop are located. For example, there are many cases of barley losses due to the effect of wind.

In 2015 a storm that developed between December 14, 15 and 16 affected three provinces (Córdoba, Santa Fe and Entre Ríos) with high-intensity hail falls and impacted over 500,000 hectares of cultivation. On December 24, there was the second strong storm of the campaign, which affected 200,000 hectares in Cordoba and Buenos Aires province. During the month of April 2016, new hailstorms were recorded at harvest time, affecting fields in the humid pampas. Given this scenario that has been repeated in recent years, it is suggested to the agricultural producer, ensure the crop immediately after planting, as the cost of insurance is the same if it is contracted at the beginning of the cycle or 30 days before harvest . It is not appropriate to assume the risk of hailstorms in the first days of implantation without cover to speculate with the moments of greater leaf development or development of pod in soybean. Nor is it advisable to hire insurance on the storm, because today the policies have at least 3 to 5 days of grace. Currently coverage is calculated on a percentage of the sum to be insured and the average (depending on the area and risk) is one quintal of soy to cover 30 quintals per hectare.

Hail insurance covers "Classic Hail" and "Hail PLUS", which compensates partial losses, total losses and yield differences due to crop replacement, as well as additional wind and frost for traditional crops. At the same time bag silos are guaranteed against climatic

phenomena and vandalism, agricultural machinery, transportation of grains and all operating agricultural risk.

Poultry insurance

The developed insurance is designed exclusively for the poultry producer, with the widest coverage that the breeding-fattening activity of poultry requires. The insurance covers the producer by loss bird, before the risks of fire, windstorm and tornado, with the option of hail. On the other hand, Integral Avícola coverage protects the producer for the loss of profits. The coverage extends for a period of 90 days from the incident so that the injured person has sufficient time for the reconstruction of the facilities.

On the other hand, indexed insurance are parameter-based instruments, which are usually grouped into indexes that seek to explain the potential losses of companies, governments, financial institutions or farmers, so that they have financial mechanisms for risk transfer. Thus, in the case of indexed insurance, insurance payments are not determined on the basis of individual studies, but in the result of an aggregate index closely correlated with individual results. Because these insurances are based on an aggregate index, there is no need to make adjustments for damages, which speeds up the insurance payment. The indices are constructed on the basis of indicators of climatic, agricultural and geological information (rainfall or sea surface temperature, average yield, satellite information on vegetation cover, parametric indices), in the manner of the Richter scale of magnitude The case of earthquakes in a predefined area. Indexed insurance is useful not only for the agricultural sector but also for other sectors that may be affected by climatic events or extreme natural phenomena; For example, the housing or transport sectors in the case of earthquakes. It should be borne in mind that indexed insurance does not require damage assessment, has high penetration, helps to reduce possible economic and income losses caused by an extreme natural phenomenon and, in addition, eliminates the costs related to information on applicants, monitoring and Some administrative costs. However, it should also be clear that these insurances do not apply to all risks, as they are based on indicators that can not be developed for any type of risk. Because they are not based on individual results and losses, there is a portion of the risk that they do not cover, called the "base risk", so that the insured may have had losses that are not related to the insurance index.

Catastrophic Events

The summer season 2016/2017 (December-March) in Argentina recorded serious catastrophic events.

In December 2016 and January 2017, high rainfall rates were recorded in Pergamino, Arrecifes, Alvarez province of Buenos Aires, Southeast of Santa Fe, Tartagal, Ledesma and Capital in the Province of Salta. The rainfall index registered in the central zone was 600 ml, more than 60% of the record of a whole year. Economic losses were estimated at US $ 1,750 million.

In the province of Santa Fe, the lagoon "La Picasa", which extends between the provinces of Buenos Aires, Cordoba and Santa Fe overflowed by heavy rainfall. The problems begin in 1978 when a canal is built between kilometer 402 of the route and the lagoon, at that time the lagoon occupied 2,500 hectares, currently covers 35,000 hectares, but its basin covers 550,000 ha, with an average depth Of 6/7 meters, as determined by a study of the National University of the Coast. Why the uncontainable growth of Picasa? The explanation of this phenomenon is simple: the basin of the lagoon is closed and the zone of contributions of water was extended to the extent that the agricultural practices transformed the physiognomy of the region. In the last ten years, in the region, the average annual rainfall exceeds 900 mm and, in some periods, reaches 1300 mm.

La Laguna La Picasa is a closed basin that has no outlet anywhere, which makes the solution complex. Economic losses are estimated at $ 43 million.

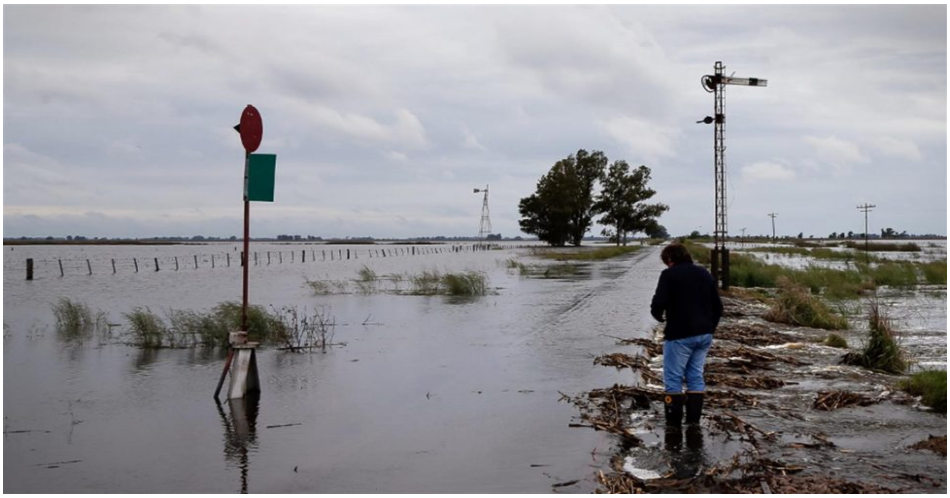
What infrastructure works would be essential? Two years ago, the Faculty of Engineering and Water Sciences of the National University of the Coast presented a project of works, approved by the provinces of Santa Fe and Cordoba, and consensuated by the Buenos Aires government.

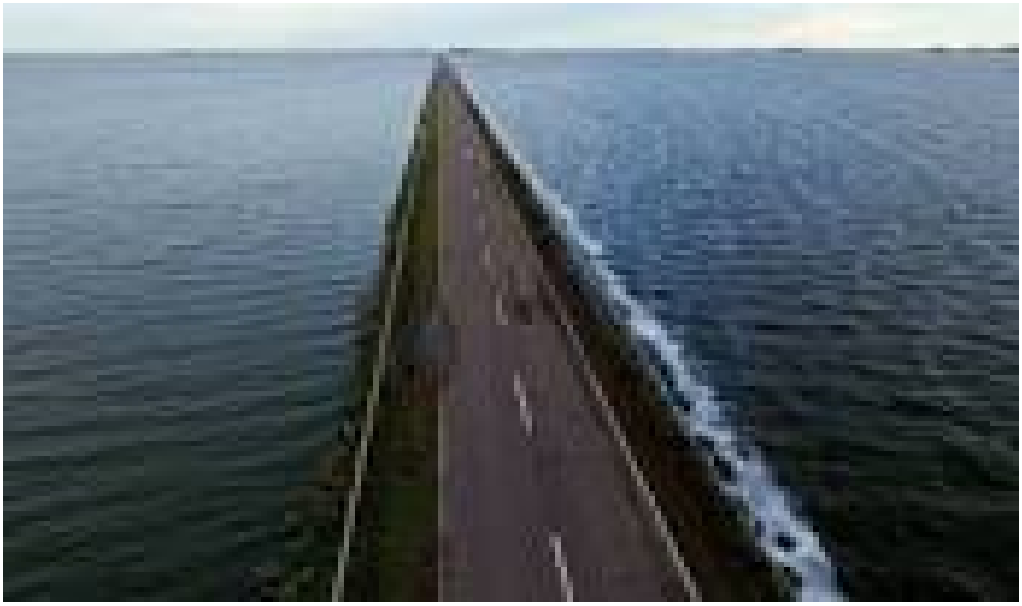
"It is expected to extract only the surplus water, so that the system continues to function as a closed basin. At the same time, it is intended to keep reservoirs in a position to capture future excesses

The technicians projected two alternatives to regulate the level of the lagoon. The first one, located north of La Picasa, would draw water from there with a pumping station and channel it through the lowlands to Teodelina, south of Villa Cañás. The work was built, never worked - due to an amparo appeal filed by several localities in Buenos Aires fearing

that the water would come on them - and now the case is in the hands of the Supreme Court.

The second alternative, south of La Picasa, would intercept the water before it reaches the river bed and drift it to the Bañados Las Horquetas and lead it to the Mar Chiquita Lagoon. In this case, a complementary pumping station would be built. These works are integrated into the Master Plan of the Rio Salado Basin, which would drain 5 m3 per second. The provinces of Santa Fe and Córdoba would have prepared the project to tender the previous regulatory works, which put in conditions, small lagoons that will serve as reservoirs. The Government will finance a water project in the basin of the Carcarañá river that aims to prevent flooding in various productive areas of the provinces of Santa Fe and Cordoba, with a direct benefit for almost 170 thousand inhabitants.





The town of Volcán Department of Tumbayá in the Province of Jujuy, located 41 kilometers from San Salvador de Jujuy, suffered in the morning hours of January 10, 2017, an avalanche of mud and stones, as a consequence of copious rainfall in area.

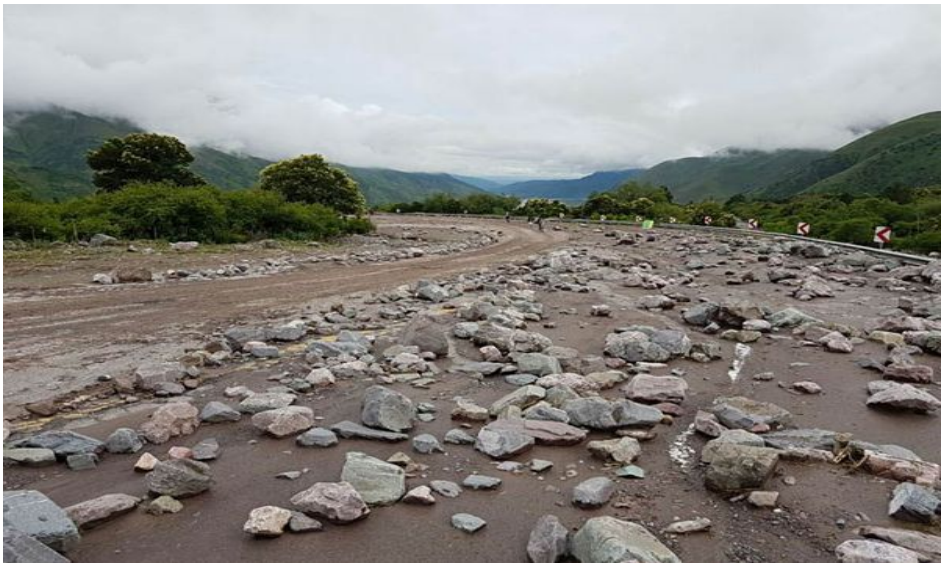
The locality of Volcán is on the Quebrada de Humahuaca, that has its origin by tectonic and also fluvial forces. The predominant climate in this region is the semi-arid, with precipitations that predominate only in the summer months, but its topography allows in summer the few rains that occur in some cases are very intense and provoke these avalanches. It is in an area that constitutes a natural barrier of humidity, which usually ascends from the lowlands. It marks the beginning of the rocks and multicolored formations of the Humahuaca Gorge and the typical flora of that region. It takes its name from the consolidated torrent of mud called volcano by the people of the zone, that takes place in summer because of the rains and the great accumulation of sediments in the concavity formed by the hill Volcan, in the slopes of the sources of the Arroyo Del Medio, Arroyo de los Filtros and Arroyo Coiruro. This phenomenon determines the greater topographic difference on the axis of the valley of the Great River and has produced great modifications in the landscape.

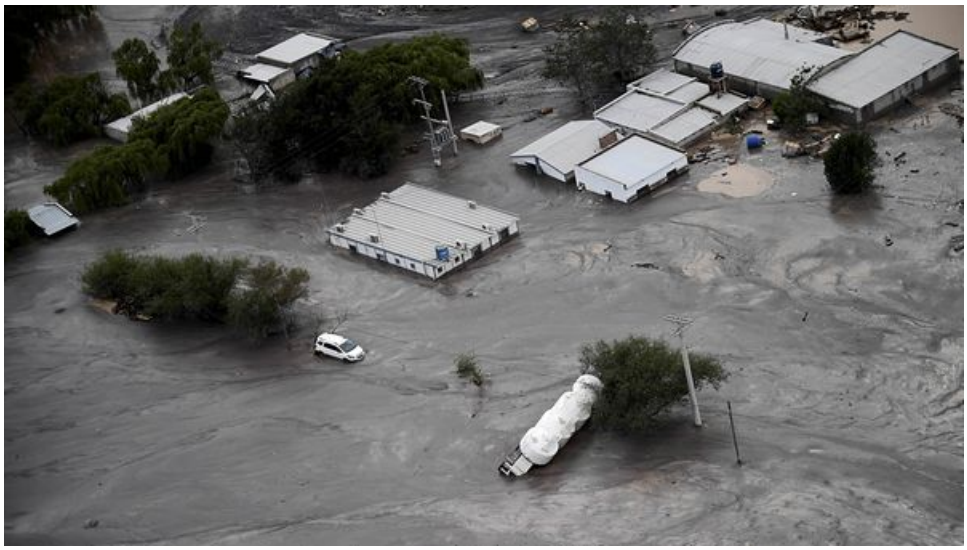
At the beginning of 2008 the locals detected the continuous collapse of the Volcán hill, which began prevention work that included cleaning the river and stream channels.

