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**By Dra. Maria S. M. Kavanagh**

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# **VOLCANO ERUPTION PUYEHUE 2011**



## **Prologue**

The Republic of Chile, is located in the South American continent, has the largest economy in Latin America and the highest income level in the region. But despite its strengths, there is an area in which the South American nation, it seems most unfortunate of the continent: natural disasters. In the last two years, the country suffered a devastating earthquake and a huge tsunami. Less than a year and a half of the earthquake February 27, 2010, the Puyehue volcano is part of the Puyehue-Cordón Volcanic Complex Caulle, erupted affecting the region in general and in particular the provinces of Black River, Neuquén and Chubut in Argentina. The ash cloud affected rural areas including the flora and fauna, tourist areas and the cities themselves, causing a high impact on the environment, which will give rise to claims of the affected insurers and presents us with a debate: What will be the task of judge before a legal structure that precedes the traditional systems of law and the challenge of defending the environment in Argentina? In light of the environmental reality of Argentina, lacking statistics on major natural disasters, the insurance market does not have a normative basis, which is why it is difficult to move forward in pursuing a wide coverage in the particular matter at occupies.

## **Summary**

This research work aims to raise awareness of the consequences caused to the environment in Argentina, the eruption of Cordón Caulle Puyehue, Chile. The report refers to the geographic location of Puyehue volcano, geological history and the history of eruptions that records the same. On the other hand, deals with the eruption of June 4, 2011, the effects of volcanic ash on the flora, fauna and water sources in different provinces. At the same time points out the role of the State before the emergency disaster measures in taxation and tax. Involvement in the tourism industry and air communications and the response of insurance claims against the victims. Finally, an appendix of photos and a schematic figures.

## **Acronyms**

**CSJN** Supreme Court of the Nation

**CVPCC** Puyehue-Cordón Volcanic Complex Caulle

**MSNM** Meters above sea level

**PNUMA** Programme United Nations Environment

**OCHOA** United Nations Office for the Coordination of Humanitarian from  
Argentina

## VOLCANO ERUPTION PUYEHUE

Puyehue Volcano is an active volcano that is part of the sixty active volcanoes in the Republic of Chile, is characterized by the type and cone collapsed stratovolcano, of 2240 meters, located in the Andes, between the Los Ríos Region and Lakes Region, specifically the international border crossing north of Cardinal Samore, on the eastern edge of the Puyehue National Park. Its geographical coordinates are 35° 0' S, 72° 5' 0" W.

Puyehue volcano is next to the Cordón Caulle (Mapudungun: Kaulle, 'Gaviota Cahuil')? And Nevada Mountains, a volcanic system in a northwest-southeast known as volcanology Puyehue-Cordón Volcanic Complex Caulle (abbreviated CVPCC).



The Republic of Chile has some 3,000 volcanoes, of which 500 are active and 60 are recent eruptive records.



**Puyehue-Cordón Volcanic Complex Caulle**

### **Geological History**

The volcanic complex includes the Puyehue and Cordón Caulle. Sierra Nevada has a long history of activity ranging from 300,000 years ago until the present. The oldest parts of the Cordillera Nevada caldera and volcano activity Mencheca reflect even older Pliocene or early years of the last Pleistocene. In 300,000 years there have been a number of changes in magma composition, the locus of volcanic activity, output rates of magma and eruptive styles.



## Recorded eruption of Puyehue - Cord Caulle

| YEAR | DATE        | NOTE   |
|------|-------------|--|
| 1759 | -----       | It is believed that an eruption had Puyehue-Cordon   |
| 1893 | -----       | It is believed that an eruption had Puyehue-Cordon   |
| 1905 | -----       | had a rash the Puyehue-Cordon  |
| 1914 | February 8  | had a rash the Puyehue-Cordon  |
| 1919 | -----       | It erupted until 1920  |
| 1921 | December 13 | had an eruption plume subplinaria a 6.2 km periodic explosions and seismicity. had an eruption plume subplinaria a 6.2 km periodic explosions and seismicity. The eruption ended in January of 1922.                     |
| 1929 | January 7   | an erupción occurred   |
| 1934 | March 6     | There was a erupción   |
| 1960 | May 24      | Following the earthquake in Valdivia in 1960, whose Main impact was on 22 May 1960<br>The Cord Caulle began to erupt throughout southern flank.  |
| 1990 | -----       | It is believed that a small volcanic cone formed The Lace-Caulle.  |
| 2011 | June 4      | The June 4, 2011, began a new process So eruption after an average of 230 Earthquakes per hour of which 12 events present Taron magnitudes greater than 4.0 degrees on the Richter scale and 50 events greater than 3.0. |

## Los volcanes de Chile

Chile tiene unos 3.000 volcanes, 500 son activos y 60 tienen registros eruptivos recientes

