Special Edition #1

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TERRA BRASIS RESSEGUROS (a)

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Terra Report

Special Edition: Brazilian Natural Catastrophes

Index:

(a) *Local Reinsurance company presently in license approval process at SUSEP*

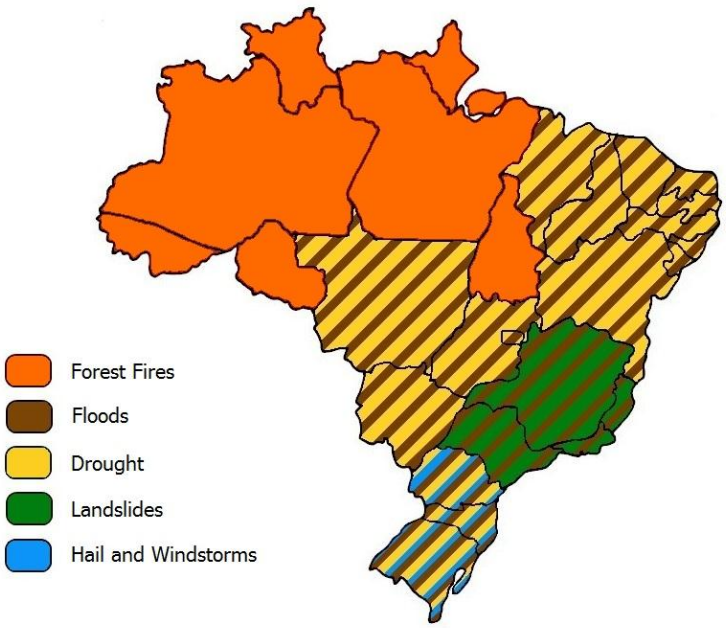
Majority Shareholder:

plural CAPITAL

An equity investment by the World Bank's International Financial Corporation (IFC) has been approved and is currently under process.

- An accurate observation shows that, contrary to popular belief, there is a significant and increasing incidence of natural catastrophes in Brazil.
- This special edition of Terra Report offers a brief summary of Brazil's exposure to natural risks and provides analyses of the different types of catastrophes that occurred as per national sources related to Civil Defense and the international databank Emergency Events Database (EM-DAT.)
- Additionally, some important aspects of the Country are described, including the so-called Drought Polygon, the El Niño and La Niña effects, and Cyclone Catarina that reached Santa Catarina State in 2004.
- Finally, it contains an analysis of the history of expenditures incurred by the Federal Government regarding Disaster Prevention and Preparation and costs related to Disaster Response and Reconstruction.
- In the future, the disclosure of such information will be made periodically through specific analytical reports.

Exposure to Brazil's Natural Risks by Region



Source: CEPED, EM-DAT, Terra Brasis Re.

Introduction

In all the global maps of catastrophes produced by international institutions or by the major international reinsurers, Brazil always appears in a light yellow color, indicating few occurrences or even the absence of natural catastrophes.

Nevertheless, a more careful local observation indicates that that is not the reality.

Though, statistically, there are no risks of earthquakes, volcanoes, hurricanes, or tsunamis compared to other geographical regions that are more exposed, various types of natural catastrophes have a long history of occurrence in our territory and in recent years, Brazil has experienced events of an intensity that is normally not common in our region.

This work by Terra Brasis Resseguros presents information referring to the occurrence of natural catastrophes in Brazil and is based on data gathered from various sources referred to during the publication.

The investment we have made in this area of research demonstrates our commitment to the fundamental objectives of the insurance and reinsurance industry, as one of the agents responsible for the identification and management of risks.

Among the entrepreneurial objectives of Terra Brasis Re, is the technical knowledge of Brazilian risks and, in researching, gathering, studying, and divulging this information, our company seeks to share this knowledge with its clients and with the insurance market as a whole, encouraging public and private investment in the sense of preventing, reducing, and transferring catastrophic risks from the Brazilian market.

This first dissemination of information on Brazilian natural catastrophes is being made through a special edition of Terra Report. In the future, the dissemination of this information will be made by means of specific periodic reports.

We are grateful to the National Secretary of Civil Defense, to CEPED – the body linked to the Federal University of Santa Catarina,- and the Emergency Events Database "EM-DAT" for the public availability of the data used herein. The report also contains analyses made internally by Terra Brasis Re and, in this way, we apologize in advance for possible errors contained in this publication. Any criticism, comment, or suggestion on this work will be welcome.

Sincerely,

Paulo Eduardo de Freitas Botti
Chief Executive Officer
Terra Brasis Re

Catastrophes and Risks

The social, political, and economic evolution of Brazil in the past decades, of which the enhancement of the domestic insurance and reinsurance market is part of, has placed a greater emphasis on the discussion of the natural disasters that have been occurring in our country, which previously was not the case.

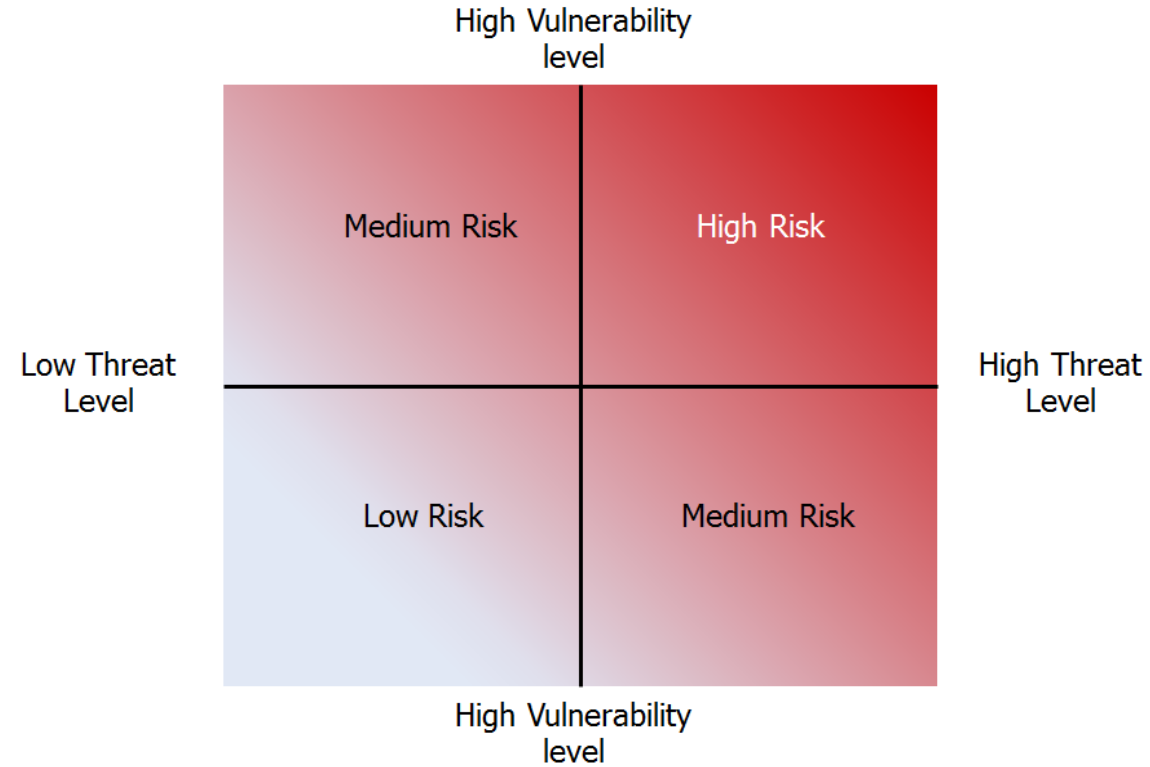
This special edition of Terra Report deals with this issue, and in order to develop coherence and unification of nomenclature, we believe it is necessary from the beginning to define the terms used in this work.

In the Insurance market, RISK is defined as the probability of the occurrence of a future and uncertain event, of a sudden and unpredictable nature, regardless of the insured's will, which may cause economic losses. Consequently, a region is said to be exposed to earthquake risks when there is a significant probability of the occurrence of an earthquake in it.

Colloquially, natural phenomena such as hurricanes, earthquakes, volcanic eruptions, and tsunamis, are called NATURAL RISKS.

In a more technical and sophisticated manner, NATURAL RISKS are evaluated in light of the combination between the Threat Level (probability and magnitude) and the Level of Vulnerability of the exposed location.