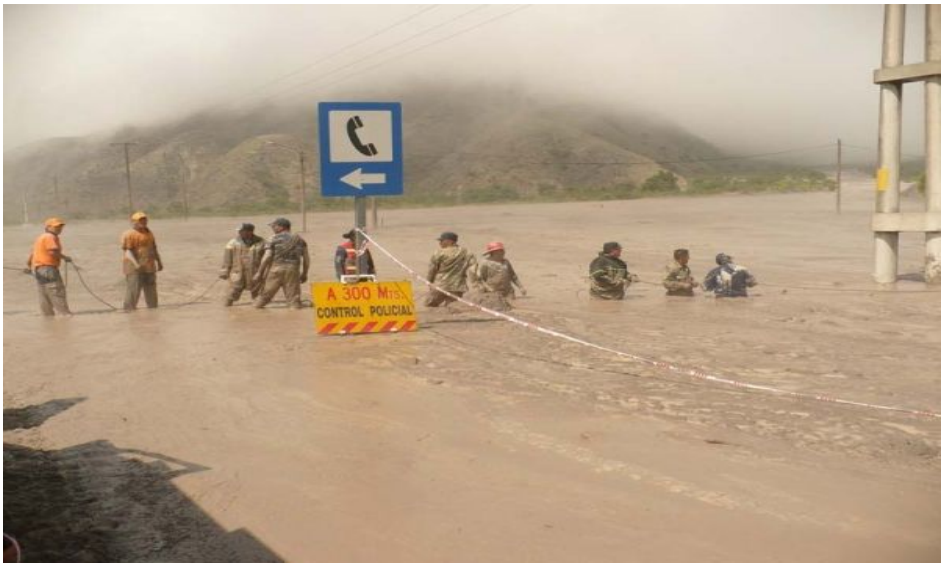
The affected area is located on a "cone of dejection" or "alluvial fan", in geography it is defined as the area where the sediments dragged from the mountain are deposited after the precipitations produced in the high mountains. The intense rains swept the sediments and these were dislodged by the natural channel determined by the slope, that path ends on the Rio Grande.

The locality of Volcán and Tumbayá are located just above a cone of ejection, increasing the risk of avalanches and floods, because if the cone of ejection exists it is because in previous years or decades these rains had already occurred.

This avalanche of mud, is the most considerable since the year 1978, was characterized to have 300 meters long by 10 meters d high of mud and stones. The displacement, denominated avalanche, affected 1500 inhabitants of the small town and two fatal victims. The existing works are not enough, it is necessary to strengthen the defenses of streams and rivers and cleaning of channels.



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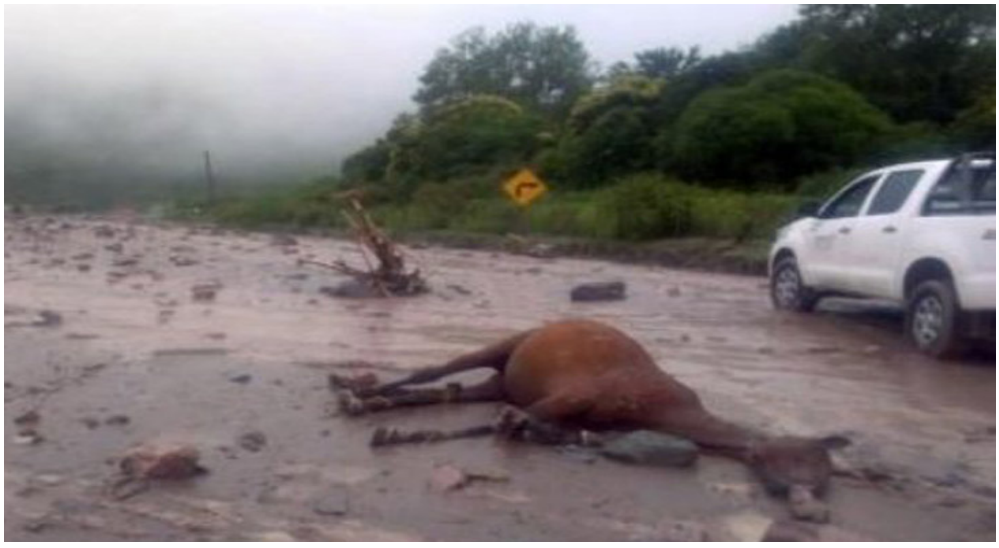


CHAPTER II

Federative Republic of Brazil

Environmental Characterization

The Federative Republic of Brazil is located in the Western Hemisphere, between the meridians of 34º47'30 "and 73º59'32" west of Greenwich and between the parallels 5º16'20 "north latitude and 33º44'42" south latitude; Is cut in the north by the equatorial line and, in the south, by the tropic of Capricorn; 90 percent of its territory is in the southern hemisphere. Brazil is the only Portuguese-speaking country in the Americas.

Brazil is in the central-eastern portion of South America and has borders with nine countries: Uruguay, Argentina, Paraguay, Bolivia, Peru, Colombia, Venezuela, Guyana and Suriname, and the French department of Guyana; Has no borders with Ecuador and Chile

Its dimensions characterize it as a continental country, occupying its territory 1.6 percent of the surface of the globe, with 5.7 percent of the planet's land and 20.8 percent of the surface of the American continent, as well Such as 12.7 percent of the world's fresh water (5 190 km3). The Brazilian territorial area is 8 547 403.5 km2 and its perimeter covers 23 086 km, being limited by more than 7 367 km by the Atlantic Ocean, 31.9 percent of its borders. It is the third largest country in area and largest in South America occupying 66 percent of the territorial area. This area includes arable land (5%), permanent crops (1%), permanent pastures (22%), forests and forests (58%) and others (14%).

Geology of Brazil

Brazil is totally within the South American platform, whose base is of a very complex geological evolution, originated in the archaic period. Brazil completed its consolidation between the upper proterozoic period and the early Paleozoic period. The basement of the South American platform is essentially of metamorphic rocks of the amphibolite and granulite phases and granitoids of the archaic age, associated with proterozoic units that are usually represented by corrugated bands of green schist phases and sedimentary and volcanic coverings (rarely metamorphic) And several granitoids. The basement is widely exposed in large shields, separated from each other by Phanerozoic cover, whose boundaries extend to neighboring countries. The shields of Guyana, Central Brazil and the Atlantic are prominent.

The Shield of Guyana extends to the north of the Amazon Basin. The shield of Central Brazil or Guaporé extends towards the interior of Brazil and south of the basin, whereas the Atlantic shield is exposed in the eastern portion reaching the Atlantic. These shields are exposed in more than 50 percent of the area of Brazil.

In this platform were developed in Brazil, in stable ortho-platform conditions, starting from the Ordovician-Silurian, sedimentary and volcanic cover that spatially fill three extensive basins with sineclisis character: Amazonas, Paraíba and Paraná. In addition to these basins, several small basins, including coastal basins and other sedimentary areas, are exposed on the platform.

Geomorphology

The relief of Brazil is divided in two great areas of plateau and in three areas of plains:

• Guyana plateau, comprising the mountainous area and the northern plateau of the Amazon, in the extreme north of the country, is an integral part of the Guyana shield, presenting pre-Cambrian crystalline rocks. This area includes the highest point in Brazil, Pico da Neblina, 3 014 meters above sea level.

• Brazilian plateau, subdivided into central, Maranhão-Piauí, northeastern Brazil, mountains and plateau of the east and southeast, south and Uruguaya-Riograndense, formed by crystalline rocks quite weathered and sedimentary basins. It is located in the central part of the country, and covers large areas of the national territory.

• Plains and lowlands of the Amazon, in the north of the country, below the Guyana plateau, presents three different altimetric levels: valleys, constituted by land of recent formation near the margins of the rivers; River terraces, with maximum altitudes of 30 msnm and periodically flooded, and low plateaus, formed by lands of the tertiary age.

• Pantanal Plain, in the west of the state of Mato Grosso do Sul and southwest of the state of Mato Grosso, is formed by lands from the Quaternary era.

• Plains and coastal lowlands, along the coast, from Maranhão to the south of the country, are made up of tertiary and current quaternary lands.

The Brazilian relief does not present formations of very high mountain ranges and that the prevailing altitudes are below 500 msnm, because it developed on an old geological base, without recent tectonic movements.

Types of soil

In agronomic terms, it should be noted that the main soils are strongly predominant ferralsols. They are extremely weathered soils, often developed on materials transported from the Pleistocene or earlier, in a humid to very humid tropical climate and covered by a tropical rain forest or a semicaduca forest. These soils are characterized by the dominance of kaolinite clays and a residual accumulation of iron and aluminum oxides and hydroxides, a stable structure, a low silt / clay ratio and a very low content of weatherable minerals. They are deep to very deep and generally show yellowish or reddish colors. Iron nodules and loaves are common, inherited from previous layers of soil.

Ferralsols are chemically poor, with low ion exchange capacity, and nutrient reserves that are easily depleted by agricultural practices, while phosphorus binding is the main problem. The available aluminum content can reach very toxic levels (84% have acidity limitations), and also manganese. On the other hand, the physical characteristics of these soils are quite favorable; Because their high permeability and stable micro-structure are less susceptible to erosion. Ferralsols are easy to work with, but if heavy machinery is used to clean the forest or if it is overgrazed it is more exposed to compaction and crusting.

The chemical limitations of these soils can be overcome in part by careful fertilization, including phosphorus and calcium, but attention should be paid to the mode and frequency of application. Ferralsols are used to grow several annual and perennial tropical crops, both by migrant and sedentary farmers. According to the classification of FAO soils, there are acrisols and leptosols. To a lesser extent, lixisols, plinthosols, arenosols and others.

Brazil's Soil Suitability Map indicates that 35 percent of its territory is not recommended for agriculture because of low fertility or steep slopes. Salinity is not a significant factor, accounting for 2 percent of the land area. Seven percent of the soils are shallow. Only 9 percent of the surface has no limitations for agricultural use, with little nutrient limitation, good drainage, good soil physical properties and sufficient precipitation.

Climate and agro-ecological zones

Weather

The climate in a given area is conditioned by several factors, including temperature, rainfall, atmospheric humidity, winds, atmospheric pressure, which in turn are conditioned by factors such as altitude, latitude, relief characteristics, vegetation and continentality.

Brazil, due to its continental dimensions, has a very wide climatic diversity, influenced by its geographical configuration, its important coastal extension, its relief and the dynamics of the air masses on its territory. This last factor assumes great importance, because it acts directly on the temperatures and the rainfall indices in the different areas of the country.

Air masses, especially those occurring more directly in Brazil are, according to the Brazilian Statistical Yearbook (IBGE): the equatorial air mass, divided into Continental Equatorial and Atlantic Equatorial; The tropical air mass, also divided into Tropical Continental and Tropical Atlantic; And the polar Atlantic air mass. All these air masses contribute to the climatic differentiation of Brazil.

Thus, climates vary from very humid and hot, from the equatorial air masses, as is the case in much of the Amazonian area, to very strong semi-arid climates, such as those in the interior of northeastern Brazil.

The northern and part of the interior of the northeastern region experience average annual temperatures above 25 ° C, while in the south of the country and in part the south-east the average annual temperatures are below 20 ° C. The absolute maximums above 40 ° C are observed in the lowlands of the interior of the northeast area with little variability during the year, which characterizes the warm climate of these regions. In middle latitudes, temperature variation throughout the year is very important for the definition of the climate in the depressions, valleys and lowlands of the southeast; In the Pantanal and mid-west lowlands; And in the central depressions and in the Uruguay river valley, in the southern area. Absolute minima, with frequent negative values, are observed in the mountainous peaks of the southeast and in large parts of the south, where they are accompanied by frost and snow. During the winter, there is a great penetration of masses of cold air of high latitudes, which contributes to the predominance of low temperatures.

Due to its great territorial extension, Brazil presents varied regimes of precipitation and temperature. In the country you can find a great variety of climates with different regional characteristics. In the north there is a rainy equatorial climate, with practically no dry season. In the northeast the rainy season, with low precipitation rates, is restricted to a few months, characterizing the semi-arid climate. The southeastern and midwestern regions are influenced not only by tropical systems but also middle latitudes, with a well defined dry season in the winter and a rainy summer season with convective rains. The south of Brazil,

due to its latitude, is affected mainly by systems of average latitude, in which the frontal systems cause the majority of the rain during the year.

North Region

The northern region has spatial and seasonal homogeneity of temperature, but this is not observed in terms of rainfall. This region receives the largest total annual precipitation, especially notable in the state of Amapá, south of the Amazon River and in the western part of this region, where rainfall exceeds 3,000 mm annually. In this region, three centers of abundant precipitation are identified:

• The first is in the northwest of the Amazon, with rainfall above 3 000 mm / year. The existence of this center is associated with the condensation of humid air brought by the easterly winds from the Intertropical Convergence Zone, with high precipitations where the current rises to the mountains from the Andes.

• The second center is in the central part of the Amazon, around 5 ° S, with rainfall of 2,500 mm / year.

• the third, in the eastern part of the Amazon basin, near the city of Belém, with rainfall of 2800 mm / year.

Three pluviometric regimes can be identified in the northern region of Brazil:

• one in the northwest, where rainfall is abundant throughout the year, peaking in April-May-June, with more than 3 000 mm / year;

• the second in a zonally oriented strip, extending to the central part of the Amazon, where the rainy season takes place in March-April-May,

• the third in the southern part of the Amazon region where rain peaks occur in January-February-March.

Northeast Region

In terms of rainfall there is considerable variation in the northeast (NE), ranging from a semi-arid interior climate, with cumulative rainfall less than 500 mm / year, to a rainy climate observed on the east coast, with accumulated annual rainfall exceeding 1 500 mm. The northern part of the region receives between 1 000 and 1 200 mm / year. As in the northern region, the temperature in the northeast has great seasonal and spatial homogeneity. Only in the south of Bahia there is a great seasonal variation in temperature, in view of the penetration of relatively cold masses in winter.

Different rain regimes are identified in the Northeast. In the north of the region, the main rainy season runs from March to May, in the south and southeast rainfall occurs during the period from December to February, and in the east the rainy season occurs from May to July. The main rainy season in the northeast, including the north and east of the region, comprising 60 percent of annual rainfall; Occurs from April to July and the dry season, for much of the region, takes place from September to December.

Southern region

The annual rainfall distribution in southern Brazil is fairly uniform. Throughout most of the territory, the average annual precipitation varies from 1,250 to 2,000 mm. Only a few areas are not within this rainfall margin. Above 2000 mm is the coast of Paraná, east of Santa Catarina and the area around São Francisco de Paula, in Rio Grande do Sul. Values below 1 250 mm are restricted to the south coast of Santa Catarina And to the north of Paraná. The relief exerts little influence on the distribution of rainfall in this region. Temperature, in turn, plays a role in the same sense as precipitation, reinforcing the climate uniformity in the south of the country. However, this is the region of Brazil with the greatest thermal variability throughout the year.

