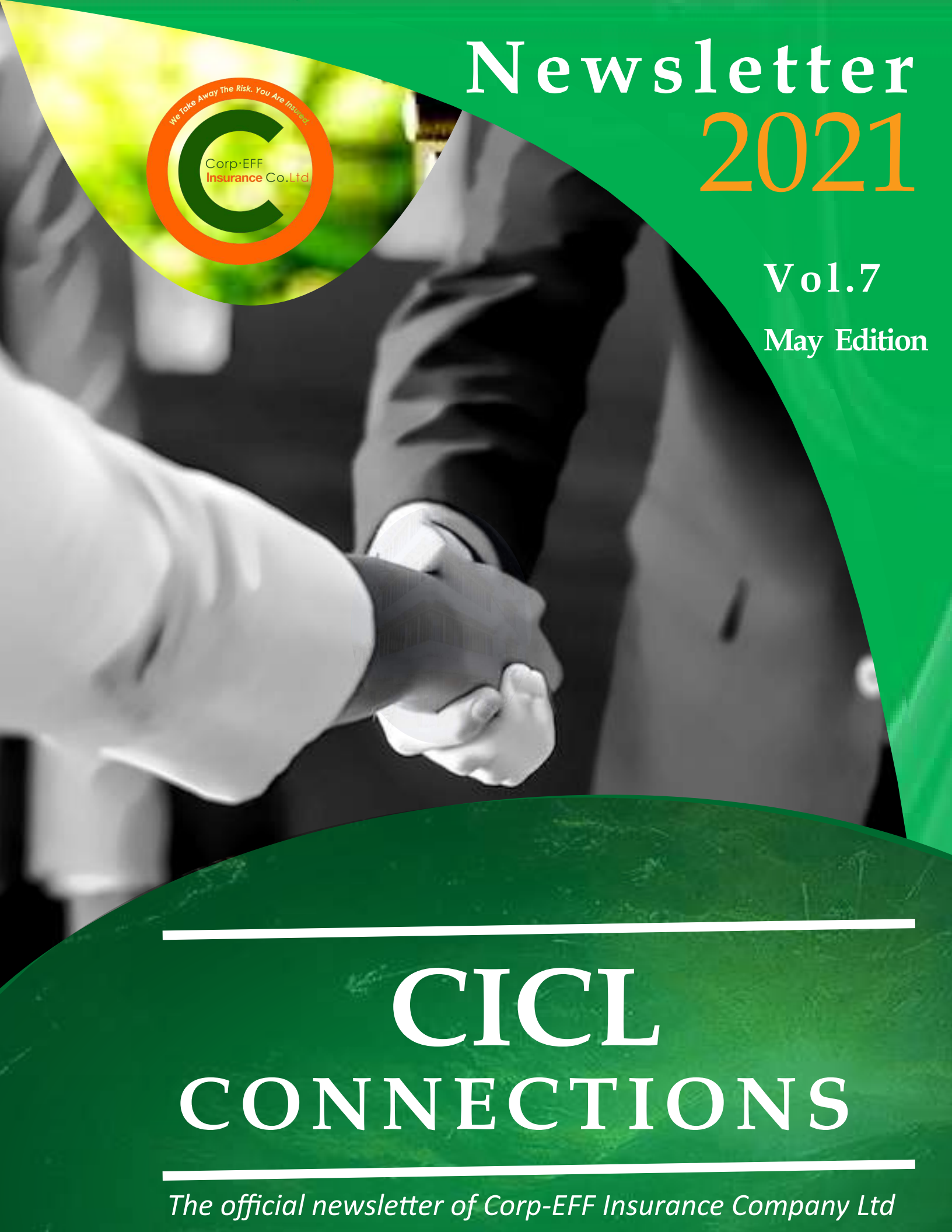

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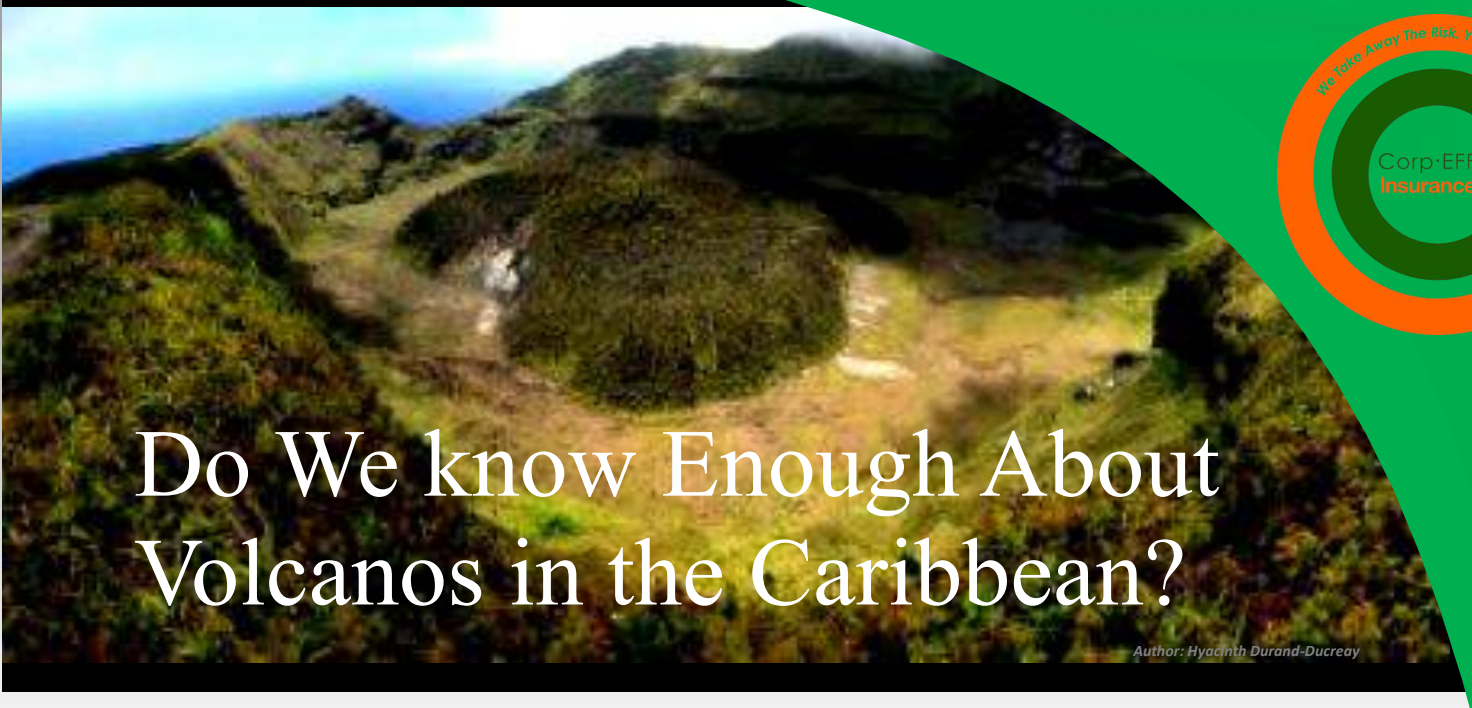


Do We know Enough About Volcanos in the Caribbean?

Author: Hyacinth Durand-Ducreay

In view of the recent volcanic eruption in St. Vincent, you may be thinking, "What do I know about volcanoes?" A more pressing question is, "Do we know enough as a Region about Caribbean Volcanoes and how are we tackling these issues?" In this article, we will attempt to enlighten you on the subject.

What are volcanoes?

Volcanoes are vents or openings in the Earth's crust through which, hot, molten rock (called magma) and gases from the interior of the Earth are released.

What volcano eruptions mean collectively is the outgassing of the interior of the Earth which brings a lot of CO2 and water to the surface; those are the two things that modulate our atmosphere and temperature patterns. If we did not have water vapour and CO2 in our atmosphere, if we did not have the greenhouse effect, we would not be able to live on this planet. That atmosphere is provided by volcanism.

There are about 1,500 potentially active volcanoes worldwide, aside from the continuous belts of volcanoes on the ocean floor at spreading centers like the Mid-Atlantic Ridge.

About 500 of those 1,500 volcanoes have erupted in historical time. Many of those are located along the Pacific Rim in what is known as the "Ring of Fire." In the United States, volcanoes in the Cascade Range and Alaska (Aleutian volcanic chain) are part of the Ring, while Hawaiian volcanoes form over a 'hot spot' near the center of the Ring.