Risk Classification



Source: RISCO AMBIENTAL: CONCEITOS E APLICAÇÕES, Ricardo de Sampaio Dagnino; Salvador Carpi Junior, Terra Brasis Re.

Therefore, even the natural phenomena, normally of a lesser impact and greater frequency such as windstorms and even rain, can be considered medium or high NATURAL RISKS depending on how they may affect society, considering the socioeconomic and environmental situation of the exposed area.

On the other hand, NATURAL CATASTROPHES are the effects of NATURAL RISKS, i.e., financial, environmental, and human losses as a result of the occurrence of a phenomenon or NATURAL RISK.

What we observed in the majority of the planet, including in Brazil, is that NATURAL CATASTROPHES have resulted from high NATURAL RISKS given the high vulnerability of the exposed areas. Poor conservation of the environment, the lack of preparation for the occurrence of natural phenomena, or even their non-compliance are the main causes.

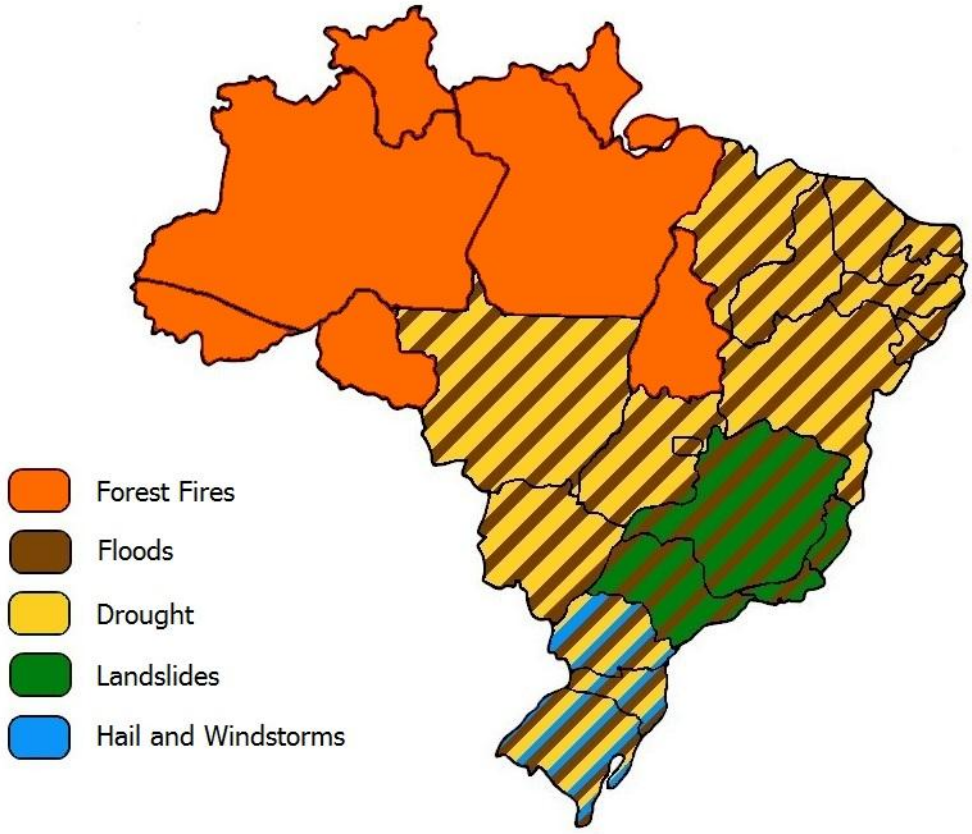
Such cases are recurring more often, thus making it possible to notice a relative increase in the frequency of the occurrence of NATURAL CATASTROPHES throughout the world. Another factor that greatly influences this is the climate. Long-term climate changes have always greatly influenced human life. Moreover, since the planet is currently more populated than in past centuries, the exposure to natural risks has increased and the short-term climate variations have significantly impacted humanity.

Summary of the Brazilian Natural Catastrophes

Despite the popular saying that Brazil is a country blessed by God, unfortunately, the truth is that the country is not free of natural catastrophes. In the national territory, we have flooding, droughts, and fires. Windstorms, hail, and sporadic cyclones and earthquakes are also reported. The frequency of such events is relatively lower than in other more exposed areas of the planet. However, the socioeconomic impact of such events is significant on a national level.

The map below describes, in brief, the exposure of various regions of Brazil to natural risks.

Exposure to Brazil's Natural Risks by Region



Source: CEPED. EM-DAT, Terra Brasis Re.

As we can see, there is a high frequency of flooding in almost the entire Brazilian territory. It is important to note that in this report, by simplification, we call the so-called flooding, not only flooding ("inundação" in Portuguese), but also water overflow ("alagamento"). However, for the insurance market, both events are distinct. The term water overflown means water originating from showers, violent downpours, rains, or from ruptures in pipes, tubes, pipelines and reservoirs. On the other hand, the term flooding means a significant increase in the volume of water from navigable rivers and channels.

In the previous map, it is possible to notice that in the Southeast region there is a higher frequency of landslides and flooding. Being that this region has the largest economic wealth of the country, historically the largest economic losses have also resulted from flooding and landslides.

The country's Southern region is peculiar in the sense of being exposed not only to flooding, but also to drought, windstorms and hail. A little known fact is that recent events seem to point to the possibility of cyclone formation in the South Atlantic. The hurricane season of the Northern Hemisphere is well known and responsible for numerous disasters in the Caribbean and in the southern states of the United States. Meanwhile, the south of Brazil, Santa Catarina in particular, seems to be susceptible to windstorms and sporadically, even to cyclones, as we will see later in this publication.

The Northeastern region is known by its alternating periods of large droughts and floods. Such topics are further examined later when the Drought Polygon, which is mainly located in this region, is analyzed. With the economic development of the Northeast in the past decade, its exposure to economic losses resulting from natural catastrophes naturally increased. This tendency should continue as long as the region is likely to continue to receive a significant amount of investments.

The Midwest is exposed to droughts and floods, while the North is affected by forest fires. Aside from its relatively low population density, with the advancement of agriculture and livestock in these regions, potential losses resulting from natural catastrophes are tending to rise.

Catarina and the cyclones in Brazil

In Brazil, the occurrence of tornadoes and cyclones was never considered as important as now. Part of this concern may be attributed to the increase in the number of records of such events in the entire national territory. And, for the evolution of this analysis to be possible, the definition of each event is necessary.

Tornadoes are phenomena originated by storms provoked by solar heating on the continent and they occur throughout the entire world. Their size varies, and their width may be from less than 30 meters to larger than 2.5 Km. They are also classified between minimums and maximums. Minimum tornadoes only last a few minutes and move approximately 1.5 Km, with a speed of 160 km/h, whereas maximum tornadoes can move an average of 320 km and last 3 hours, with a speed over 400 km/h.

Usually, tornadoes are funnel-shaped, have a very irregular path, and are able to move in straight lines or winding paths. There also exist tornadoes that multiply in other funnels, and even those that skip certain areas.

In Brazil, some say that tornadoes are not as rare as is commonly thought. This is due to the fact that, contrary to what happens in the United States, in Brazil the clouds are closer to the land, which makes it difficult to see tornadoes from a distance.

The national records, which began in 1985, report occurrences mainly in the city of São Paulo, during the period from September to May. Such concentration can be explained by a chain reaction activated by the increase in the level of pollution in the region. The immediate consequence of this event is the significant elevation in the average temperature, which generates an increase in the volume of storms, and finally, an increase in the number of tornadoes.

More specific studies concluded that, besides São Paulo, the cities of São Bernardo do Campo, Itu, and Ribeirão Preto have also been targets. The same thing happened with cities like Palmital, Lençóis Paulista, and Indaiatuba, in which the recorded intensities were considered high, respectively class F2 and F3 and F3, on a scale that goes from F1 to F6, F6 being the most intense. Indaiatuba, in particular, suffered relevant damages to the point of considering the passage of the tornado a catastrophe, hitting 400 houses, destroying 15 companies, bringing down 18 wagons with the strength of the wind, and the loss of power of 99% of the city.