Southeastern and Midwest Regions

Due to their location, the Southeast and Midwest regions are characterized as transition regions between warm climates from low latitude to temperate mid-latitude temperate climates. The south of the Southeast and Midwest regions are affected by most synoptic systems affecting the south of the country, with some differences in the intensity and seasonality of the system. The inverted depressions act mostly during the winter, causing moderate climatic conditions, especially in the states of Mato Grosso do Sul and São Paulo. Top-level cyclone swirls from the Pacific region are organized with intense convection associated with instability caused by the subtropical jet. Prefrontal instability lines, generated by the association of large scale dynamic factors and medium scale characteristics, are responsible for intense precipitation. In the upland regions, located in the eastern part of the southeast, extreme minimum temperatures are recorded during the winter, while the highest temperatures are observed in the state of Mato Grosso, in the central region of Brazil. In general, in these regions, precipitation is evenly distributed, with

the average annual cumulative precipitation ranging from 1500 to 2000 mm. Two peak cores are recorded in the central region of Brazil and on the coast of the southeast region, while in the north of the state of Minas Gerais there is a relative scarcity of rain throughout the year.

Agro-ecological zones

Brazil is known as the richest country in the world in terms of mega diversity, with its fauna and flora comprising 10-20 percent of the world species described to date (Brazil, Convention on Biological Diversity). The vegetation changes from north to south, expressing different environmental conditions.

Amazonia (Amazon Rainforest)

The Amazon rainforest occupies northern Brazil, comprising 47.1 percent of its national territory or 4 000 000 km2, and could contain all the countries of the European Union (15). It is the largest jungle formation in the world, and is conditioned by humid equatorial climate. This is the best-preserved biome, with 85 percent of the Brazilian Amazon still afforested. Fifteen percent of the Amazon rainforest has been destroyed, with the opening of roads, through mining, colonization and logging, and by the advance of the agricultural frontier.

This area possesses a great variety of vegetation physiognomies, from the dense jungles to the open mixed jungles of flooded plains. The dense jungles are represented by the lowland forests ("terra firme"), the "várzea" forests which are Periodically flooded, and "igapó" forests which are permanently flooded, as occurs in almost the entire central region of Amazonia.

The savannahs and savannahs of Roraima are found in the poor soils of the northern end of the Rio Branco basin. The "Campinaranas" or "Caatinga amazônica" are forests of white sand, being distributed like stains along the basin of the Black River. These last two formations consist of Cerrado vegetation; These Cerrado areas are isolated from the main Cerrado ecosystem of the Brazilian central plateau. Mixed jungle of palms, semi-bamboo forests, lianas, bamboo jungles and related areas also constitute important types of vegetation.

The semi-arid Caatinga

This area of uncertain rains covers all the states of northeastern Brazil and the north of Minas Gerais, occupying 11 percent of the national territory (about 1 million km2). It is a vast semi-arid steppe area comprising thorny shrubs (Caatinga) and dry deciduous forests ('Caatinga alta'), as well as isolated patches of rainforest ('swamps') and rocky outcrops ('lajeiros'). Its interior, the "Sertão" of northeastern Brazil, is characterized by the occurrence of the very fine vegetation of the semi-arid Caatinga. The higher or "Agreste" areas, which are subject to less intense droughts, are located near the coast. The transition between the "Caatinga" and the "Amazon" is known as the middle-north or "Zona dos Cocais" (palms zone). Suffering from prolonged droughts, desertification, soil erosion and salinisation, the Caatinga has lost 50 percent of its native vegetation. Extensive livestock rearing, agriculture, resource extraction and subsistence production all had significant impacts on this biome. Hunting for food is an important additional factor, especially in the dry season.

The "Closed"

The "Cerrado" is located in the central Brazilian plateau. The continuous area of the "Cerrado" corresponds to 22 percent of the national territory (about 1 900 000 km2) and there are also large patches in the Amazon, some small in the Caatinga and also in the Atlantic jungle. Its climate presents two very different and defined aspects. The "waters" station and the "dry" station, corresponding to the wet and dry stations, respectively, which are very well defined. The "cerrado" presents varied physiognomies, from cleared areas lacking woody vegetation to "closures", which are dense tree formations. The area is covered by dendritic jungles and trails that follow watercourses, and includes moors of high altitudes.

The "Cerrado" biome, which has undergone the tremendous advance of the agricultural frontier in recent decades, has already lost more than 40 percent of its native vegetation through crop expansion, cattle breeding and the increase Of the human population. More than 50 percent of the remaining natural ecosystems have been degraded. Burning, both for the maintenance and creation of pastures for livestock and for plantations, is a common practice and results in soil erosion as well as severe loss of biological diversity. Economic activities of some kind are present throughout most of the remaining area.

The Atlantic Rainforest

The Atlantic rainforest, including semi-deciduous rainforests, was originally the largest latitudinal forest on the planet, ranging between 6 and 32 ° S of latitude (Joly et al., 1999). The jungle once covered 11 percent of the national territory, but today its extent is smaller, due to centuries of deforestation. Currently, the Atlantic Forest has only 4 percent of its original area, and only 8-75 percent of the original jungle cover remains (the Atlantic Forest area on the previous map is the original area; jungle).

There is a great climatic variability throughout its distribution, from super-humid temperate climates in the extreme south, to tropical humid and semi-arid in the northeast. The irregular relief of the coastal zone adds even more variability to the ecosystem, which includes mounts, restingas (coastal forests and shrubs on sandy soils), mangroves, the Araucaria forests and pastures of the Campos area in the south. In the slopes the forest is less dense, due to the frequent fall of trees. This is one of the most important reservoirs of biodiversity in the country and the world.

The "Mato Grosso Pantanal"

The Pantanal is the largest plain subject to regular flooding of the planet, covered by mostly open vegetation, which occupies 1.8 percent of the national territory. This ecosystem consists mainly of sandy soils, covered by different physiognomies due to the variety of micro-reliefs and flood regimes The main plant formations are the savannah, the savannah parquizada (clean field), the evergreen gallery forest, the semi-deciduous jungle and the Chaco. As a transition area between the Cerrado and the Amazon, the Pantanal contains a mosaic of terrestrial ecosystems. The hacienda becomes the main economic activity, with livestock rearing in the native pastures of floodplains, showing that the land is not a swamp despite its deceptive toponymy.

Other Formations

The fields of the south (Campos or Pampas area)

The Campos area occurs in the sub-tropical climate of the southern tip and represents 2.4 percent of the country's vegetation cover. The open lands of the "gaúchas" plains and plateaus (native of Rio Grande do Sul and the "coxilhas", a gently undulating relief, are colonized by pioneer field species that form open savannah and steppe vegetation. The most important of these fields is herbaceous, with many species of Poaceae, Asteraceae, Cyperaceae, Fabaceae, Rubiaceae, Apiaceae and Verbenaceae (Ministry of the

Environment, 2000) .The average height of this area Continuous cover, sometimes dense, is from 40 to 60 cm, sometimes 1 m.This area extends to Uruguay and Argentina, totaling 450 000 km2 and feeding 65 million ruminants Considering the climatic and soil conditions of this ecosystem , Could be expected to be covered by subtropical forests and not dominated by herbaceous formations.These extensive pastures are likely to be remnants of the semi-arid climate that has dominated The region during the climatic changes of the quaternary period.

The jungle of Araucarias

The plateau of southern Brazil, with altitudes above 500 m, is the distribution area of the "pine (pine) of Paraná", Araucaria angustifolia, which occupies 2.6 percent of the national territory. In this forest, representatives of the tropical and temperate flora coexist, being dominated, nevertheless, by the "pine of Paraná". Rainforests vary in tree density and height of vegetation and can be classified according to soil aspects as alluvial, along the rivers, submontane (which no longer exists), and mountainous, the main dominating the landscape. The open vegetation of pasture-woody fields occurs on surface soils. Due to the high economic value of the "Araucária" pine forests, they are subject to intense logging pressure.

Coastal and insular ecosystems

Coastal ecosystems are generally associated with the Atlantic rainforest because of their proximity. In the sandy soils of the coastal strips and dunes, sand banks have been developed. They vary in form from low shrub to arboreal. Mangroves (mangroves) and saline fields of fluvial-marine origin have developed on saline soils. In the sandy or muddy plains of the continental shelf submarine ecosystems occur. In the next area are the beaches and rocks, colonized by algae. The islands and reefs are remarkable geographical features of the landscape.

Brazilian Biodiversity

Brazil is the nation with the richest biodiversity in the world (Brazil, Convention on Biological Diversity). At least 10 percent of the world's amphibians and mammals, 27 percent of primates and 17 percent of all bird species occur in Brazil. As for flora, there are 50 000 to 56 000 described species of higher plants, or 22-24 percent of the world's angiosperm species. As a comparison, it is estimated that in North America there are 17

000 species, in Europe 12 500 and it is considered that in Africa occur between 40 000 and 45 000 species. Not only the number of species is high, but also the level of native species (endemism).

The dimensions and complexity of Brazil's biodiversity, both marine and terrestrial, may mean that it will probably never be fully described. Officially, five large biomes are recognized. The Amazon biome comprises 40 percent of the world's rainforests, being the largest rainforest remaining in the world. The Cerrado is the most extensive savannah in a single country. The Atlantic jungle extends from south to north covering an area of 1 million km2. This biome currently includes the Campos area, covering 13,608,000 ha of natural pastures in southern Brazil with more than 400 grass species and 150 forage legumes, which is not officially recognized as a biome. The Caatinga is a vast semi-arid area of about 1 000 000 km2, contrasting with the Pantanal and its 140 000 km2 of wetlands. Coastal and marine biomass total up to 3 500 000 km2 under Brazilian jurisdiction. There are numerous subsystems and ecosystems within these biomes, each with unique characteristics; The conservation of ecotones (areas of transition).

Catastrophic Insurance

Climatic variability and extreme events have seriously affected Brazil in recent years. In the subtropical Brazil, Groisman et al (2005) and Marango et al. (2009) identified a large systematic increase in precipitation since the 1950s and, in southeastern Brazil, an increase in the frequency of extreme precipitation events was found. In the state of Sao Paulo, Carvalho et al. (2004) found that extreme precipitation events show an interannual variability related to El Niño and La Niña, and seasonal variability associated with the activity of the South Atlantic Convergence Zone (SACZ) and low levels of Jet South America (SALLJ).

Flooding causes huge economic disasters, to insureds, companies, and insurance companies. On the other hand, floods cause loss of a large number of lives. In turn, drought can affect whole cities such as the supply of electricity generated from sources fed by rainwater, which can cause great economic losses.

In 2016, a bill was presented to the Brazilian Parliament, which lists the catastrophic events to be covered.

The episodes of lack of water can cause serious problems to society, and the mass exodus of populations from entire regions. In southern Brazil, heavy rains affected the state of Santa Catarina from 22 to 24 November 2008 and caused large floods and landslides, affecting 1.5 million people, resulting in 120 deaths and leaving To 69,000 people homeless. Landslides and floods caused by storms have blocked almost all roads in the area, disrupting water and electricity supplies to thousands of homes. It was reported that most of the deaths caused by landslides were completely destroyed homes and businesses. The storms broke a stretch of pipeline between Bolivia and southern Brazil, forcing the suspension of fuel supply to the part of Santa Catarina and the surrounding state of Rio Grande do Sul. In some cities, there were reports of looting of supermarkets And pharmacies of hungry and desperate flood victims. This event was considered the worst climate tragedy in the history of the region.

An unusual combination of climatic conditions favored the intensification of rainfall along the coastal region of Santa Catarina. Unofficial estimates of the damages caused by this event of extreme rainfall, floods and subsequent landslides are of the order of $ 350 million due At the closing of the port of Paranaguá, one of the most important ports of southern Brazil (INPE 2008), extreme events during El Niño in 1983 caused heavy rains and floods, causing an economic loss of about 1.1 million dollars in The entire state of Santa Catarina. In addition, Munich-Re (2009) reported total losses of $ 750 million, with insured losses of $ 470 million.

In March 2004, a hurricane affected the coastal region of the state, with losses of approximately $ 1 billion (Pezza and Simmonds 2005 Pezza et al., 2009). Catherine's arrival on the Brazilian coast in March 2004 came to be known as the first time a hurricane was documented in the South Atlantic Ocean, inaugurating a vision of how a large-scale event can contribute to a change in a region Tropical, once considered free hurricanes.

Rainfall deficits during the summer and fall of 2001 resulted in a significant reduction in river flow in the Northeast, Midwest and Southeast regions of Brazil, reducing hydroelectric power production capacity in these areas (90 % Of Brazil's energy comes from hydroelectric sources). In an unusually dry and warm summer, there was an excess of energy demand for air conditioning and refrigeration, causing reductions in the levels of hydroelectric dams, which reached critical minimum levels (5% or less of the total

volume). The nature of large-scale deficits, which almost affected the whole country, caused an energy crisis that forced the government to impose energy conservation measures to prevent the total loss of blackout during part of 2001 And 2002 (Cavalcanti and Kousky 2004).

The drought that has been affecting southern Brazil and northeastern Argentina since 2008 has affected soybean and grain production in Argentina and, together with the fall in international prices, generates an expected reduction of around 30 % Of exports, from 8 to 9 billion in 2009. This forecast may change if the rain returns to normal and soybean prices rise. The year 2009 is considered the driest in 80 years. In the south of Rio Grande do Sul, bordering Argentina and Uruguay, many farmers reported that the drought resulted in the loss of corn and other grains. It was not possible to plant hay for livestock, and milk production was reduced. In 96 municipalities, the state of emergency was declared due to damage to the cultivation of soybeans, maize and beans, pastures and water supply for human and animal consumption.

In southern Brazil, the national production of the last wheat crop was 6 million tons, the best result since 2004. The drought has delayed the planting of wheat in some regions of Santa Catarina and Rio Grande do Sul and parts of Paraná, which could affect the winter harvest in the southern hemisphere, according to the Ministry of Agriculture. The official forecast for grain production for the period 2008-2009 is 5.5 million tonnes, which means a decrease of 9% compared to that expected earlier this year.

On 5 November 2015, in the city of Mariana / MG, the Failure of the Fundão Dam, operated by Samarco Mining S.A. (Controlled by Vale S.A. and BHP Billiton Brasil Ltda.) Caused the greatest tragedy in Brazilian mining. For the description of this catastrophic phenomenon, we take the work done by Maria da Gloria Faria and Pery Saraiva Neto.