En erupción desde:  
1 de junio, 2011

**Volcán Puyehue**  
Altitud: 2.240 msnm  
Ultima erupción: 1960



### Puyehue volcano eruption of 2011 Puyehue volcano

Began with an emission of ash on June 3, 2011, it was a moderate eruption, but as of June 4 of that year the cloud exceeded 10,000 feet, with a shift to the east, reaching several cities in Argentina. The alert status was shared with countries suspension of educational activities. The situation of Puyehue volcano, is not comparable to the event Grinsvötn Icelandic volcano, because the plates away from each other, while the Chilean volcano plates were rammed each other causing the phenomenon of subduction. The fractures generated by rearranging panels capable of providing an expeditious way to magmas that rise to sites very close to the surface, where it can release other emissions such as gas and ash. <sup>1</sup>

The eruption of Puyehue volcanic complex - Lanyard Caulle equivalent to seventy bombs or two percent of global electric power, according to a study by three physicists at the University of Black River. . Investigators said they did this study from the perspective that had been applied Enrico Fermi (1901-1954) Italian physicist known. It is estimated that the volcano expelled one hundred million tons of ash, sand and pumice. <sup>2</sup>

<sup>1</sup> Graciela Arguello Geóloga

<sup>2</sup> www.lapatriaenlinea.com

The scholars mentioned, hypothesized that the area covered by the material ejected by the volcano is about 1,700 square kilometers with an average thickness of four inches.



**Puyehue-Cordón Complex Volcanic eruption Caulle June 4, 2011**

Puyehue volcano's eruption forced the evacuation of 3,500 people in Chile and caused a rain of ashes in the Patagonian town of Bariloche Black River Province, located 100 km east of the volcano. The blanket of ash prevented the departure of aircraft from the airport of Bariloche and the recommendation for the population to refrain from leaving their homes. The Ministry of Agriculture declared an agricultural emergency in the provinces of Chubut, Neuquén River and Black with a time of emergency for a period of one year.



**Sheep in the province of Neuquen affected by volcanic ash**

It is noteworthy that most of the affected territory had been four years of drought emergency and that in these cases the combination with ash fall compounded the picture.

The most affected areas are the western province of Black River and West South Central province of Neuquén, understanding the ecological areas of the Cordillera, Precordillera, Sierras, West Highlands, Central Plateau and Mount Austral.  
Neuquén Province

### **Lakes Department**

The impact of the ash layer in this region is very serious, covering 90% of available forage in the area closer to the mountains and 50% to the area of the steppe to the east. The impact on cattle, sheep and horses, predominantly to a lesser extent goats are considered very serious. Sheep are most affected by not having access to natural forage source and have a thick wet layer of ash between the fibers of wool, which greatly increases the weight, which causes the "flip" of animals and death is imminent. On the other hand, Equine forage rejects dirty, like the sheep are very concerned. Cattle are displayed at the time of the survey prostrate and try to move north in search of forage.

The impact on water sources, is also considered very serious, as the water of rivers and streams with particles in suspension and the animals are eating the only option.

### **Department Lácar**

The impact of ash in this area is characterized by being very serious, ash fall has covered 90% of the available forage.

With regard to cattle, sheep, goats and horses, the degree of impairment is similar to that described above in the department.

## Departments Aluminé Huiliches and south of Catan Lil

These departments were hit by the ash cloud irregularly and the situation with the department as an indicator Los Lagos is mild.

In this area due to low rainfall there is a lot of ash in suspension. The region's lack of visibility forced the suspension of traffic at night.

Black River Province

## Departments of May 25, Picalniyue and Ñorquinco

The impact of ash fall on natural forage sources was determined to be serious - very serious, as well as on livestock and water sources.



Moreover, the affected area was already compromised by a dry box Department July 9 and El Cuy. Ecological areas of southern Central Plateau and Mount In this area the impact of ash was lower. The producers have chosen to confine animals at night and give fodder. There is a high incidence of eye problems related to the dust.

Chemical characterization of ash The material analyzed samples of volcanic ash from the eruption of Puyehue presented a mildly acidic to neutral pH with a low electrical conductivity of suspension. The effects of ash on livestock systems

**Aguadas:** ashes according to density and particle size can seriously affect water supplies, being more vulnerable still water (embankments, ponds, Menucos, pools, fountains) that streams or rivers.