List of Tornadoes with a Large Number of Fatalities in Brazil

Data	State	City	Dead	Wounded
30/sep/91	SP	Itu e Jundiaí	16	176
31/aug/89	MS	Ivinhema	16	-
14/sep/23	SP	Chavantes and Oriundos	10	100
sep/67	RS	Lajeado	6	40
17/may/92	PR	Almirante Tamandaré	6	33
14/mai/94	SP	Ribeirão Preto	3	-
25/may/04	SP	Palmital	2	50
04/may/01	SP	Sumaré	1	-
26/oct/99	MS	Ponta Porã	1	13
08/jul/03	RS	São Francisco de Paula	1	50
03/jan/05	SC	Criciúma	1	10
TOTAL			**63**	**472**

Source: O Impacto das Catástrofes Climáticas na Solvência das Seguradoras, René Hernande Vieira Lopes.

The damages caused by tornadoes in the Brazilian territory are no longer measured only by values, but in fatalities, as the chart from the previous page demonstrates.

Another event that is also becoming more prevalent in Brazil is the cyclones. These are natural phenomena always formed over the ocean, and can later advance by land. Some factors are essential for a tropical cyclone to form, among which are, the winds blowing in the same direction, low humidity of the air, and ocean temperature around 26.5°C. Cyclones receive different names depending on the location where they are formed. They are called typhoons in the China Sea, the Philippines, and in the south of Japan; hurricane in North America and in the Caribbean; cyclone in the Indian Ocean and willy-willies in the Southern Pacific and on the northern coast of Australia.

Historically, Brazil is a country where the occurrence of cyclones is minimal, practically inexistent, and the few occurrences reported are of a low intensity. However, this understanding is being questioned since 2004, when a cyclone of significant proportions hit the state of Santa Catarina.

The phenomenon was informally called "Catarina" and was also the first tropical cyclone to be officially recorded in the South Atlantic. The conditions were exceptionally favorable, which led to its intensification, reaching its peak of intensity with winds of up to 155 km/h on March 28th. The storm reached the coast at the level of the city of Torres, Rio Grande do Sul. See below a summary of damages caused by Catarina.

Damages Resulting from Cyclone Catarina

Human Damages		Material Damages		Economic Damages (R$ million)	
Temporarily Homeless	27550	Houses Damaged	35873	Agricultural Damages	87
Homeless	2589	Houses Destroyed	993	Buildings Recovery	500
Displaced	3016	Commercial Buildings Damaged	2274	Eletric Grid Recovery	15
Dead	518	Commercial Buildings Destroyed	472	**TOTAL**	**602**
Wounded	3	Public Buildings Damaged	397		
TOTAL	**33676**	Public Buildings Destroyed	3		
		TOTAL	**40012**		

Source: Defesa Civil de Santa Catarina, O Impacto das Catástrofes Climáticas na Solvência das Seguradoras, René Hernande Vieira Lopes, Terra Brasis Re.

Given the fact that, according to trustworthy records, the cyclone had formed in a region that had never recorded the presence of tropical cyclones before, the damage was severe. Cyclone Catarina destroyed approximately 1,000 residences and damaged another 36,000. The economic losses were huge, especially in the banana plantations, where 85% of the crop was lost, and in the rice plantations, where 40% of them were affected. Despite such consequences, the economic loss of R$ 602 million, at that time equivalent to US$ 205 million, was considered very low in comparison to other countries affected by tropical cyclones. For the purpose of comparison, Hurricane Katrina, which brushed the Southern United States in 2005, caused US$125 billion in damages, the highest amount of losses ever caused by a hurricane.

El Niño and La Niña

The El Niño effect is the name given to the consequences of the displacement of the South Pacific anticyclone to the Southeast. This event occurs every year between the months of January to March. In this period, the trade winds originating from the Chilean and Peruvian coasts decrease, causing the hot water of the equatorial current to extend towards the south, clashing with a cold front originating from Humboldt. The masses of hot and humid air accompany the warmer waters, causing, among other effects, exceptional rains in the western coast of South America. Therefore, it is a seasonal climatic phenomenon of which the name is the translation of "the boy," originating from the fact that in the countries where the rains become more intense, baby Jesus is the symbol of the cool season.

In certain years, El Niño has a greater intensity than normal, causing an increase of more than 5º C in the temperature of the water in the Pacific Ocean. This warmer water produces a catastrophic destruction of the plankton, resulting in the mortality of the fish. It also causes torrential rains on the coasts of Ecuador and on the northern coast of Peru. An especially intense El Niño also causes an increase in cases of malaria in the amazon region, since the floods caused by this phenomenon increase the population's contact with contaminated water. It is estimated that the average interval between an El Niño of great intensity is 10 years.

In Brazil, the effects of El Niño annually result in a greater intensity of rains in the Southern, Southeastern, and Midwest regions. It is also believed that an El Niño of great intensity contributes to droughts in the Northeastern region. The state of São Paulo, being in a zone of transition between the driest region and the most humid region, presents a displacement in the effects of the El Niño, i.e. in the year following an El Niño of great or moderate intensity there is a higher incidence of rains than the average from prior seasons. An example of this can be noticed in the El Niño of 1997-1998, in which the rains were irregular in the summer.

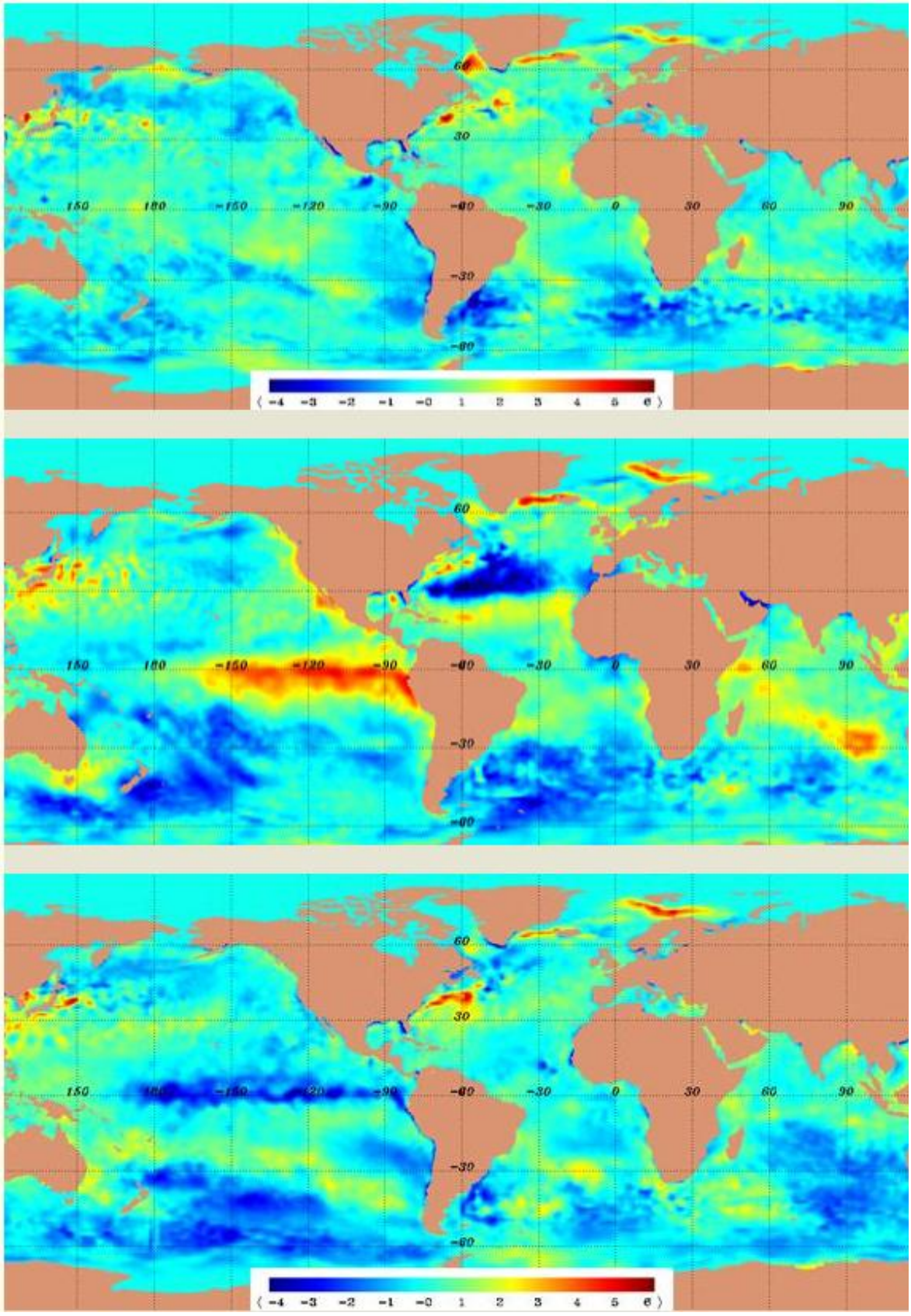
The more usual problems caused by the rains of the El Niño effect are floods and flooding. However, not all the consequences are negative. When it occurs, the phenomenon is responsible for the increase in production of the harvest in Rio Grande do Sul. The phenomenon also generates the decrease in the concentration of carbon dioxide (CO_2) in the atmosphere.