The flood of 34 million cubic meters of mud, consisting of sand, silica, high Fe (iron) and Mn (manganese), devastated the district of Bento Rodrigues and other urban areas, causing severe impacts of more than 680 km in The beds And the banks of the rivers Gualaxo do Norte, Carmo and Doce

The flood caused by the spill of 34 million m3 of mud tailings from mining was covered in just 40 minutes at a distance of 10 km between the dam of Fundão and the dam of Bento Rodrigues, the most affected region.

The region recorded 18 confirmed deaths, one missing and more than 700 homeless and displaced, in addition to the 207 buildings destroyed by mud, representing 82% of the total of 252 existing buildings.

The impact of the phenomenon on the population caused 256 injuries; 380 patients; 644 homeless people; 716 displaced persons; The total affected was 319,565 people.

Immediate damage:

In the states of Gerais and Espírito Santo, the phenomenon deeply impacted the estuary of the Doce River, as well as the coastal region above and below its mouth in the state of Espirito Santo. It also caused a high turbidity, preventing the use of water, maintaining the continuous plume of sediments that hits the edge of the mouth of the river, hindering the regeneration of the aquatic biota and the impacted edge, causing the sedimentation of the power generation tanks .

The disaster in Mariana affected 663.2 km of the water body of the states of Minas Gerais

Effects on the Brazilian coast

The flood caused pollution of 170 km of beaches, 110 km north of the mouth of the river Doce and 60 km to the south, also affecting the spawning of sea turtles in the Biological Reserve of Comboios.

Effects on vegetation

The ciliary forest, a marginal vegetation, was completely decimated along with the wildlife in it. It is estimated that 1,026.65 hectares were affected directly by the sludge, with 10% being made up of the Mata Atlántica, along 77 km of waterways.

Within the affected region there are areas of permanent preservation that suffered a devastation of approximately 374.81 ha of ciliary forest cover.

Effects on rivers and streams.

The high load of solid waste that ruined the waters of the river caused the mortanization of 3 tons of fish in the Twelve and in other rivers and of 500 kg in the sea, through the commitment of the gills, thus avoiding the exchange of oxygen.

The disaster affected 71 species of aquatic biodiversity, including threatened and native species as well as wildlife.

Other immediate damages:

Thousand animals were lost, including cattle, horses and animals for domestic and family consumption. Another 485 animals were sheltered in a barn under the responsibility of Samarco, including dogs, cats, chickens and others.

Other immediate damages

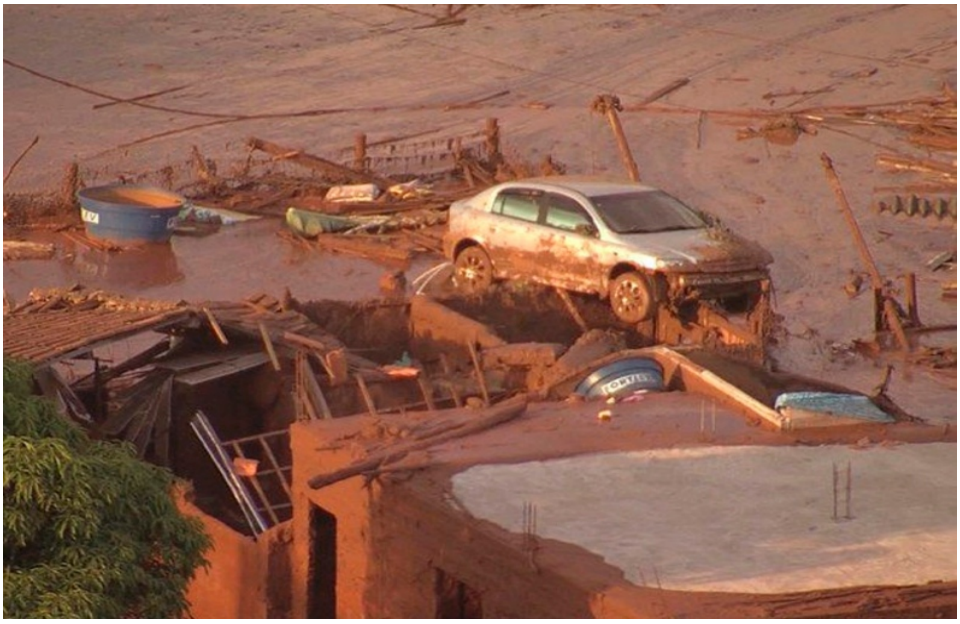
The functioning of the public water supply system in many cities and districts that capture the waters of the Twelve River was altered due to the very high turbidity

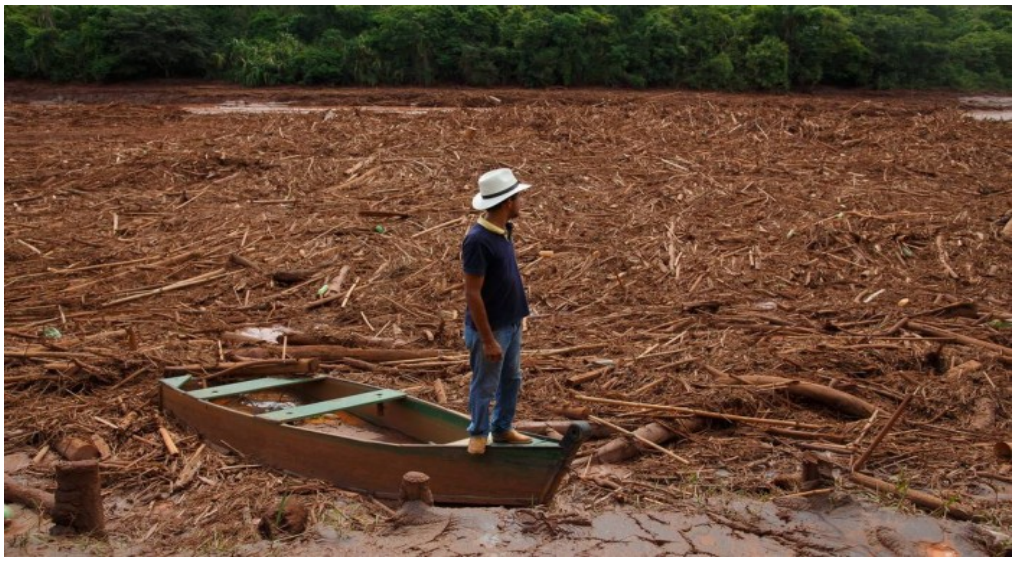
Other immediate and long term damages

Fishing activity was paralyzed, affecting the subsistence of 1,249 fishermen not only because of the mortality, but also because of the lack of conclusive studies on the contamination of the fish, molluscs and crustaceans that inhabit the estuary and the mouth of the Doce River.

The production and distribution of milk was paralyzed throughout the region, with an estimated loss of 21,000 liters per day.

It is possible to mention that the General Federal Procurement issued a document in the year 2013 warning the risks of the dam. According to the text prepared by the environmental prosecutor, Carlos Eduardo Ferreira Pinto, the license to operate was not recommended because of the risks of destabilization and increased erosion.





CHAPTER III

The Republic of Chile

Environmental Characterization

The Republic of Chile is located in the western and southern part of South America, between the parallels 17 ° 30 'on its northern boundary, to 56 ° 30' south latitude in the southern part of South America. For its part, the Chilean Antarctic Territory extends to the south pole reaching 90 ° south latitude.

The Chilean territory extends in an area of 2.006.096 km ², reaching a length that goes from the northern limit with Peru to the Antarctic Pole, superior to the 8,000 km. It is important to note that Easter Island in Polynesia is part of the national territory; The archipelago of Juan Fernández and the islands San Félix, Salas and Gómez and San Ambrosio, in addition to the corresponding continental shelf. Chile has sovereignty over the adjacent seas and surrounds the island territories. The maritime space reaches 200 nautical miles from the coastline, within which are differentiated three sectors: Territorial Sea, corresponding to the first 12 nautical miles; Zona Contigua, corresponding to the first 24 nautical miles; And Exclusive Economic Zone, corresponds to 188 miles beyond the territorial sea. Here the State has exclusive right over the exploitation, conservation and administration of marine resources, including the sea bed and subsoil.

Chile is located along a highly seismic and volcanic zone, belonging to the Pacific Fire Belt, due to the subduction of the Nazca and Antarctic plates in the South American plate. The South American part of the country comprises a long and narrow strip of land on the western coast of the Southern Cone, which extends mostly from the southeastern rim of the Pacific Ocean to the Andes between the parallels 17 ° 29'57 "S and 56 It reaches a maximum width of 445 km at 52 ° 21'S, at the height of the Strait of Magellan, and a minimum width of 90 km at 31 ° 37'S, between Punta Amolanas and Paso Of the Stone House.

The Chilean relief is made up of four "macroforms", altered by multiple variables that the territory presents: the Intermediate Depression, which crosses the country longitudinally, flanked by two mountain systems that make up about 80% of the territory: the Andes mountain range This natural frontier with Bolivia and Argentina, with its highest point located in the Nevado Ojos del Salado, at 6891,3 msnm, making it the highest active

volcano in the world, in the Atacama Region - and the Cordillera de la Costa To the west - of lower height with respect to the one of the Andes, with its highest point located in the Vicuña Mackenna hill, to 3114 msnm, located in the mountain range Vicuña Mackenna, to the south of Antofagasta. Between the coastal and Pacific Ranges is a series of coastal plains, of varying extent, that allow the settlement of coastal towns and large ports. Some areas of the territory include flat territories to the east of the Andes, such as the Patagonian and Magellanic steppes, or are high plateaus surrounded by high mountain ranges, such as the Altiplano called Puna de Atacama.

El Norte Grande es la zona comprendida entre el límite septentrional del país y el paralelo 26° S, abarcando las tres primeras regiones del país. Se caracteriza por la presencia del desierto de Atacama, el de mayor aridez del mundo. El desierto se ve fragmentado por quebradas que originan la zona conocida como la pampa del Tamarugal. La cordillera de la Costa es maciza y cae abruptamente formando el farellón costero que reemplaza a las planicies litorales, prácticamente ausentes. La cordillera de los Andes, dividida en dos y cuyo brazo oriental recorre Bolivia, tiene una altura elevada y de importante actividad volcánica, la que ha permitido la formación del altiplano andino y de estructuras salinas como el salar de Atacama, debido a la acumulación de sedimentos durante años.

Al sur se encuentra el Norte Chico, que se extiende hasta el río Aconcagua. Los Andes comienzan a disminuir su altitud hacia el sur y a acercarse a la costa, alcanzando los 90 km de distancia a la altura de Illapel, la zona más angosta del territorio chileno. Los dos sistemas montañosos se entrecruzan, eliminando prácticamente la Depresión intermedia. La existencia de ríos que atraviesan el territorio permite la formación de valles transversales, donde se ha desarrollado fuertemente la agricultura en los últimos tiempos, mientras las planicies litorales comienzan a ampliarse.

La zona Central es la más habitada del país. Las planicies litorales son amplias y permiten el establecimiento de ciudades y puertos junto al Pacífico, entre tanto la cordillera de la Costa desciende su altura. La cordillera de los Andes mantiene alturas superiores a los 6000 msnm pero comienza lentamente a descender acercándose a los 4000 msnm en promedio. La Depresión intermedia reaparece convirtiéndose en un fértil valle que permite el desarrollo agrícola y el establecimiento humano, debido a la acumulación de sedimentos.

Hacia el sur, la cordillera de la Costa reaparece en la cordillera de Nahuelbuta, mientras los sedimentos glaciales dan origen a una serie de lagos en la zona de la Frontera.

La Patagonia se extiende desde el seno de Reloncaví, a la altura del paralelo 41° S, hacia el sur. Durante la última glaciación, esta zona estaba cubierta por hielos que erosionaron fuertemente las estructuras del relieve chileno. Como resultado de esto, la Depresión intermedia se hunde en el mar, mientras la cordillera de la Costa origina una serie de archipiélagos, como el de Chiloé y el de los Chonos, hasta desaparecer en la península de Taitao, en el paralelo 47° S. La cordillera de los Andes pierde altura y la erosión producida por la acción de los glaciares ha originado fiordos. En los Andes patagónicos se destaca, además, la presencia de grandes masas de hielo conocidas como campos de hielo que corresponden a las mayores reservas de agua del Hemisferio Sur fuera de la Antártida.

A partir del golfo de Penas, la cordillera de los Andes se divide en dos secciones. Por un lado, la cordillera Patagónica Insular que corre junto al océano Pacífico, con alturas que bordean los 1000 msnm, conforma el intrincado archipiélago Patagónico, con uno de los climas más feroces del planeta. Por otro lado, la sección oriental de los Andes da lugar a los Andes Patagónicos, un extenso grupo de montañas de caprichosas formas que se encuentran entre las más conocidas del mundo para la escalada en roca; entre ellos están el monte Fitz Roy y las míticas torres del Paine, con cumbres que superan los 3000 msnm. Más al sur, los Andes Patagónicos pierden altura relativa y oscilan en torno a los 1500 msnm cerca de la costa norte del estrecho de Magallanes, donde se sumergen totalmente en el cabo Froward para luego reaparecer con alturas significativas en la isla Grande de Tierra del Fuego donde reciben el nombre de cordillera Darwin, la cual supera los 2500 msnm y toma una orientación este-oeste, distinta de la que tiene en el resto del continente. Cabe notar que gran parte de los Andes Patagónicos, entre los paralelos 52° y 54° corren exclusivamente en territorio chileno y no están en la frontera con Argentina.

La cordillera de los Andes, al igual que previamente lo había hecho la cordillera de la Costa, comienza a desmembrarse en el océano originando un sinnúmero de islas e islotes, situación que aumenta en el archipiélago de Tierra del Fuego, donde un sinfín de islas montañosas representan los últimos esbozos del macizo andino, hasta desparecer en él, hundiéndose al este de la isla de los Estados y reapareciendo en el arco de las Antillas

Australes y luego en la península Antártica, donde se le denomina Antartandes, en el Territorio Chileno Antártico, que se extiende entre los meridianos 53° W y 90° W.

Al este de la cordillera de los Andes, en varios puntos de la zona Austral chilena, se presenta la pampa patagónica o estepa magallánica, la cual presenta una continuidad geográfica de la patagonia Argentina, formada principalmente por terrazas aluviales y glaciares que van descendiendo en dirección al Atlántico. Esta parte del territorio chileno se encuentra totalmente al oriente de los Andes, al contrario del resto del país. La pampa patagónica es una estructura sedimentaria mucho más antigua que los Andes y por ello ha sido erosionada por el viento y la acción glaciar, dejando en su mayor parte relieves llanos con algunas sierras y conjuntos montañosos de no más de 1500 msnm. La pampa patagónica es atravesada por el estrecho de Magallanes, pero continúa desarrollándose en la parte norte de Tierra del Fuego.