**Grasslands:** The ashes as they accumulate in significant quantities, more than 15 cm. End up covering the grass, preventing access to the source animal fodder. In the case

of sheep forage rejects saturated ash. Livestock: Cattle are affected with diseases of the respiratory tract and mucous membranes eye, the latter decreases vision or total loss of it. Furthermore the ash penetrate the fleece of sheep reached a considerable weight if they get wet due to the rain, if the animal is weakened by lack of fodder and water, this weight can "flip" the animal unable to walk. In this case, death is imminent. The total number of producers with different degrees of involvement in 2500 is estimated producers. The worst affected area, observed between 7 and 10 cm of ash, talc-like particles. As a result of ash fall killed 600,000 sheep, leading to a loss of EUR 31,000,000 .-

### **Role of the State**

The Ministry of Agriculture declared a state of emergency and / or agricultural disaster through Resolution **457/2011** in the province of Chubut, it states that the rash caused by the volcanic chain in Puyehue-Cordón Caulle Republic of Chile will affect farms located in the Departments of Gastre, Telsen and Martyrs.

The opinion states, the emergency period from 1 June 2011 to June 7, 2012.

The affected producers may be eligible for the benefits agreed to **Law No. 26,509**, presenting a certificate issued by the competent authority of the province, stating that their farms or farms are included where provided.

Moreover, national banking institutions, officers or mixed, and the Federal Administration of Public Revenue (AFIP), the necessary means to agricultural producers within the resolution, have the standard benefits under **No. 26,509**.

At the same time, Resolution **449/2011**, declared an agricultural emergency in the province of Black River by the eruption of Puyehue in Chile, producing pyroclastic material affected livestock production.

The standard rule from the June 8, 2011 to June 7, 2012.

By Resolution 450/2011 was declared a state of agricultural emergency in the Province of Neuquén, for those farms affected by the accumulation of volcanic sand.

### **Measures in Fiscal**

The Federal Public Revenue Administration, through General Resolution **3148**, provides tax benefits relating to cancellation of tax and social security obligations.

The rule applies to manufacturing, wholesale and retail trade, repair of vehicles, hospitality services and personal and household goods and services directly related to tourism.

### **Measures on taxation**

The tribute for the Property Tax shall be exempt from payment for the unexpired period of 2011, all the properties located in the Department of the Lakes, it excludes the resolution to rural properties and subrurales not register or use productive activity industrial trade, tourism and services.

The property located in the Department of Lacar has a fee waiver to the 25% tax.

### **Mortgage Foreclosures pledge and**

The rule suspended for the term of this urgency judgments of law - enforcement of tax debts, which are pending before the courts based in the Department of Lagos.

### **Provincial Emergency Fund**

The measure provides for the establishment of a Provincial Emergency Fund with the following resources:

The funds are incorporated into the general budget of the Provincial Administration. The contributions that eventually made the National Government. The contributions from donations, legacies and other contributions. Funds from the efforts authorized by Article 23-empowers the Provincial Executive to request the Executive Branch or multilateral lending agencies, an amount up to \$ 50 million to solve environmental issues and cleaning in general

### **Black Rio Province**

The legislature of the Province of Black River, by Act 4665, declaring the disaster area within the quadrangle formed by the parallels 40 ° 30 'and 42 ° and meridians 37 and 71 within one year.

On the other hand declares a state of economic emergency and Tourism, for the same period of time department Pilcaniyeu Bariloche and the province of Black River.



## **Tourist Industry**

The report was prepared by the following entities Chamber of Commerce, Hotel and Restaurant Association, the College of Architects, the Provincial Council of Surveying, Geology and Engineering, House Builders and the Association of Auctioneers who make up the table arrangements for the sustainability of Villa La Angostura. These agencies estimated that tourism revenues in the absence of the environmental disaster should have been 43 to 44 million euros per year. Moreover, in the construction area had made a profit of about 23 to 25 million euros per year. The annual event will lose approximately 33 million Euros, 900 companies and 3,500 jobs are at high risk of loss



**Artisan Walk-Villa La Angostura, Neuquén - Argentina**



## **Air communications**

The eruption of the Puyehue-Cordón volcanic chain Caulle caused the cancellation of flights in Argentina, estimating the airline a loss of approximately 42 million Euros, with 2500 flights canceled and the continued inconvenience to thousands of passengers. The situation caused by the volcano prevented the sale of 28 million Euros for what they had projected Aerolíneas Argentinas and Austral. The ash caused the closure of more than 6 airports in Argentina. For its part, the Chilean airline LAN, estimated a loss of 14 million euros in the winter season. The ash cloud spread to the Republic of Uruguay, causing flight cancellations. While Australian Qantas Airways airline had to cancel 22 flights between New Zealand and Tasmania, and 8 flights over the territory of the South Island of New Zealand.



**Airport San Carlos de Bariloche, Argentina**

## **Insurance Companies**

Most insurance companies provide for the damage caused by volcanic ash covering all risks of Motor Vehicles, while in the risk of Combined Family Comprehensive Trade as the risk is excluded.