Like the El Niño effect, the La Niña effect alters the climatic conditions of part of the planet for a certain period of time. In large part, we can say that the El Niña phenomenon is the opposite of El Niño. While El Niño is characterized by a heating of the water of the South Pacific, La Niña is the result of a cooling of approximately 2° to 3º C of the waters of the Equatorial Pacific (Central and Eastern). Like El Niño, the intensity of La Niña may vary from year to year. Nevertheless, contrary to El Niño, which maintains a certain standard, La Niña occurrences present a variation in frequency and intensity.

In Brazil, the most evident effects of the La Niña phenomenon are diverse throughout the Brazilian territory. Among them is the decrease in precipitation during the periods between September and February, mainly in Rio Grande do Sul; the arrival of cold fronts at the Brazilian northeast and on the coast of Bahia, Sergipe, and Alagoas; abundant rain in the north and east of the Amazon, and above-average rains over the semi-arid northeast.

Specifically in Rio Grande do Sul, where El Niño generates an increase of the crop, the La Niña phenomenon generates a significant decrease of the harvest due to the decrease in the volume of rain. In the same region, the decrease in temperature is also a consequence of La Niña. To date, current reports confirm the occurrence of huge drops in temperature in 1955, 1965, 1975, 1988, 1996, and 1999/2000. Primarily in 1965, a strong snowstorm generated the equivalent of one and one-half meters of snow accumulated in the cities of the region.

Normal Sea Temperature, Temperature during El Niño and La Niña.



Note: Top: Normal sea surface temperature. Middle: Sea surface temperature during El Niño. Below: Temperature of the sea during La Niña.

Source: United States Navy (USN) Fleet Numerical Meteorology e Oceanography Center (FNMOC).

The Drought Polygon

The drought in the northeastern backlands is among Brazil's most serious natural catastrophes. For centuries, governments have tried to resolve it with limited success. There are records of programs aimed at combatting the drought in the Northeast that date back to the time of the Empire. Dom Pedro II, the second emperor of Brazil, ordered the construction of dams, among other acts, to decrease the effects of the drought, between the years 1877 and 1879.

The so-called "Drought Polygon" was created by a law in 1936, which defined the limits of a region in the Northeast that was periodically affected by drought, constituted by different geographical zones and with distinct aridity indexes. Its text was revised several times in the years following the law's creation. The most recent revision occurred in 2005, done by the Inter-Ministerial Working Group, which established the new Denomination of the Semi-Arid Brazilian region. The criteria of inclusion of the municipalities was modified and is now:

I. Average annual rainfall less than 800 millimeters;

II. Aridity index of up to 0.5 calculated by the water balance based upon the precipitation and potential evapotranspiration in the period between 1961 and 1990; and

III. Risk of a drought larger than 60%, based on the period between 1970 and 1990.

The total area is comprised by the state of Minas Gerais plus eight Northeastern States, where Maranhão is still an exception, regardless of having shown signs of drought in recent years. Currently, the polygon includes 1,348 municipalities and approximately 967 thousand square kilometers.

Studies indicate that this region has been expanding throughout the years. Among various factors that may be influencing this growth, the difference in the surface temperature of the waters of the North Atlantic, which are warmer, and of the South, which are cold, must be noted; and the displacement of the Inter-tropical Convergence Zone to the Northern Hemisphere in certain periods where they should remain in the South. Another factor that contributes significantly is the way humans are occupying the region, done by predatorial use of the land without regard for its depletion and excessive deforestation (mainly in areas near springs and rivers.)

The consequence of the combination of such factors is the change in the earth's peculiar characteristics, making it more fragile and sandy, the climate more arid, and transforming the landscape into an area with sparse vegetation, with desert like characteristics.

New Denomination of the Semi-Arid Region in Brazil (Drought Polygon), 2005

Source: Grupo de Trabalho Interministerial, Terra Brasis Re.

Analyses of the Brazilian Natural Catastrophes

As a first analysis of the catastrophes that occurred in Brazil, we researched the "Emergency Events Database (EM-DAT)." The EM-DAT was created in 1988 by the "Centre for Research on the Epidemiology of Disaster (OFDA)" of the "United States Agency for International Development (USAID.)" Currently, the databank is administered by the Université Catholique de Louvain, based in Brussels, Belgium.

The databank contains information on occurrences and effects of natural and technological disasters in the world, reported since 1900. The EM-DAT divides natural disasters into three types: geological risks (earthquakes, volcanic eruptions, land movements resulting from tectonic movements and tsunamis,) hydro-meteorological risks (flooding, droughts, storms, extreme temperatures, burnings, and land movements resulting from hydrological causes,) and biological risks (epidemics and insect infestations.)

A disaster is classified as any occurrence that causes 10 or more deaths, or affects 100 or more people, or a declaration of a state of emergency, or a request for international assistance. The data may be found on the site www.emdat.be.

We have some reservations with regard to the quality of the data from EM-DAT. For instance, most of the events listed do not present an economic impact. Furthermore, the data from 2011 seems to be incomplete. Nevertheless, this was the most comprehensive source found with a history dating back several decades. Thus, we believe it is valid to show the result of this work herein.

Natural Disasters in Brazilian Territory from 1982 to 2011

					average per event		
	# of Events	Fatalities	Total Affected	Damage ('000 US$)	Killed	Total Affected	Damage ('000 US$)
Flood	81	3,946	14,492,099	6,707,170.00	48.7	178,915	82,804.57
Mass movement wet	17	683	237,484	86,000.00	40.2	13,970	5,058.82
Epidemic	14	717	1,010,116	0.00	51.2	72,151	0.00
Drought	12	20	32,812,000	2,423,000.00	1.7	2,734,333	201,916.67
Storm	12	130	212,944	441,000.00	10.8	17,745	36,750.00
Extreme temperature	5	116	0	475,000.00	23.2	0	95,000.00
Wildfire	3	1	12,000	36,000.00	0.3	4,000	12,000.00
Earthquake (seismic activ	2	2	23,286	5,000.00	1.0	11,643	2,500.00
Insect infestation	1	0	2,000	0.00	0.0	2,000	0.00
Total	**147**	**5,615**	**48,801,929**	**10,173,170.00**	**38.2**	**331,986**	**69,205.24**

Source: EM-DAT, Terra Brasis Re.

The chart above summarizes the results of this databank regarding Brazil's past 30 years. During this period, 147 disasters were recorded, averaging almost 5 events per year. The number of fatal events reached 5,615 with more than 48 million people affected. This results in an average of 187 deaths and more than 1.6 million people affected yearly. The databank shows an economic loss of approximately US$ 10 billion for the period, an average of US$ 338 million per year. Nevertheless, we believe that such loss estimate is understated, since various events listed do not present data with regard to the economic losses.