En el medio del océano Pacífico, el país tiene soberanía sobre diversas islas de origen volcánico, conocidas en conjunto como Chile Insular. De ellas, se destacan el archipiélago de Juan Fernández y la isla de Pascua, la que se encuentra en la zona de fractura entre la placa de Nazca y la placa Pacífica, conocida como dorsal del Pacífico Oriental.

Catastrophic Insurance

In the insurance market in Chile, there is ample freedom to contract insurance and premiums. This means that natural or legal persons can freely contract, in Chile or abroad, all kinds of insurance and companies can freely charge what they determine, according to market conditions. In addition, national insurers and reinsurers may take risks from abroad, in addition to the subscription of national risks. There are some compulsory insurance and these must be contracted with Chilean companies, such as the Personal Accident Compulsory Insurance (SOAP) and the joint-venture Fire Insurance. There are also voluntary insurance, but in practice they may be mandatory, as is the case of Insurance Associated to Mortgage Credits, where lenders can demand the contracting of these insurance for the approval of the credit. In the particular case of earthquake and offshore coverages, they are not compulsory and are contracted as additional coverage for fire insurance. In this regard, it is important to note that the latter can be acquired by the mortgage debtor independently, but more usually it is the lender that performs the hiring.

According to the survey carried out by the SVS after the 2010 earthquake, it was found that of the houses that had fire insurance with additional earthquake (24% of the total of houses studied), 90% were associated with mortgages . This reflects the importance of banking as a conduit for home insurance brokerage.

In the case of massive or catastrophic claims, reinsurers play an important role. In the catastrophe of 2010, the international reinsurers were the ones who absorbed in large part the payments of the earthquake and subsequent tsunami casualties. Under the Insurance Law, local insurers may be reinsured with national limited liability companies whose exclusive purpose is reinsurance; With national insurance companies, which can only reinsure the risks of the same group in which they are authorized to operate; Or with foreign reinsurance entities, which must have at least two international risk classifications equal to or greater than BBB (according to NCG 139). Reinsurance can be contracted with the entities indicated above or through reinsurance brokers that are registered in a register that carries the SVS for this purpose. For solvency and liquidity reasons, insurers offering additional earthquake coverage are required to establish a Catastrophic Earthquake Reserve (RCT), which in simple terms corresponds to the priority or deductible charge of the insurer plus a percentage (known as PML) of the amounts insured in the zone with the highest exposure of the company to exceed the maximum capacity of catastrophic excess loss contracts. At the time of the earthquake, SVS Circular No. 1,126 of 1993 established how general insurers providing earthquake coverage should constitute such a RCT.

Normative improvements

Update of the Catastrophic Earthquake Reserve (RCT) formula.

At the time of the earthquake and subsequent earthquake of 2010, local insurers had an RCT of US $ 11 million, which had to pay almost US $ 50 million to reinstall the capacity of their reinsurance contracts. For this reason, the SVS updated the regulations by publishing in April 2011 General Standard No. 306, in order to incorporate half of the resettlement costs in the calculation of the reserve, as long as they had not been previously paid as part Of the reinsurance premium. In addition, it is established that the RCT must be maintained at all times, as long as there is existing coverage for earthquake risk, even if the catastrophic event occurred.

During 2011 and the present, the SVS has collaborated with the Association of Insurers of Chile (AACH) in a project that aims to develop a model to estimate the maximum probable losses (PML) of insurance companies that Offer coverage for earthquake or tsunami risks.

Some sectors have proposed the creation of compulsory earthquake insurance, applicable to all real estate owners. One of the great problems to materialize an initiative like this is the difficulty to control and to sanction the noncompliance of this obligation, especially considering sectors of low resources. On the other hand, there are sectors in which even wanting to contract insurance, can not be accessed due to supply problems, for example in areas at greater risk, or for construction materials such as adobe.

Contracting a collective earthquake insurance

Another option is the possibility of the State contracting with insurers a collective insurance to cover the risks faced by a significant portion of the lower income population. This could be done by subsidizing a large percentage of the cost of the premium, making it accessible to this group, or directly covering 100% of the insurance cost.

Creation of a catastrophic fund

The creation of a catastrophic fund for the protection of the population is another option, as it exists in many countries exposed to this type of risk. This alternative could have multiple variants in terms of coverage, financing, participation of private insurers, reinsurance. This is a topic still little explored in Chile but a priori is complex, since unlike the option indicated in the previous point, would require the development of an ad hoc legal and institutional framework. On the other hand, it would take time to accumulate funds that are sufficient to bear the costs of a catastrophic event. Issue of a cat bond ("CAT Bond")

By means of a catastrophe, the risks of a natural disaster are transferred to the capital market, offering certain advantages over traditional reinsurance. Some of these are: high return on investment and greater portfolio diversification, no reinsurer credit risk, which increases capacity (covering large risks at a reasonable price) and stabilizes the volatility of the volume of premiums and guarantees Allocation of post-event resources quickly and without the need to settle claims. Among the disadvantages it can be mentioned that the amounts covered by the bond are usually limited, high issuance costs and the possible illiquidity of the bond. Going deeper in this last alternative, it can be mentioned that the

World Bank has a program called "MultiCat Program" through which it assists governments to issue catastrophic bonds.

The sponsor government pays premiums to the issuer as if it were a traditional reinsurance contract. These funds are then placed in a Trust, which invests in high risk rating (AAA) assets. The return of the Trust (coupons) along with sponsor government premiums is paid to investors, including reinsurers, hedge funds, and institutional investors. If the catastrophic event occurs, within the term of the CAT Bond and in compliance with the indicated parameters (for example, earthquake of magnitude 7.9), the funds (principal) are transferred to the sponsoring government immediately and without Liquidation of claims, which is not the case with traditional reinsurance. If the catastrophic event does not occur, or if the parameters indicated in the CAT Bond are not met, the funds are transferred to the investors at the maturity of the bond. Although the World Bank does not take risks in this program, it assists in the issuance of the bond, allowing in this way to lower the costs of its issuance.

Catastrophic Events

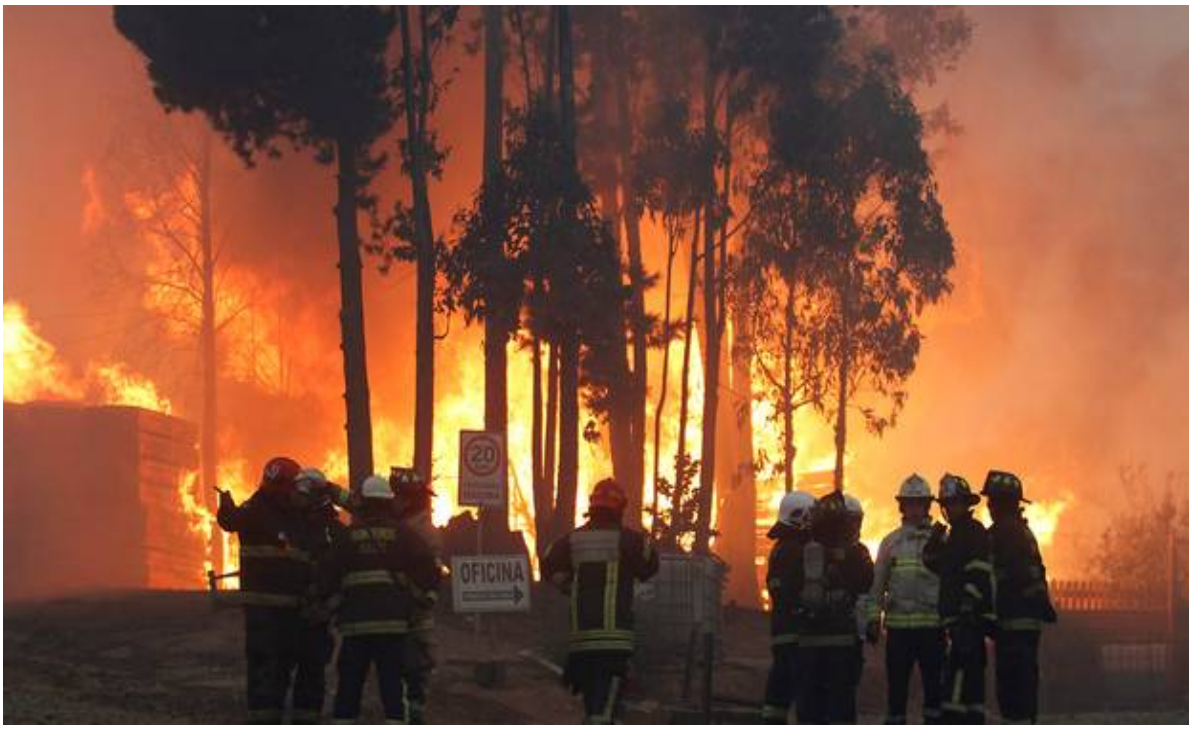
In January of 2017, in Chile faced the biggest forest disaster in history, affected 221,060 hectares of the central and southern part of the country, between the regions of Valparaiso and La Araucanía (CONAF).

The catastrophic disaster had an impact on the economies of small farmers, breeders, in the forestry sector losses are estimated to have reached 40 million dollars.

The first step must be to reforest immediately the areas where all is lost, in order not to have more losses in what the substrate means, that is, in the soil. The recovery by reforestation is important because after another season will occur precipitations, winds and all phenomena we call erosion, and this is the one that drags everything that is the vegetal layer that has been generated during so many years, reason why this can be Lose if that layer is completely unprotected. In terms of recovery time, surfaces of different ages have been lost. Species over 25 years old are not recovering because they lost that material that went to some industry or processing.

Government authorities reported that the origin of the fires was anthropic, many of them intentional.

The disaster caused serious consequences in the town of Santa Olga, a thousand homes destroyed, 10 people dead.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CHAPTER IV

Republic of Peru

Environmental Characterization

Peru is a megabiodiverse country. It is privileged in diversity of landscapes, biomes and ecosystems. The Andes, the longest tropical mountain range in the world, cross the Peruvian territory longitudinally and rise to more than 6,000 meters of altitude, providing a complex combination of climates, soils and microenvironments that support a diverse biological diversity and ecosystems . Within this framework, a great social and cultural diversity is configured (National Report on the State of the Environment, 2012). In general terms, Peru presents a great diversity of ecosystems in coast, highlands and jungle, appreciating as a diverse mosaic that is distributed longitudinally and latitudinally, and at different scales as functional units; This means that some larger ecosystems include other smaller ones. Tropical forests, dry forests, and fragile ecosystems can be considered as the main continental ecosystems.

The geographic framework of Peru is characterized by the presence of the sea off its coasts, the Andes mountain range, the Amazon jungle and its latitudinal location. Peru has a very high ecological diversity of climates, ecological floors and production areas, as well as productive ecosystems.

The variety of the geographical relief of Peru provokes that the anthropic distribution is varied and the accessibility difficult. Likewise, the distribution in the territory is inverse to the disposition of the natural resources, reason why the anthropic and productive activities are centralized in the coast, that is desert and semiarid.

Peru, because of its geographic characteristics, is especially vulnerable to climate change and the risks of disasters caused by natural phenomena due to their consequences on people's health, natural heritage and infrastructure in general, and thus on development sustainable.

Geographically, the country has three regions. The jungle is the largest region of the country, occupying 60.3% of the Peruvian territory and is made up of two defined zones: the high forest or mountain eyebrow, and the Amazon plain or low jungle. Despite its extension, it is occupied by only 9.4% of the population. The coast is the most densely populated region, accounting for 11.7% of the national territory, and home to 52.6% of the

population. Finally, the Sierra covers 28.0% of the national territory and contains 38.0% of the Peruvian population.

Catastrophic Insurance

The Ministry of Agriculture and Irrigation (MINAGRI) implements Catastrophic Agricultural Insurance (SAC), protects farmers from the high Andean areas that suffer from the low temperatures in the south of the country, insurance covers 15 different crops in regions of Rural poverty.

MINAGRI approved the supplementary procedure directive for the operation of the Guarantee Fund for the Field and the Agricultural Insurance, aiming to provide financing of the SAC for the agricultural campaigns 2015-2016 and 2016-2017.

The SAC will provide protection to farmers whose basic crops are vegetables, grasses, forages. The insurance contract specifically includes products such as dried peas, barley grain, dry beans, dry beans, kiwicha, starch, quinoa, wheat, green peas, green beans, corn, potatoes, alfalfa, Oat forage and barley forage.

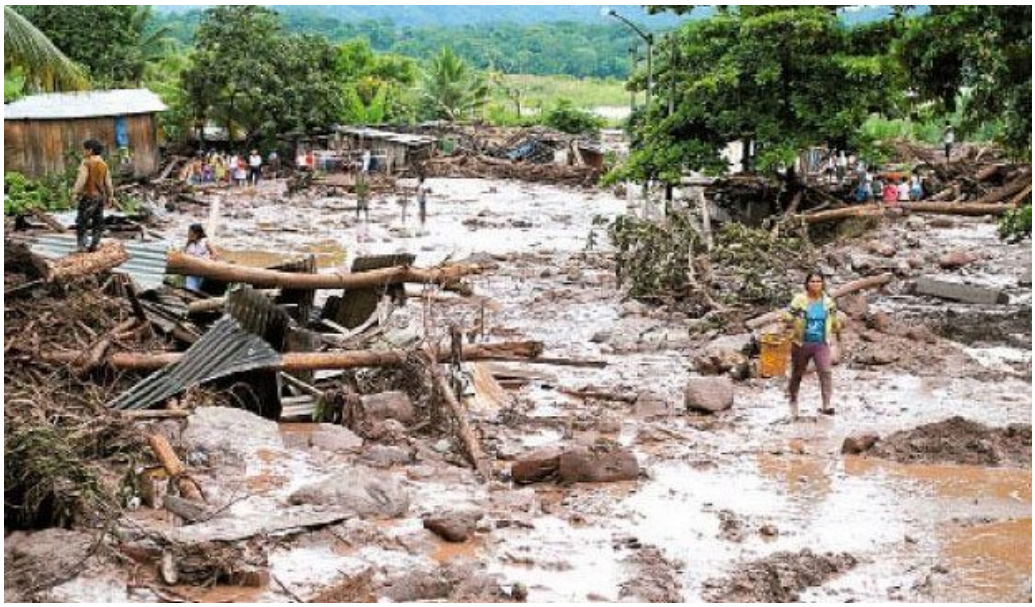
The Agricultural Agricultural Insurance (SAC) is applied by private insurance companies, who execute the policy in case of loss of the insured hectares. For this, the funds available from the Guarantee Fund for the Field and the Agricultural Insurance (FOGASA) are available.