The largest insurance, covering claims as a result of volcanic ash in relation to risk of

railcars since the volcanic eruption is included within the scope of damage. Moreover, the insurer Allianz Argentina, in solidarity with the tragedy suffered made a donation of 18,000 Euros to assist those affected by the ash. At the same time, Allianz Argentina will help meet the need for supplementary feeding of pregnant ewes to successfully reach the month of August, when many of them give birth to lambs that are the future of productive activity in the area

With regard to environmental law in Argentina, the Courts have begun to analyze the environmental issues that have been submitted to it, there is a lot of failures to reject the income share of them, when analyzing the legitimacy . But from the reform of the Magna Carta in the year 1994, the provincial courts and the same Supreme Court's Office (SCJ) have been more open to admit a broader legitimacy. On June 16, 2004, the Court of 1st Instance Administrative San Nicolas Carrasco, Juan A. and others v. Lower Paraná Puerto delegation, Provincial Directorate of Port Activities and others. Law 2005 B, 836, suspended as a precautionary measure in a project that began to run despite the lack of environmental impact statement - in the case, construction of bulk storage cells in port-At first, took place part of the injunction aimed to halt the construction of cells for bulk storage in port areas, whose implementation had been initiated without a declaration of environmental impact.

## **European Union**

The European Union sent experts in geology and environmental pollution in southern Argentina to assess the risks of the eruption of Puyehue, Chile. The assessment was led by the European Joint Environment Unit of the United Nations Programme for Environment (UNEP) and United Nations Office for the Coordination of Humanitarian Affairs of Argentina (Ochoa). The UN Mission conmemoración worked closely with the civil protection services and provided technical advice for the immediate alleviation and prevention measures. The team of experts analyzed the immediate risks to the health of people because of volcanic ash and gases emitted

## **Conclusion**

The eruption of Puyehue, Chile has resulted in both Chile and Argentina, financial losses have outstripped the forecasts that insurers and reinsurers handle, putting the industry on alert.

The direct consequence will result in increased costs for all types of coverage, this is due to the nature of business implies a distribution of risk throughout the system. Argentine insurance market, regulatory and meaningless statistical experience in major disasters, for that reason it is impossible to advance in the pursuit of broad coverage in the matter at hand.

In this sense, the experience abroad can be more substantial and meritorious, modeled on the Spanish market, if it assumes that insurance is a tool of a financial nature. We are facing a "good" that belongs to the social and trans. The legally protected interest has been clearly identified by our Constitution in Article 41 and the General Environmental Law in Article 1.

The challenge now is the correspondence of the instrumental, bound for the performative efficacy of Rights, especially the fundamental. Currently, the Environmental Law in our country suffers from rickets efficiency, therefore, the priority is to provide legal instruments for legal operators through them, to overcome the obstacles to the development and consolidation of environmental issues, in the relentless pursuit of prevention of environmental damage. We need to court decisions, rulings are effective and contain clear provisions on specific mechanisms to track the execution of the sentence. Today it is necessary to modify the profile of the judge in terms of environmental development, the judge's task is more arduous, as it should go to a prima facie legal structure that precedes the traditional legal systems and local positive law itself. Thus judges have before it a challenge disturbing. Is that environmental protection requires the active participation of the judiciary.

Precautionary measures are perhaps the most important procedural tool has acquired under the environmental legislation and the new roles that the figure of the judge. Modern procedural law points to the need of a quick but temporary and revisable and hence the high significance of emergency measures.

However, it should be clear that in adopting such measures, the judge must always be cautious, especially if the injunction through the court is to anticipate the declaration of unconstitutionality of laws.

## **Glossary**

### **Catastrophe bonds**

Catastrophe bonds have been issued mainly for insurance companies in order to spread risks and enter into insurance contracts that would have been too risky at the margin in the absence of such a mechanism. In the event of a catastrophe occurs, the insurance company can either not pay the principal of the bond or interest, by providing the resources necessary to make payment to the agent affected by the disaster, mainly for reconstruction.

### **Collapsed cone**

They are built from particles and drops of congealed lava ejected from a single opening. As the gas-charged lava is blown violently into the air, it breaks into small fragments that solidify and fall as cinders around the vent to form a circular or oval cone.

### **Stratovolcano**

It is a kind of conical volcano and high altitude, composed of multiple layers of hardened lava, alternating pyroclastic and volcanic ash.

### **Magma**

Molten rock formed beneath the surface of a planet. It has fluid behavior and can be moved below the layers of bark

### **Subduction**

Slip the edge of a plate of Earth's crust under the edge of another.

### **Proclastics**

Related to clastic rock material (broken and fragmented) formed by a volcanic

explosion or aerial expulsion from a volcanic hole

## Annex I

### Photos















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