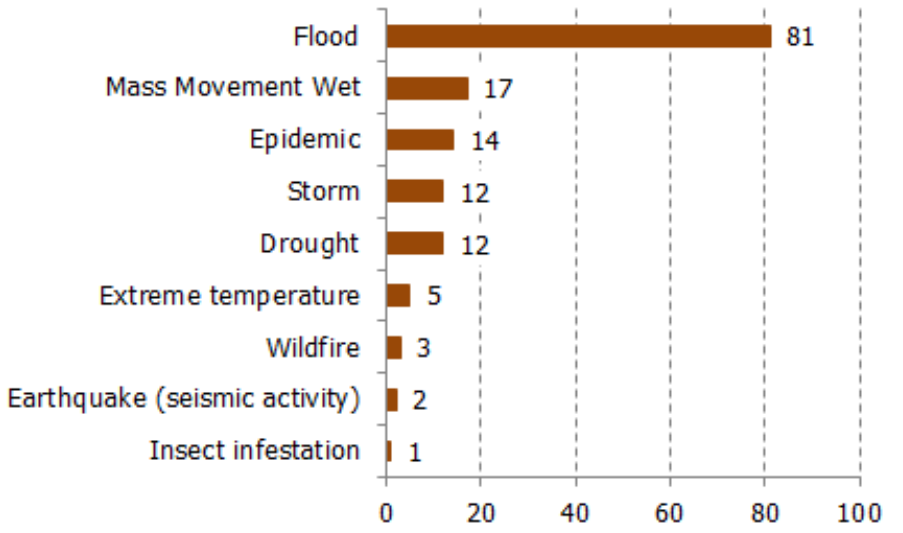
Summary of Natural Disasters in Brazil from 1982 to 2011

Number of Events	147
Number of Fatalities	5,615
Number of Affected People	48,801,929
Economic Damages (U$)	10,147,000,000.00
Annual Average of Events	4.9
Annual Average of Fatalities	187
Annual Average of Affected People	1,626,731
Annual Average of Economic Damages (U$)	338,233,333.33

Source: EM-DAT, Terra Brasis Re.

Among the disasters listed, floods are noted as being the most frequent events, representing 81 of the 147 events tallied, or 55% of the occurrences. Landslides, Epidemics, Storms, and Drought are also events that are represented in the chart of occurrences of Brazilian natural catastrophes, each representing between 8% and 12% of the total number of events. Brazil was also not immune to extreme temperatures, wildfires, earthquakes, and insect infestations. However, the occurrence of these types of events was relatively low in the last thirty years. The chart below illustrates this distribution.

Distribution of Natural Disasters in Brazil from 1982 to 2011

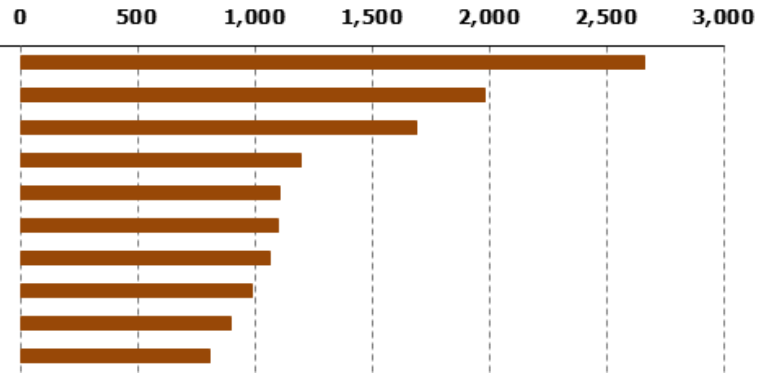


Source: EM-DAT, Terra Brasis Re.

In fact, floods in Brazil are not only frequent, but also have a significant impact, even on a global scale, especially with regard to loss of lives resulting from these events. The floods that occurred in Brazil in January 2011 are among the ten worst global floods in the last decade, in number of lives lost, as the following chart illustrates.

Largest Global Floods from 2003 to 2011 in Number of Fatalities

Country	Date	Fatalities
Haiti	23/mai/04	2,665
Pakistan	28/jul/10	1,985
China	29/mai/10	1,691
India	24/jul/05	1,200
Bangladesh	21/jul/07	1,110
India	03/jul/07	1,103
India	11/jun/08	1,063
India	07/2009	992
India	20/jun/04	900
Brazil	11/jan/11	806

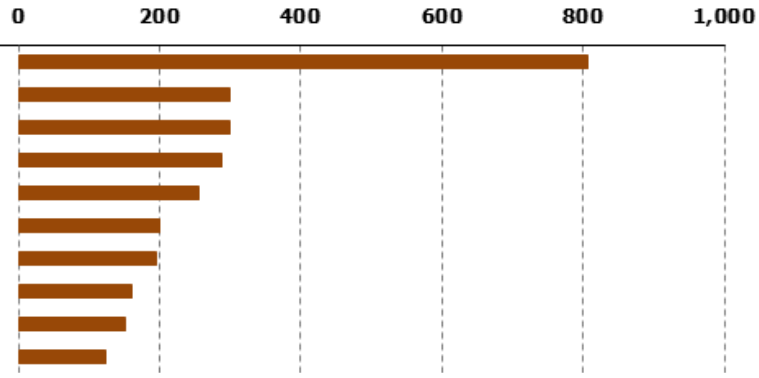


Source: EM-DAT, Terra Brasis Re.

Floods have been the most frequent disasters and have the largest impact with regard to the number of deaths in the last thirty years in Brazil, as the following chart illustrates.

Largest Events in Brazil from 1983 to 2011 in Number of Fatalities

Type	Date	Fatalities
Flood	01/11/2011	806
Epidemics	05/01/1984	300
Flood	06/10/1905	300
Flood	02/01/1988	289
Flood	04/04/2010	256
Flood	12/01/1984	200
Epidemics	04/01/1991	196
Flood	12/2003	161
Flood	11/22/2008	151
Epidemics	03/01/2008	123

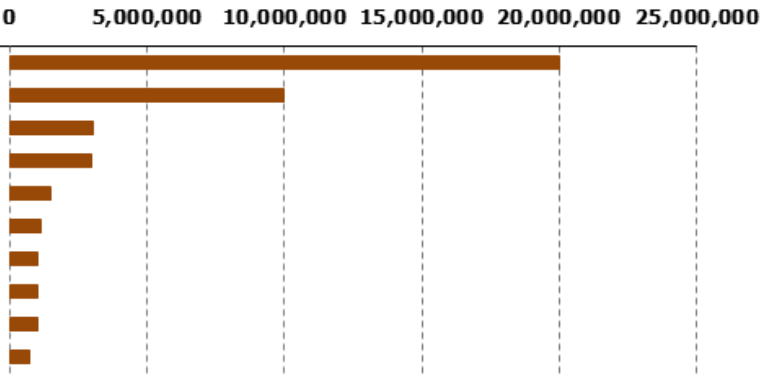


Source: EM-DAT, Terra Brasis Re.

Nevertheless, with regard to the number of lives affected, the large droughts are to be noticed, as shown below.

Largest Events in Brazil from 1983 to 2011 in Number of Lives Affected

Type	Date	People Affected
Drought	09/01/1983	20,000,000
Drought	04/01/1983	10,000,000
Flood	02/02/1998	3,020,734
Flood	01/01/1983	3,008,300
Flood	11/22/2008	1,500,015
Flood	04/22/2009	1,150,900
Drought	06/01/2001	1,000,000
Drought	10/2007	1,000,000
Flood	09/01/2011	1,000,000
Drought	06/01/1987	750,000

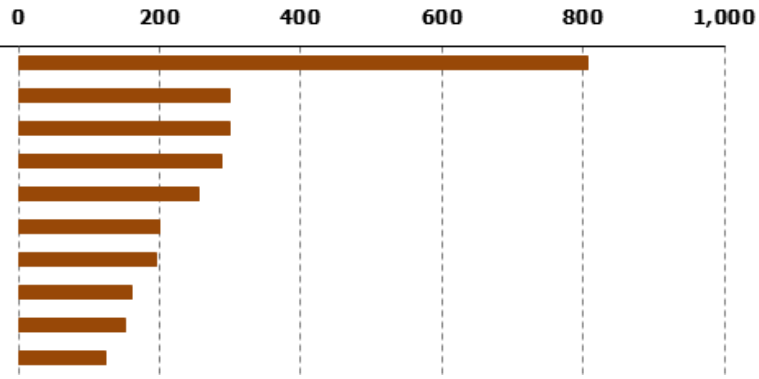


Source: EM-DAT, Terra Brasis Re.

With regard to economic impact, droughts, as well as floods, have significant values.

Largest Events in Brazil from 1983 to 2011 by Economic Losses, US$ millions.