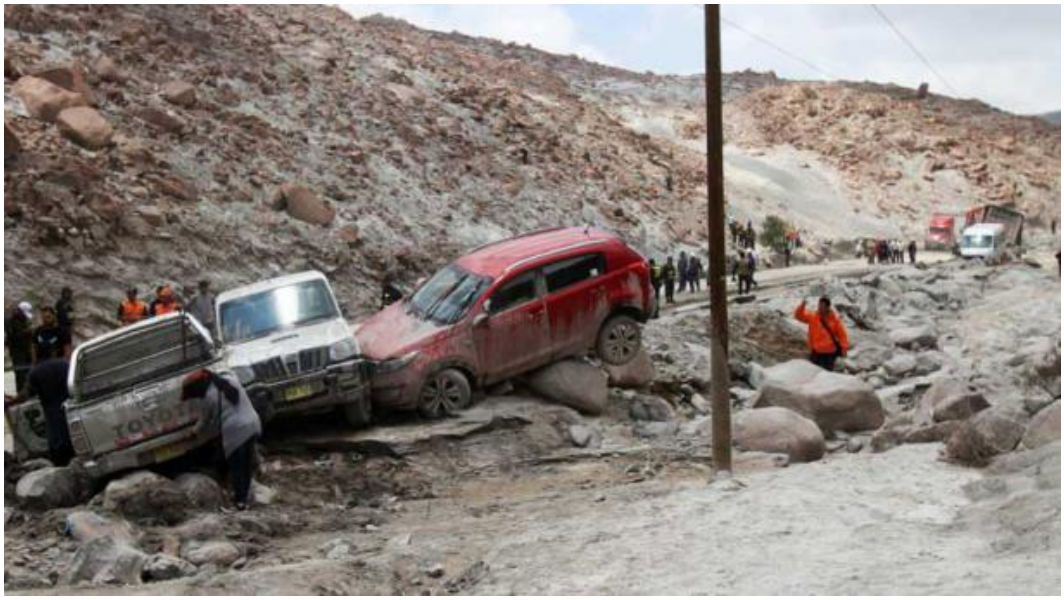
Catastrophic Events

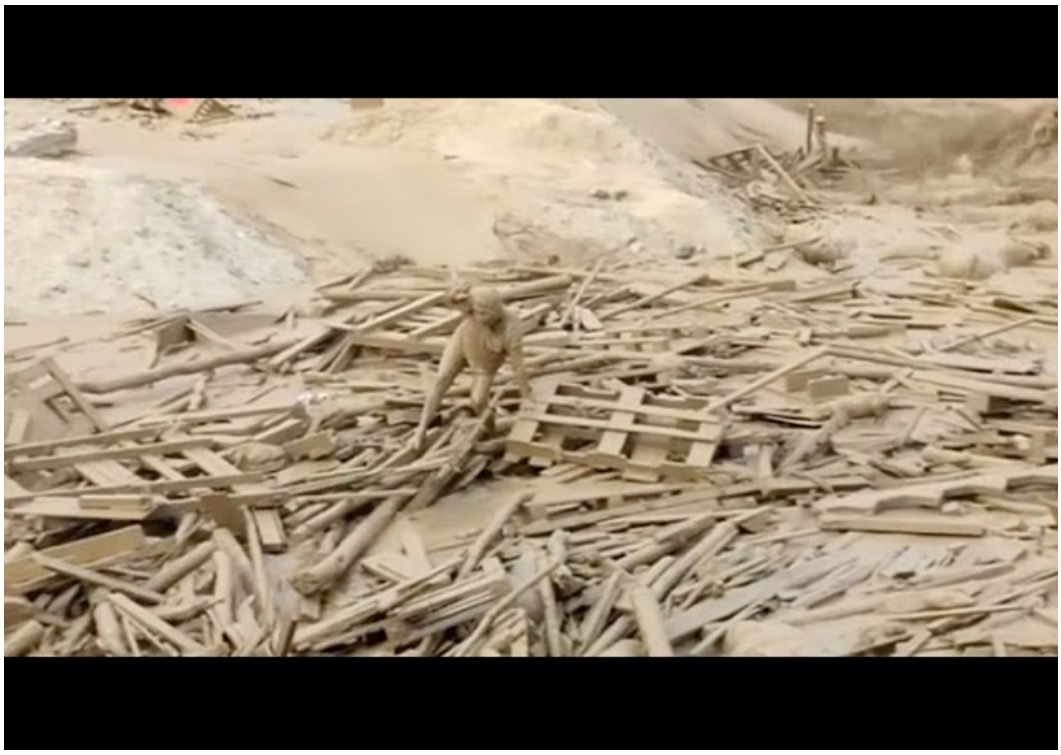
In Lima, intense rainfall during the month of March 2017, caused the Rímac river to overflow. These conditions caused the foundation of the footbridge Solidaridad, also known as Talavera, to wear out.

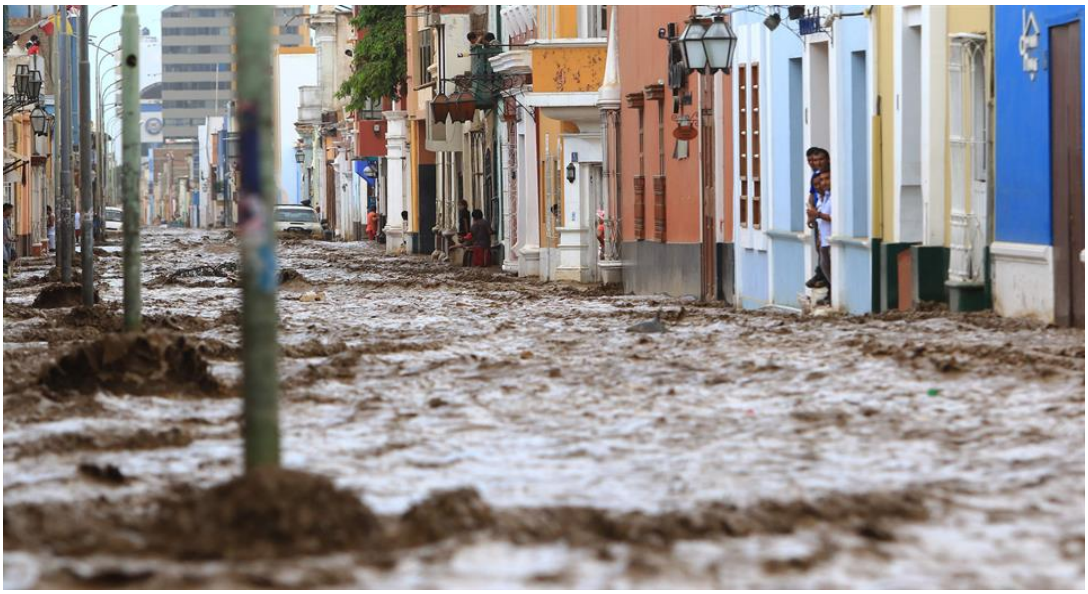
The multisectoral committee responsible for the national study of El Niño Costero said in early March that the intense and unusual rains on the Pacific North Coast are caused by high sea temperatures.

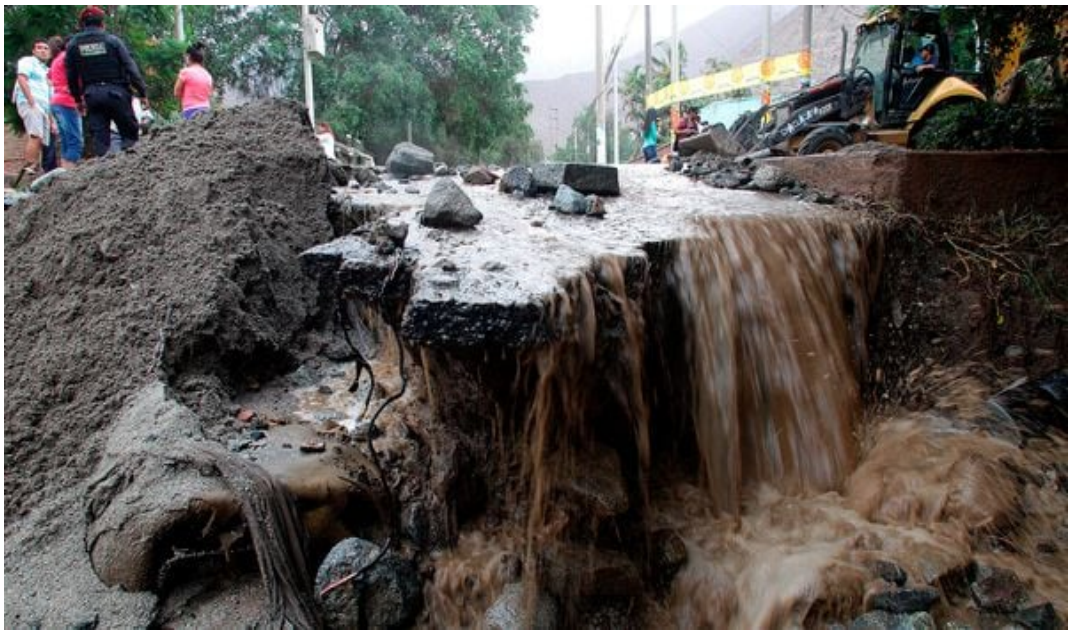
The natural disaster is the most severe of the last decades, with rains, floods and avalanches affecting 20 of the 25 regions of the country causing 62 deaths. The National Civil Defense Institute (Indeci) reported that the climate phenomenon has affected more than 546,000 people. National losses are estimated at $ 1.2 billion.

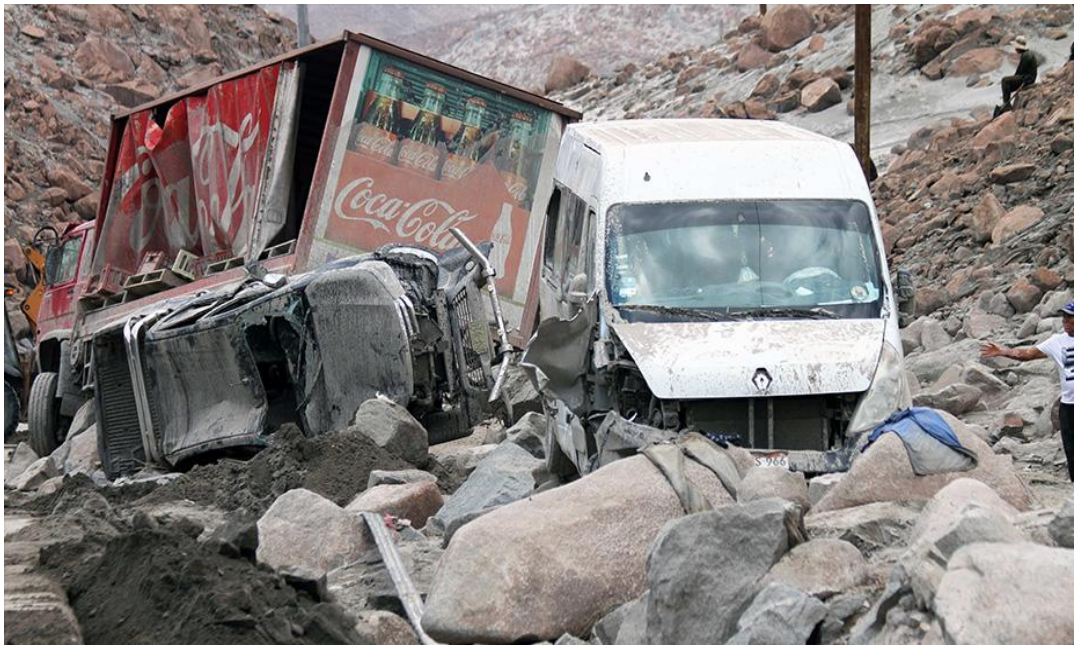











Coca-Cola

CHAPTER V

Eastern Republic of Uruguay

Environmental Characterization

The Eastern Republic of Uruguay has a total area of 176 215 km ², in which 175 015 km ² is the sum total of the departments and 1200 km ² comprises the sum of the artificial lakes of the Black river, it also exerts its sovereignty over several islands Located in the Uruguay River (with a total of 105 km²), 16,799 km² of jurisdictional waters (Uruguay river, Río de la Plata and Merín lagoon) and a territorial sea area of 125 057 km².

Uruguay maintains two border disputes with Brazil regarding the territories known as Isla Brasilera and Rincón de Artigas, in the department of Artigas, which occupy an area of 237 km². The total area of the Uruguayan territory covers 318 413 km².

Uruguay is the only country in South America that is entirely in the temperate zone. The absence of important orographic systems contributes to the fact that spatial variations in temperature, precipitation and other parameters are not so high. The average annual temperature is 17 ° C.

The relief remembers in the south part to the lands pampeanas and is constituted by vast plains corrugated and furrowed by hills of little elevation called blades. However, they are rather an ecotone that oscillates between meadows of temperate climate and subtropical forests. The most important are those belonging to the blade of Haedo and the blade Grande. Its highest point is the Cathedral hill, with 514 msnm.

The most important river basin is the Uruguay River, which is used as a means of communication with neighboring countries.

The network of rivers and streams that spread throughout the country nourishes the soil and benefits the crops, in addition to favoring the growth of suitable pasture for the breeding of livestock and farm animals.

The Uruguay River, which serves as a natural boundary with neighboring Argentina, along the Río de la Plata, the Santa Lucía River and the Negro River, represent the most important water courses in the national territory. In the case of the Rio de la Plata, which separates the country from Buenos Aires, it is in itself a tourist attraction. It extends from the coast of Colonia del Sacramento to Punta del Este, in the department of Maldonado,

including an approximate extension of 300 km of beaches and fluvial ports, among them, that of Montevideo.

The Santa Lucía River, which is born in Lavalleja department, and extends through Florida, Canelones, Montevideo and San José in an area of 14,200 km², serves as a natural boundary between several of these departments and provides drinking water to approximately Half of the country. It is an aquatic way through which boats and cargoes pass to the main Uruguayan cities, and it is rich in marine fauna, reason why the fishing constitutes one of its natural resources.