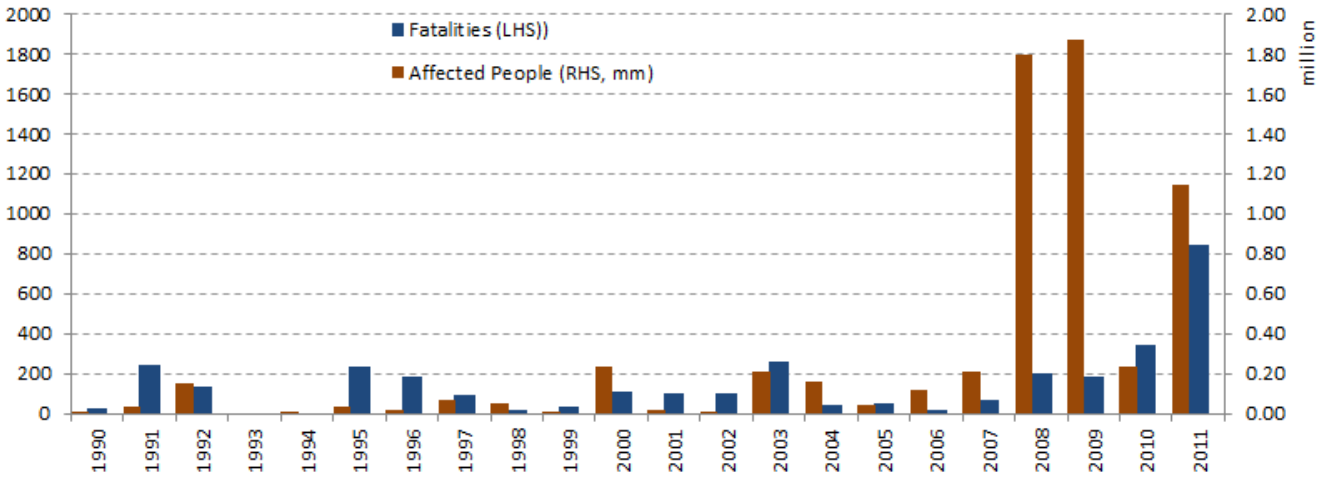
Type	Date	Economic Damage
Drought	12/01/2004	1,650,000
Flood	06/01/1984	1,000,000
Flood	06/01/1984	1,000,000
Flood	02/02/1988	1,000,000
Flood	11/22/2008	750,000
Drought	11/01/1985	651,000
Flood	06/19/2010	602,000
Flood	04/2009	550,000
Extr. temp.	06/24/1994	475,000
Storm	03/27/2004	350,000



Source: EM-DAT, Terra Brasis Re.

In order to allow for the analysis of the evolution of the catastrophic events in time, we preferred to look at all the events related to heavy rains. Therefore, priority was given to the combination of floods, landslides, and storms. In this manner, it is possible to analyze the effect of natural events caused by rainfall, separate from the effects of droughts, which, regardless of having distinct consequences, formed another large group of Brazilian disasters.

Number of Fatalities and Individuals Affected as a Result of Flooding, Storms, and Landslides.

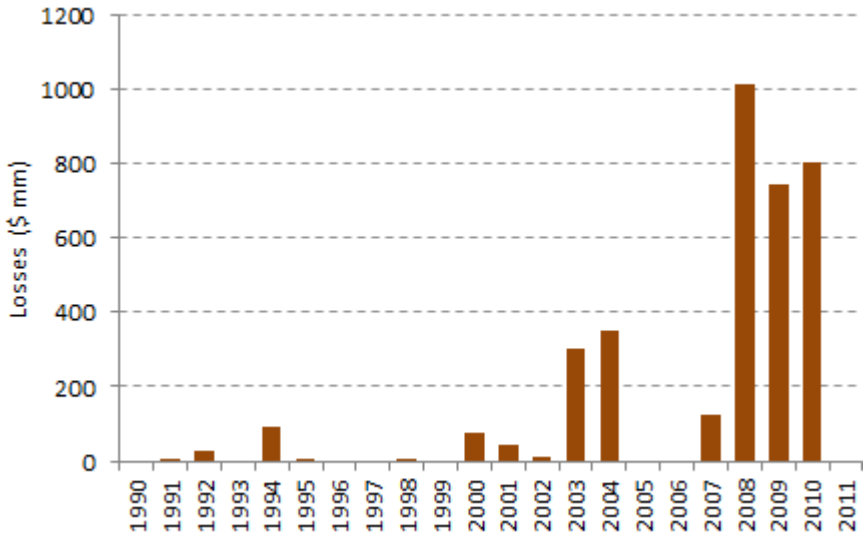


Source: EM-DAT, Terra Brasis Re.

As per the above graph, one can note that related impacts seem to be increasing with time. This may be explained not only by limitations in the collection of older data, but also by the rise in population growth, which occurs mostly in precarious areas that are exposed to risks.

The analysis below shows a growth tendency for losses resulting from floods, storms, and landslides. The databank still does not contain losses in reference to 2011, even though it is known that they were very significant and most likely higher than those in 2010.

Losses Resulting from Floods, Storms, and Landslides, US$



Source: EM-DAT, Terra Brasis Re.

In conclusion, the analysis of the data from EM-DAT demonstrates a clear tendency of a higher impact of catastrophes throughout the Brazilian territory, even considering possible limitations of this databank. It may also be concluded that flooding and droughts are consistently the catastrophes that have the largest impact in Brazil.

Situation of Emergency or Public Calamity

The systemic organization of civil defense in Brazil started with the creation of the National Civil Defense System (SINDEC), in 1988, reorganized in August 1993, and updated by Decree # 5.376, of February 2005.

Civil defense actions are articulated by the SINDEC bodies, under the coordination of the National Secretary of Civil Defense and the Ministry of National Integration, with the intention of reducing disasters, as follows:

I. disaster prevention;

II. preparation for emergencies and disasters;

III. disaster response; and

IV. reconstruction and recovery.

Situation of Emergency is defined as the recognition by the government of an abnormal condition, provoked by disasters, causing losses that can be overcome by the affected community.

State of Public Calamity is defined as the recognition by the government of an abnormal condition, provoked by disasters, causing serious losses to the affected community, including to the safety or life of those in the community.

Therefore, the analysis of the occurrences of emergency situations and states of public calamity provides valuable information about the Brazilian natural catastrophes. In one of its technical studies, the National Confederation of Municipalities (CNM) analyzed the evolution of the ordinances issued by the National Secretary of Civil Defense in detail[1].

The following charts show the distribution of these events for the period between 2003 and 2009. In the first chart, the first column on the left shows the classification of the events in accordance with the criteria of the National Secretary of Civil Defense, and the second column shows the classification according to the criteria of the EM-DAT databank. The second chart shows the same data, but reclassified according to the methodology used by EM-DAT. In this way, we tried to make the comparison of the EM-DAT data with those from the National Secretary of Civil Defense.

[1] Desastres Naturais no Brasil, Estudo Técnico/CNM – May 2010.

Ordinances of Emergency Situation and State of Public Calamity by region, 2003 to 2009.

Event	Event (EM-DAT)	Midwest	Northeastern	North	Southeast	Southern	Total	%
Earthquake	Earthquake	3	13	0	2	0	18	0%
Flood ("Alagamento")	Flood	6	10	1	8	25	50	0%
Extratropical Cyclone	Storm	0	0	0	0	67	67	1%
Landslide	Landslide	0	3	0	6	1	10	0%
Flood ("Enchente")	Flood	12	496	77	211	76	872	9%
Flood ("Enxurrada")	Flood	53	368	34	289	224	968	9%
Fluvial Erosion	Flood	3	2	8	3	0	16	0%
Drought ("Estiagem")	Drought	108	3144	92	650	1721	5715	56%
Hail	Storm	5	27	0	56	150	238	2%
Flood ("Inundação")	Flood	40	436	8	270	48	802	8%
Drought ("Seca")	Drought	0	650	14	57	169	890	9%
Windstorm	Storm	36	5	0	110	270	421	4%
Wildfire	Wildfire	1	1	11	2	0	15	0%
Other	Other	14	19	12	44	33	122	1%
Total:		**281**	**5174**	**257**	**1708**	**2784**	**10204**	**100%**

Event (EM-DAT)	Midwest	Northeastern	North	Southeast	Southern	Total	%
Flood	114	1312	128	781	373	2708	27%
Storm	41	32	0	166	487	726	7%
Landslide	0	3	0	6	1	10	0%
Drought	108	3794	106	707	1890	6605	65%
Wildfire	1	1	11	2	0	15	0%
Earthquake	3	13	0	2	0	18	0%
Other	14	19	12	44	33	122	1%
Total:	**281**	**5174**	**257**	**1708**	**2784**	**10204**	**100%**

Source: Defesa Civil, CNM, Terra Brasis Re.