The Negro River, which divides Uruguay into two parts, is characterized by its dark color, its depth and its breadth. Above it rises bridges of between one and two kilometers in length, which cross from one bank to another of the country. The Negro River bathes the coasts of, and serves as natural boundary between, the homonymous department, Tacuarembó, Cerro Largo, Durazno, Soriano and Flores. It is a navigable river, suitable for sport fishing and bathing, in high areas. It is born on the border with Brazil and is tributary of the Uruguay River, to which it is united near the border with the province of Entre Ríos, in Argentina.

The Uruguay River is used in a hydroelectric dam - that of Salto Grande - which provides electricity to almost all Uruguayan territory and some neighboring Argentine departments.

The month of March presents the biggest rains in the majority of the territory with a maximum of 140 mm, covering part of the departments of Artigas, Rivera, Salto and Tacuarembó and a minimum isoyeta of 90 mm. Which is located to the southeast. The driest month on average is December for the whole country, with precipitations between 100 mm. On Artigas and 60 mm. About Rocha.

Uruguay has approximately 500 kilometers of coastline, 300 of which belong to the Rio de la Plata and the other 200 to the Atlantic Ocean (departments of Maldonado and Rocha)

Catastrophic Insurance

The geographical location of Uruguay indicates that the country is not exposed to major catastrophic events, such as earthquakes and tsunamis. The country has less exposure to flooding and infrequently to tornadoes with limited effects on industry performance.

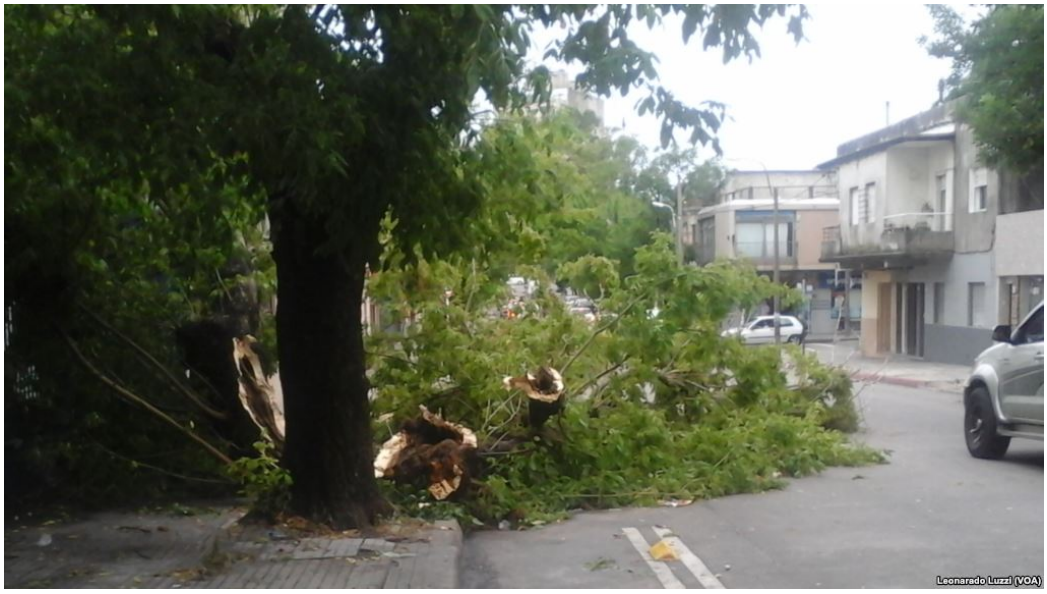
Insurance indexed to climate variables emerged as an alternative to traditional damage insurance to cover such systemic events. The contracts are subsidized by the high cost of

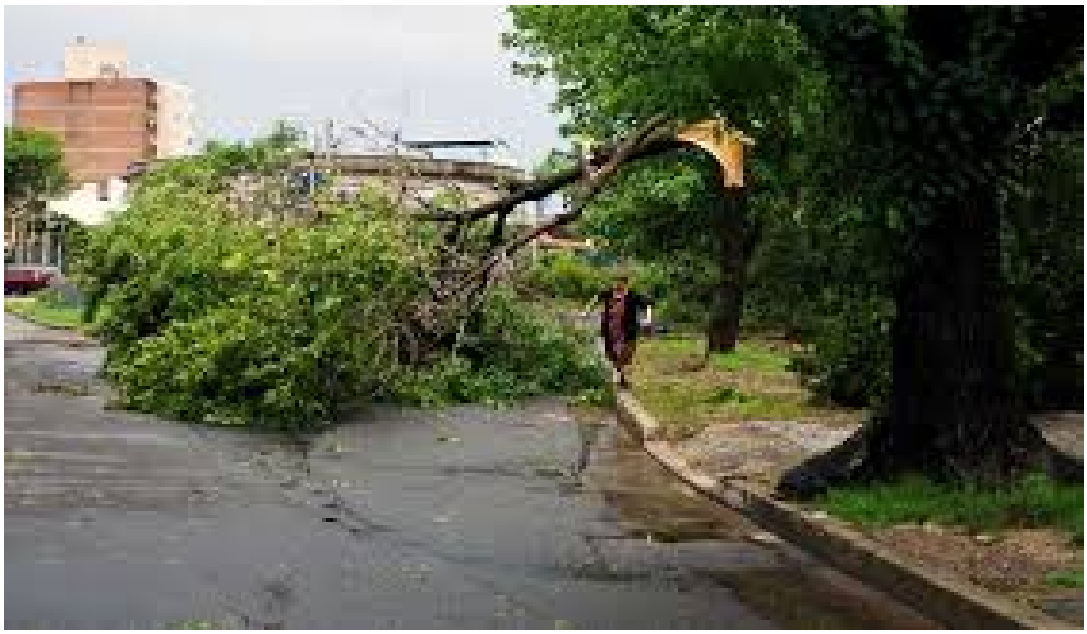
the premiums, or directly acquired by the governments to have resources in a timely manner before catastrophes or agricultural emergencies. The MGAP has contributed to the design of two insurance indexed one for excessive rainfall in horticulture and the other for droughts in breeding stock, which continues in the pilot phase until February 2018. In both cases extreme events are covered. Currently the MGAP together with the INALE is evaluating alternatives of design of a drought insurance and excessive rainfall for the dairy

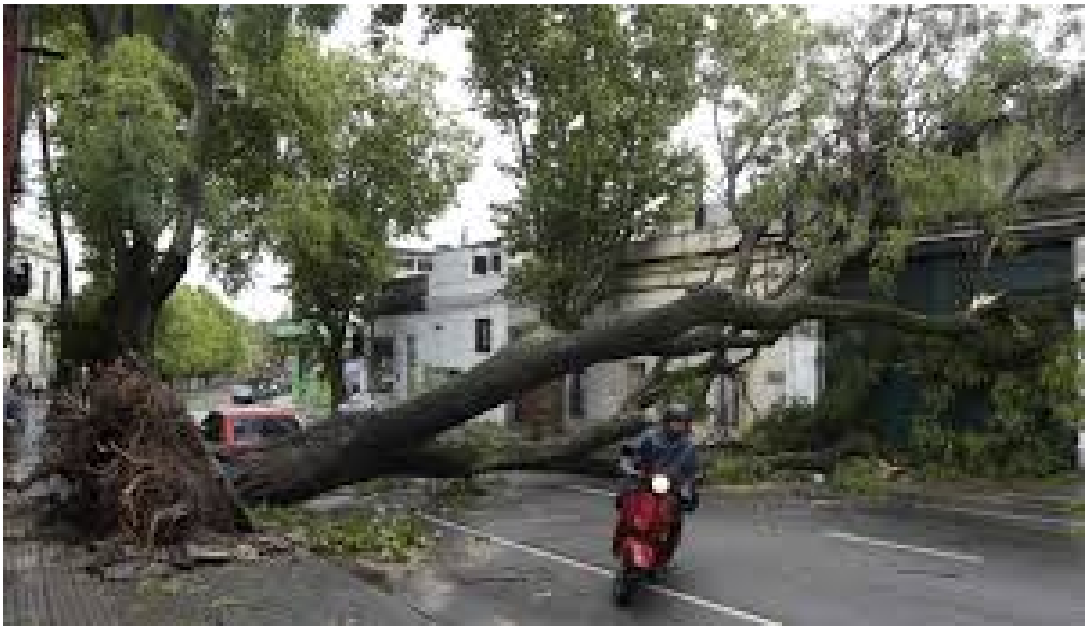
Catastrophic Events

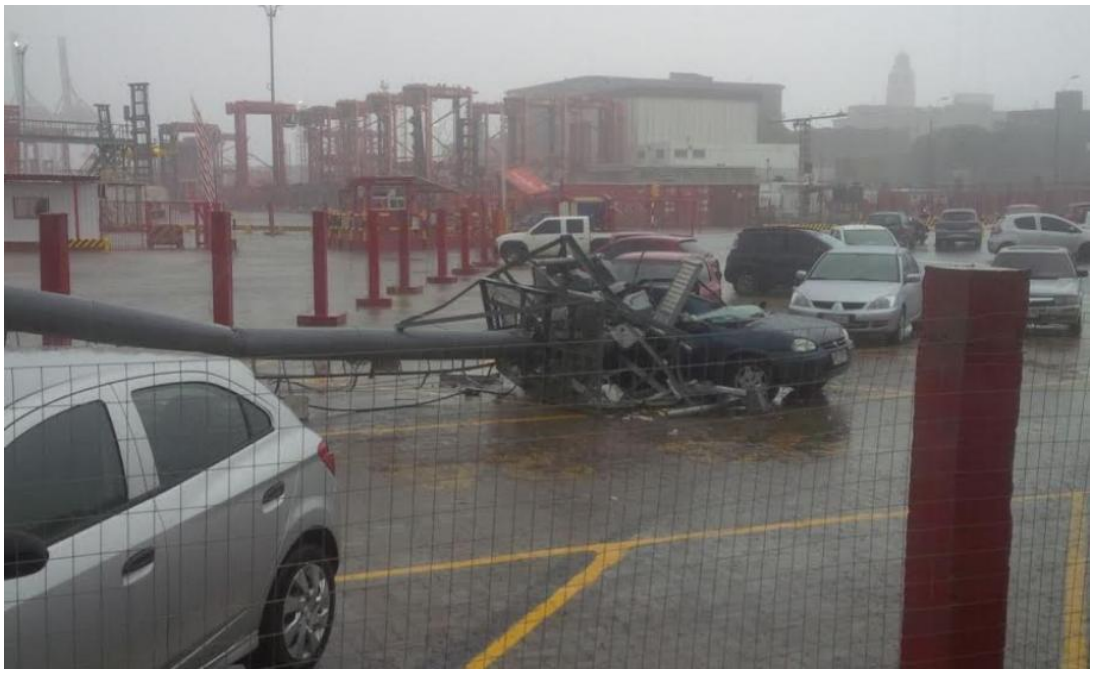
In the city of Montevideo, January 3, 2017, a full summer season for the region, there was a phenomenon that consisted of severe storms with bursts exceeding 120 km per hour accompanied by heavy rainfall and hail. The power outage affected 34,700 people.

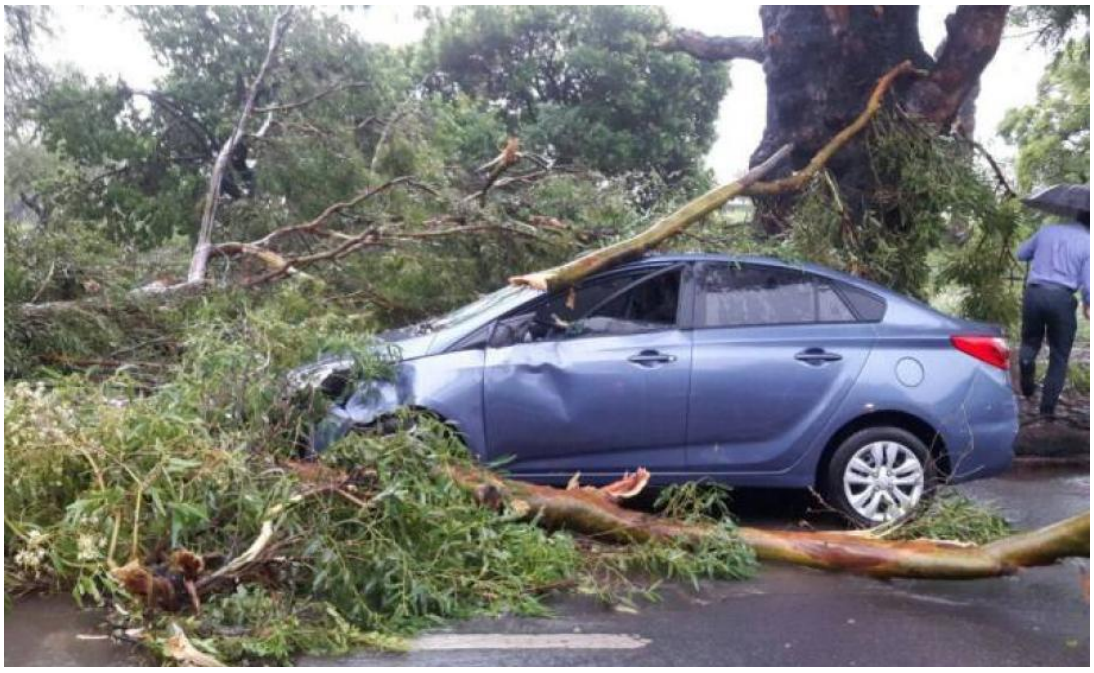
The cause of these phenomena in the region is due to the existence of an unstable mass, it is the area of the so-called South American plain, a place where intense storms, hail and even tornadoes are frequently formed. The extension of this "corridor" of the tornados embraces the zones of Argentina, Paraguay, Brazil and Uruguay. The territory most likely to present these own climatic conditions for the formation of a tornado extends from La Pampa to Rio Grande Do Sul.

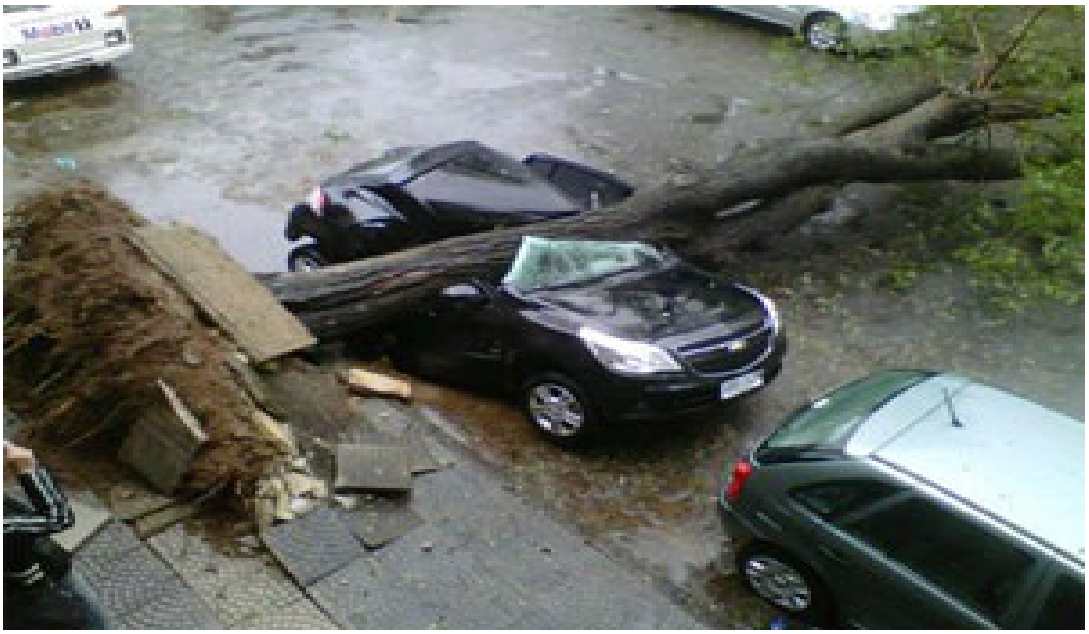


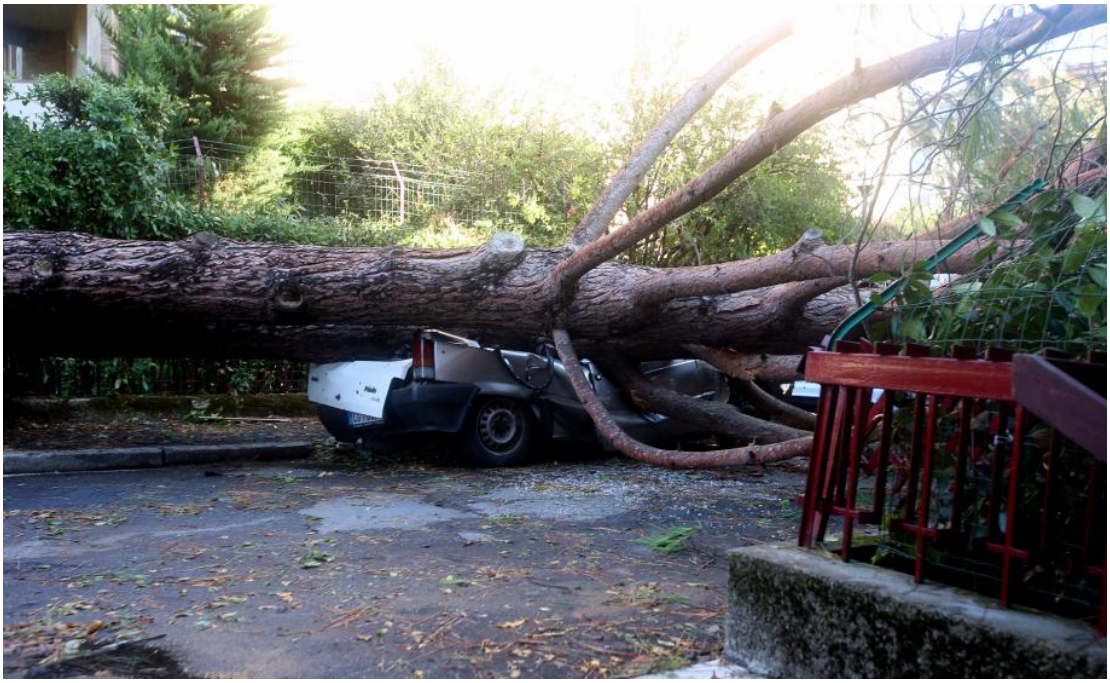












Glossary

Arenosols Develop on unconsolidated sandy texture materials that, locally, can be calcareous. In small areas it can appear on sandstones or siliceous rocks very altered and sanded.

Bathymetry A set of techniques for the measurement of the depths of the sea, rivers, etc., and the study of the distribution of plants and animals in their various layers or zones.

Biome Each ecological unit in which the biosphere is divided according to a set of climatic and geological factors that determine the type of vegetation and fauna.

Centripetal is said to be advancing or directed or pushed towards the central part.

Comment Muds associated with volcanic eruptions can travel at high speeds from their point of origin and are one of the most destructive volcanic threats.

Ecotonos is a place where the ecological components are in tension. It is the transition zone between two or more distinct ecological communities (biocenosis).

Fault is a fracture, generally flat, in the ground along which the two blocks have slipped in relation to each other. The faults are caused by tectonic stresses, including gravity and horizontal thrust, acting on the crust.

Phanerozoic is an eighth part of the estimated life of the Earth, it has been the most studied period, because it can detect many phases of our own evolution, and because the record of rocks usually improves as we approach the present. While it is not easy to subdivide the Precambrian into milder temporal units, this is what has happened to the Phanerozoic, especially in relation to the last hundred million years. The science that determines and understands the geological time, the stratigraphy, is at present very advanced.

Ferrasols The term ferralsol derives from the Latin words "ferrum" which means iron and "aluminum" which means aluminum, alluding to the high content of sesquioxides present in these soils, red and yellow, tropical.

Groundwater A groundwater table is an accumulation of groundwater that lies at a relatively low depth below ground level.

Granulite (from Latin 'granulum', small grain) are metamorphic rocks that have suffered during their metamorphism high temperatures. Because of this, they have a granoblastic texture, that is, the crystallized minerals it contains all have an appreciable and homogeneous size.

Granitoids Granitoids are produced by slowly solidifying magma with a high content of silica in depths under high pressure. 6Magma of granite composition that surfaces to form rhyolite, the volcanic equivalent of granite.

Lapilli (singular lapillus, from the Latin: "little stones") is a term of classification of tefra according to its size and is constituted by fragments.

Leptosols The term leptosol derives from the Greek word "leptos" meaning thin, alluding to its reduced thickness. The original material may be either rocks or unconsolidated materials with less than 10% fine earth.

They appear mainly in high or medium areas with a steep topography and steep slopes. They are found in all climatic zones and, particularly, in heavily eroded areas.

Lexiosols It is a type of plain soil that is characterized by slightly inclined slopes with sandy loam texture to clay loam and moderate to good drainage.

Liquefaction The liquefaction of the soil or of the earth, produced by the instability of the same, or by earthquakes.

Mangrove Mangrove is a biotic area or biome, formed by trees very tolerant to salts existing in the intertidal zone near the mouth of freshwater courses in tropical and subtropical latitudes.

Cyclonic Waves Cyclonic waves are an abnormal growth of sea level associated with hurricanes and other sea storms. Cyclonic waves are caused by strong coastal winds and / or by very low pressure cells and ocean storms.

Plinthosol The term plinthosol derives from the Greek word "plinthos" which means brick, alluding to the shape of the plinthite. The plinthite is more frequent in products of alteration of basic rocks than of acid. In some cases, the presence of sufficient iron that originates the typical morphological model of the plinthite, originating from the original material or elevated by the water from the same, is crucial.

Salinization. Excessive accumulation of sodium, potassium, calcium and magnesium salts, chlorides, sulfates, carbonates, bicarbonates and nitrates in water and soil.

Seiches A seiche is a stationary wave that affects a body of enclosed or partially enclosed water. The seiches and phenomena related to seichesse have observed in lakes, reservoirs, pools, bays, seas.

Sineclysis is a structural depression function as basins of accumulation so that sedimentary rocks predominate.

Tefra is a generic term that applies to fragments of lava and volcanic rock of any size thrown into the air by gas explosions.

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Conclusion

The upward trend in total economic losses over the last few decades shows the increasing exposure of the world economy to natural catastrophes. This evolution has caused unprecedented losses to the global insurance market, where these losses are transmitted from the insured, via the primary insurers, to the reinsurance companies.

In this research, a section is developed in which a detailed description of potentially dangerous natural phenomena, hydrological geological threats, techniques and tools for the evolution of natural hazards is developed, which will allow us to understand more in depth the Catastrophic events in the Mercosur Region.

In Chapter I, the Argentine Republic deals with the geographic environmental situation, catastrophic insurance for the livestock farming sector. Two cases of recent catastrophic events were taken in the Province of Santa Fe and the avalanche occurred in the locality of Volcán in the Province of Jujuy, in both cases there is absence of catastrophic insurance, as it happens in Colombia, where the State takes care of the coverages for this type of events.

Chapter II Federative Republic of Brazil, as in the previous chapter, mention is made of the country's environmental geography, current insurance for catastrophic events and the case of Maria da Gloria Faria and Pery Saraiva Neto .

As far as catastrophic insurance is concerned, mention is made of the catastrophic insurance project presented to Parliament in 2016, the bill was presented by Congressman Jorge Silva, which lists the events that should have insurance protection, Such as storms, hailstorms, floods, avalanches, earthquakes, tsunamis and other large-scale natural disasters.

Chapter III The Republic of Chile, in this chapter we mention the environmental geographic situation, which highlights the highly seismic and volcanic zone of the country.

During 2011 and the present, the SVS has collaborated with the Association of Insurers of Chile (AACH) in a project that aims to develop a model to estimate the maximum probable losses (PML) of insurance companies that Offer coverage for earthquake or tsunami risks.

Some sectors have proposed the creation of compulsory earthquake insurance, applicable to all real estate owners. One of the great problems to materialize an initiative like this is the difficulty to control and to sanction the breach of this obligation, especially considering sectors of low resources. On the other hand, there are sectors in which even wanting to

contract insurance, can not be accessed due to supply problems, for example in areas at greater risk, or for construction materials such as adobe.

In this chapter we take as a witness the cases of fires that occurred in the summer season of 2017, the largest of the forest history occurred in the country.

Chapter IV Republic of Peru refers to the country's environmental geography, a great diversity of ecosystems characterized by the proximity of the sea to its coasts.

The Ministry of Agriculture and Irrigation (MINAGRI) implements Catastrophic Agricultural Insurance (SAC), protects farmers from the high Andean areas that suffer from the low temperatures in the south of the country, insurance covers 15 different crops in regions of Rural poverty.

MINAGRI approved the supplementary procedure directive for the operation of the Guarantee Fund for the Field and the Agricultural Insurance, aiming to provide financing of the SAC for the agricultural campaigns 2015-2016 and 2016-2017.

The SAC will provide protection to farmers whose basic crops are vegetables, grasses, forages. The insurance contract specifically includes products such as dried peas, barley grain, dry beans, dry beans, kiwicha, starch, quinoa, wheat, green peas, green beans, corn, potatoes, alfalfa, Oat forage and barley forage.

The Agricultural Agricultural Insurance (SAC) is applied by private insurance companies, who execute the policy in case of loss of the insured hectares. For this, the funds available from the Guarantee Fund for the Field and the Agricultural Insurance (FOGASA) are available.

The case was taken from Lima, where intense rainfall during the month of March 2017, caused the Rímac river to overflow. These conditions caused the foundation of the footbridge Solidaridad, also known as Talavera, to wear out.

The multisectoral committee responsible for the national study of El Niño Costero said in early March that the intense and unusual rains on the Pacific North Coast are caused by high sea temperatures.

The natural disaster is the most severe of the last decades, with rains, floods and avalanches affecting 20 of the 25 regions of the country causing 62 deaths. The National Civil Defense Institute (Indeci) reported that the climate phenomenon has affected more than 546,000 people. National losses are estimated at $ 1.2 billion.

Chapter V The Eastern Republic of Uruguay refers to the environmental geographic situation. It was taken as a case of the phenomenon occurred in January 2017, which consisted of severe storms with bursts exceeding 120 km per hour accompanied by heavy rainfall and hail. The power outage affected 34,700 people.

The cause of these phenomena in the region is due to the existence of an unstable mass, it is the area of the so-called South American plain, a place where intense storms, hail and even tornadoes are frequently formed.

The analysis of all witness cases and as a synthesis, it is urgent to have institutional systems and administrative solutions that link the public sector with the private sector and civil society, as well as building bridges between the protagonists of the local, district, National and international. Legislative reform is necessary, but it is not in itself a powerful tool to improve equity and increase participation. Legislation can define norms and limits for activities, for example, establishing building codes or training requirements and basic responsibilities of those principally responsible for risk management. But mere passage of laws does not solve the problem. It is necessary to establish effective control mechanisms to ensure compliance.

To achieve the medium-term goal of meeting the Millennium Development Goals and the long-term goal of more sustainable development paths, disaster risk must be taken into account.

Periods of reconstruction following a major disaster are an excellent opportunity to integrate risk reduction into development planning.

Reducing disaster risk can be a very useful basis for adaptation to climate change. The articulation of programs and agencies working on disaster risks and climate change should be a priority.

In relation to ordinary risks, catastrophic natural risks require different insurance criteria, with specific technical-actuarial treatments, with appropriate financial instruments, and with sufficient statistical support.

It is very important to make the State aware of the situation that could be faced in case of the occurrence of a natural phenomenon such as cyclones, floods and earthquakes.

The insurance sector is obliged to adapt its pricing to a new reality and to modify its subscription criteria. However, it is not easy because of the difficulty in predicting the

occurrence of new risks and their effects. The measures taken by the sector are not sufficient and it has to redirect its management to new forms of insurance, combining risk transfer and financing, through new products such as "finite-risk" products, purchase options Catastrophic risks and direct securitization. These new forms of risk placement allow the ceding company to have available long-term hedges and prices established a priori, to level fluctuations in the censor's claims over time, to reduce transaction costs thanks to its multi-year effectiveness, improvement The most significant figures in the transferor's balance sheet; And, lastly, increase of solvency and the capacity of subscription to the transferor.

Finally, the traditional reinsurance of catastrophic risks has a lot of life ahead, but it must be done in a closer approximation to the purely financial techniques, since they are destined to know spectacular developments jointly to achieve complete transfer products Risks and financing. All this is leading to a transformation of the traditional role of reinsurers. Among the consequences of this transformation is the need for greater transparency in traditional risk pricing mechanisms and more efficient placement and distribution of capital.