It can be noted once more that droughts and floods constitute a large majority of the events recognized by the Civil Defense. Storms are the third most frequent type of event, though with a much lower level of occurrence than the first two.

It is worth remembering that to date, only the frequencies of different types of events were analyzed, not outlining their impact measured by number of fatalities, people affected, or by economic losses or insured losses.

Distribution of the Percentage of Ordinances referring to Emergency Situations and State of Public Calamity, period from 2003 to 2009.

Event	Midwest	Northeastern	North	Southeast	Southern	Total
Flood	4%	48%	5%	29%	14%	100%
Storm	6%	4%	0%	23%	67%	100%
Landslide	0%	30%	0%	60%	10%	100%
Drought	2%	57%	2%	11%	29%	100%
Wildfire	7%	7%	73%	13%	0%	100%
Earthquake	17%	72%	0%	11%	0%	100%
Other	11%	16%	10%	36%	27%	100%
Total:	**3%**	**51%**	**3%**	**17%**	**27%**	**100%**

Source: Defesa Civil, CNM, Terra Brasis Re.

The distribution of events per region, illustrated in the chart above, shows us that the Northeastern and Southern regions of Brazil are the most exposed, respectively accounting for 51% and 27% of the total number of occurrences. The Northeastern region in particular seems to be exposed to practically every

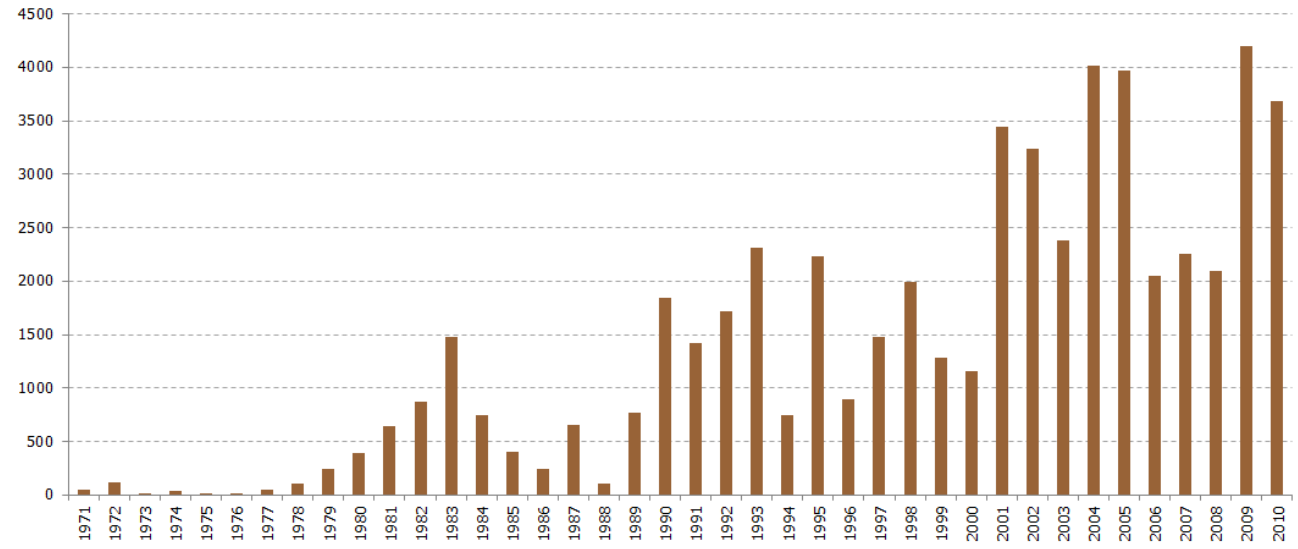
type of event. The large majority of the storms are concentrated in the Southern region, which is also exposed to drought. The Southeastern region, the most populated one, and with the highest GDP, is the most exposed to landslides as well as to floods. The Midwest and Northern regions seem relatively less exposed, though subject to events of drought and floods.

More recently, the National Secretary of Civil Defense, in partnership with the Government of the State of Santa Catarina and the Federal University of Santa Catarina, initiated a project called National Planning for Risk Management (PNGR). This project complements the data from States of Public Calamity and State of Emergency with the documents available at SEDEC and in the Official Gazette. In total, more than 50 thousand occurrences are being recorded.

Initially, during the 1940s, state and municipal ordinances were found; and news from newspapers as ways of reporting these events. In the following periods, decrees and some other documents show the occurrence of some events. Nevertheless, the recording of such cases effectively began to be made during the 1970s. However, even without a standard model, which was instituted only in 1999, with the implementation of the Preliminary Disaster Notification Module (NOPRED), used as an initial registry of the disaster and of the estimate of its intensity, and of the Loss Assessment Module (AVADAN), which records the intrinsic characteristics of the disaster, the area affected, loss of life, material and environmental loss, and of the economic and social losses.

From this databank, it was possible to construct the chart below. We named the collection of all the events identified by PNGR as "occurrence," whether being recorded from an AVADAN, from a NOPRED, a decree, or merely newspaper news.

Evolution of the Volume of "Occurrences" Recorded in Brazil



Source: Defesa Civil, Terra Brasis Re.

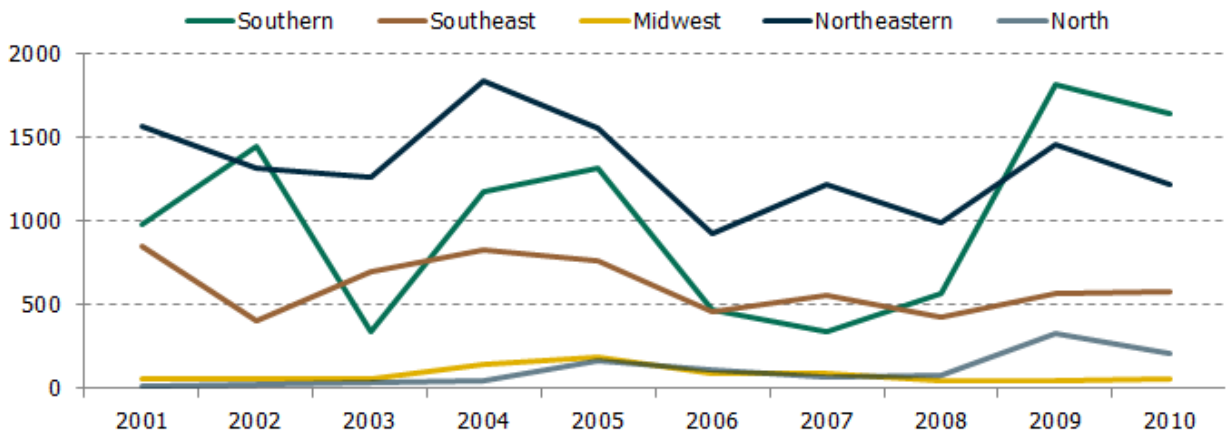
Analyzing the chart above, the lack of information is reflected in the initial periods, which may be explained by some factors, such as the non-recording of occurrences, their diversion, or loss.

It is also possible to perceive the amount of occurrences in relation to the years, which is directly linked to the man-Earth relationship. Therefore, its acts, whether directly or indirectly, affect the globe. Disorderly growth, generating the occupation of areas that, until then, had been uninhabited and considered risky, such as areas near rivers, hillsides, and sandy terrain; the over-emission of compositions in excess in the air resulting from combustion and other processes; and poor use of the land in general, are factors that keep accelerating this growth. The forecast indicates that the non-

reduction of these actions will give rise to an increase in the intensity and frequency of occurrences in these locations.

Still using the data from PNGR, the distribution of the occurrences among the Brazilian regions for the last decade was also analyzed. The result, shown below, does not clearly indicate any growth tendency. The Northern and Midwest regions are persistently regions of a low frequency of occurrences, while the Southern and Northeast regions are normally the number one leaders in occurrences.

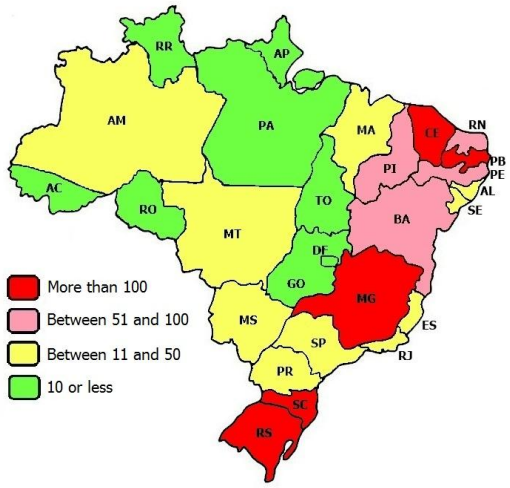
Distribution of "Occurrences" According to PNGR, 2001 to 2010.



Source: Defesa Civil, PNGR, Terra Brasis Re.

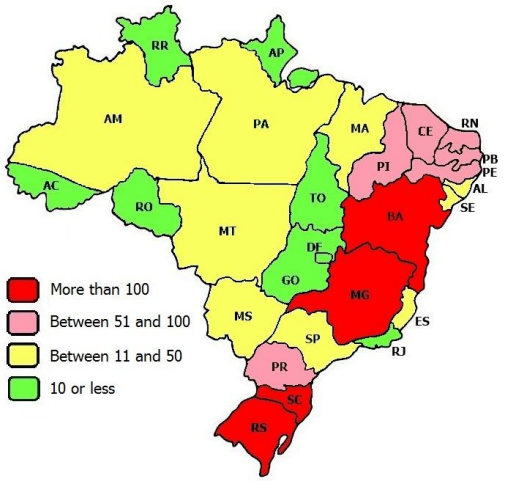
Finally, the map of Brazilian risks by state was plotted below. The map on the left side used data from the Civil Defense, which only includes declarations of Emergency Situations and States of Public Calamity and refer to the periods from 2003 to 2009. The map on the right shows data from PNGR that complements the declarations of Emergency Situations and States of Public Calamity with other documents, within a longer period, from 1971 to 2011.

Annual Average of Emergency Situation and Public Calamity, 2003 to 2009.



Source: Defesa Civil, CNM, Terra Brasis Re.

Annual Average of "Occurrences" According to PNGR, 1971 to 2011.



Source: Defesa Civil, PNGR, Terra Brasis Re.

The results of both maps are similar. The Southern and Northeastern regions appear as the ones most exposed to natural risks. It is important to emphasize once more that the analysis in question is only based on the frequency of occurrences and not on the socioeconomic impact of these events.

The recent floods in the State of Rio de Janeiro in 2011 are an example of how the impact of events even in regions considered relatively protected, can be devastating.

Government Spending with Prevention and Response

The annual costs incurred in the programs of "Disaster Prevention and Preparation" and "Disaster Response and Reconstruction" were developed by "Siga Brasil", an on-line system referring to the Government Budget (SIAFI/STN).

The table below lists the authorized amounts, the amounts allocated, and amounts paid for disaster prevention and disaster response. After a brief analysis, it is possible to notice that the expenses with disaster responses are significantly higher than the expenses with disaster prevention.

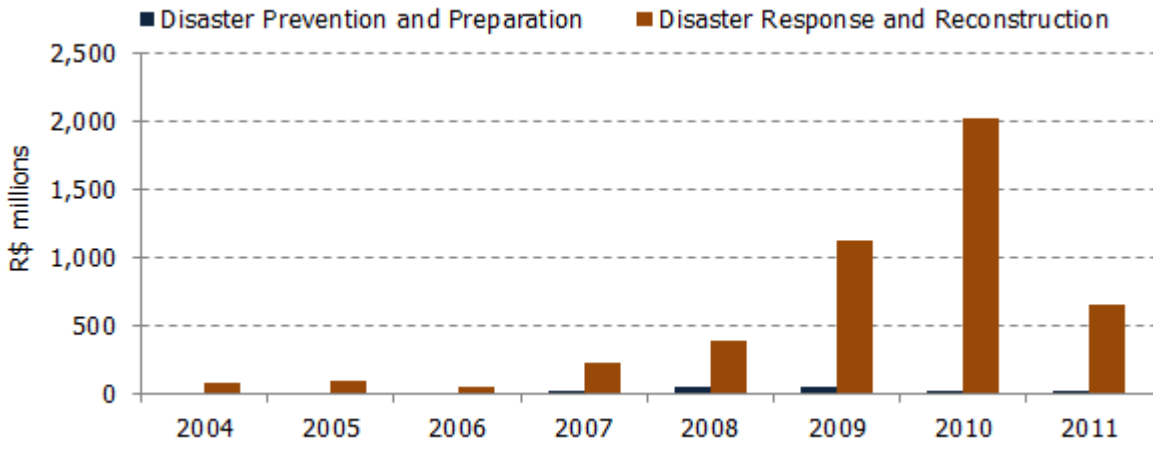
Government Spending with Disaster Prevention and Response Programs (R$):

	Disaster Prevention and Preparation			Disaster Response and Reconstruction		
	Authorized	Allocated	Paid	Authorized	Allocated	Paid
2004	129,154,000	47,626,217	9,849,463	129,956,152	90,064,537	77,266,376
2005	142,369,152	35,950,053	2,337,484	254,129,531	228,169,813	100,718,662
2006	110,359,456	43,858,600	8,105,099	254,547,109	181,296,298	51,354,926
2007	262,880,000	136,209,696	20,798,671	554,292,972	370,371,460	221,784,022
2008	616,509,214	318,765,382	57,455,027	1,168,716,740	727,453,319	388,230,399
2009	646,565,600	450,608,871	47,211,307	1,922,621,130	1,570,434,835	1,133,830,657
2010	425,000,603	280,357,009	18,316,047	3,045,399,483	2,896,440,065	2,028,023,997
2011	508,459,478	260,598,497	28,978,110	1,367,581,700	1,006,841,833	661,382,293

Source: Siga Brasil, Terra Brasis Re.

We can also notice that the maximum amount paid for disaster prevention occurred in 2008, reaching R$ 57 million. For 2011, the amount spent on disaster prevention was only R$ 28 million and represents approximately half of the amount spent in 2008. The amount spent on prevention is constantly less than those spent on disaster response. The larger difference between these amounts occurred in 2010 where R$ 2 billion were spent in response and only R$ 18 million in prevention.

Government Spending with Disaster Prevention and Response:



Source: Siga Brasil, Terra Brasis Re.

In the study previously mentioned, CNM also analyzes this data and states: "This immense difference between the amounts paid in prevention and in response clearly shows how little the government has been spending to prevent losses caused by natural disasters. The lack of investment in prevention directly relates to the increase in disaster response spending, which increasingly affects communities located in risk areas (in the case of rain) and increasingly causes losses to the municipalities that suffer with the intense drought. As already seen above, the natural event that affects the largest amount of municipalities in the country is the drought, a problem that causes losses that can be avoided with construction aimed for prevention."

Conclusion

This report intended to present data related to the evolution of catastrophic events in Brazil, as well as to interpret them. Despite the difficulties in obtaining the information and determining its reliability, it was possible to develop some concepts.

From the analysis of the data with a longer history, considering the lack of a registration standard in the first few years, one may perceive a considerable increase in the volume of catastrophes throughout the country. The databank provided by the National Civil Defense confirms such conclusion and allows for better data resolution, enabling an analysis by natural catastrophe. From there, we may understand the distribution of the most common events in the country: floods and droughts.

Considering their growing number of occurrences, we may conclude that their resulting human and economic losses are as relevant to the country as earthquakes and hurricanes are to developed countries. In this same aspect, this report also listed incidents of the same magnitude in Brazil, like Catarina and certain tornadoes, which may be considered catastrophic, given that Brazil does not have an adequate investment plan in prevention.

Among the many reasons that may explain the increase of natural catastrophes, besides human action much can be attributed to the climate effects El Niño and La Niña. Such phenomena have annual occurrences with varied intensity and result in increasing costs related to post-disaster reconstruction.

Finally, being aware of the distribution of catastrophes and the prospects of their evolution, one can note that Brazil is immature in all aspects related to natural catastrophes and primarily their prevention. The Brazilian insurance market is still inexperienced in this area. For this reason, the risk of natural catastrophe is usually excluded from the majority of insurance contracts. This may be attributed to the lack of information about such events and the shortage of reliable data, thus the financial losses and insured values are not covered in this report.

Terra Brasis Re has been conducting studies, research, and creating partnerships in this field, with the intention of obtaining and sharing knowledge that can encourage advances in the (re)insurance market. This is a first report, which raised basic concepts about the subject, in order to generate more detailed analyses in the future. The next issue shall include analyses made based on financial values and their impact on the Brazilian insurance and reinsurance sectors.

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