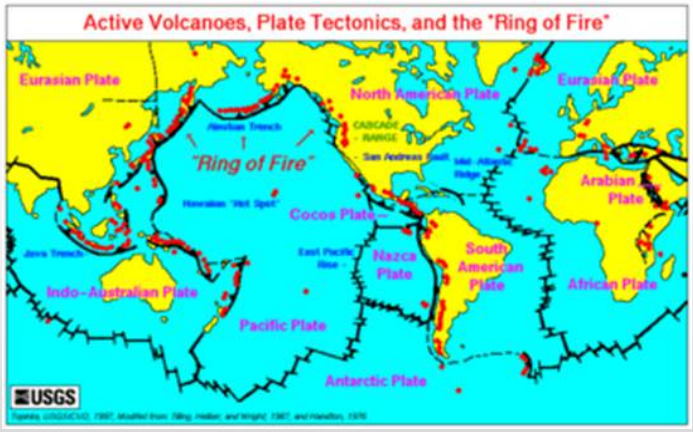
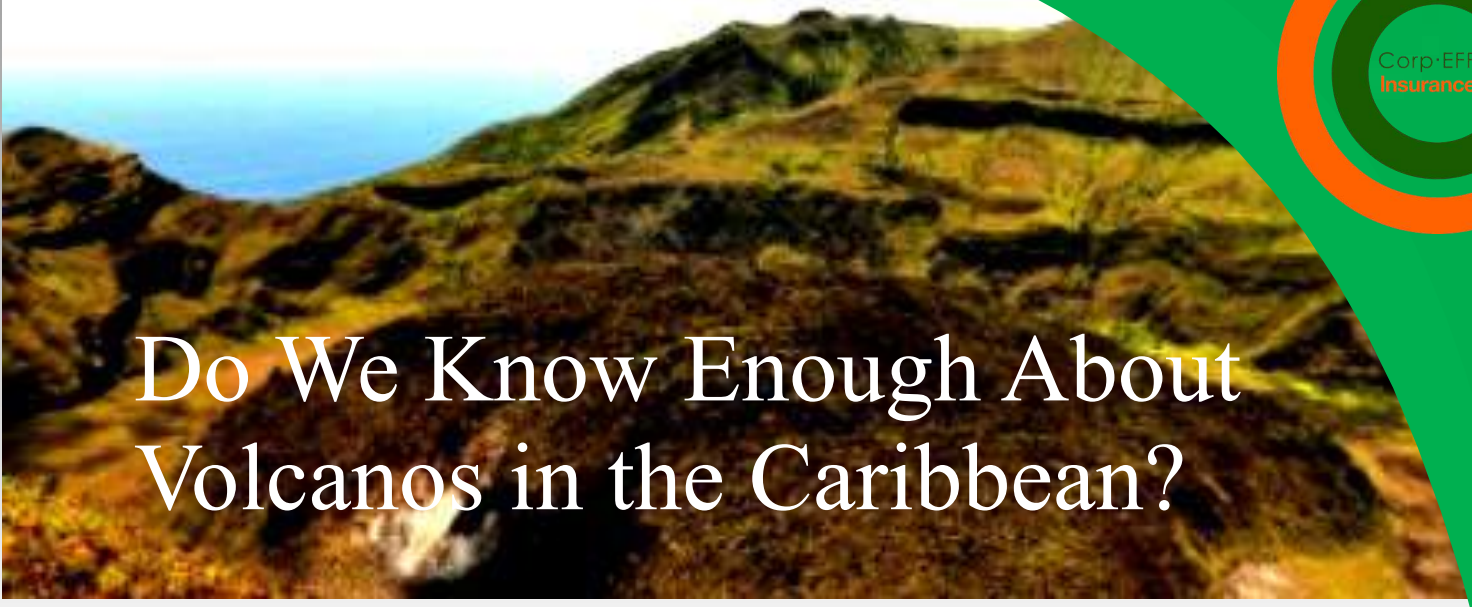


Figure 1 Ring of Fire

The volcanic islands of the Lesser Antilles Volcanic Arc, which stretch from the Virgin Islands in the north to the islands off the coast of Venezuela in the south, were created by the sideways and downward displacement of the edge of a plate of the earth's crust into the mantle underneath another plate, known as "Subduction."



Do We Know Enough About Volcanos in the Caribbean?

There are 19 active volcanoes along this border, including the Soufriere Hills on Montserrat, Mount Pelée on Martinique, La Grande Soufriere on Guadeloupe, Soufriere Saint Vincent on Saint Vincent, and the submarine volcano Kick 'em Jenny about 10 kilometers north of Grenada and 9 in Dominica.

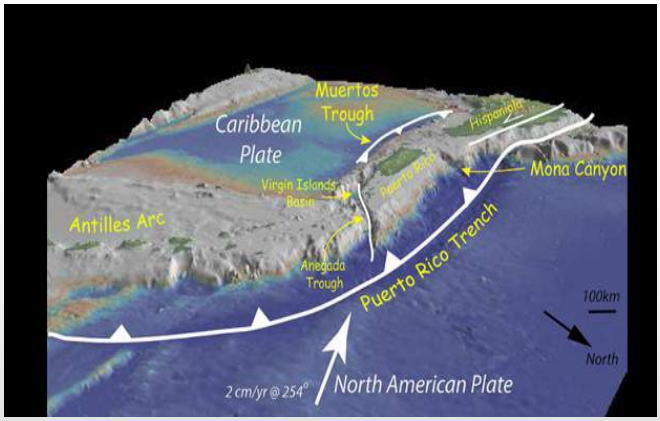


Figure 2 Caribbean Belt

There are 169 potentially active volcanoes in the United States with more than 50 volcanic eruptions in the past 31 years. While there are 19 'live' (likely to erupt again) volcanoes in the Eastern Caribbean. Volcanic eruptions pose a direct threat to every island from Grenada to Saba. 'Live' volcanic centers can be found on the islands of Grenada, St. Vincent, St. Lucia, Martinique, Dominica, Guadeloupe, Montserrat, St. Kitts, Nevis, St. Eustatius, and Saba. While the island of Dominica has the most live centers, the Volcano on the island of St. Vincent has had the most repeated explosions in the last 300 years of records.

Other islands such as Anguilla, Antigua, Barbuda, Barbados, British Virgin Islands, most of the Grenadines, and Trinidad & Tobago (which are not volcanic) are at risk due to their proximity to volcanic islands. They are subject to volcanic hazards such as severe ash-fall and volcanically-generated tsunamis. The map below refers to the active volcanos in the United States.

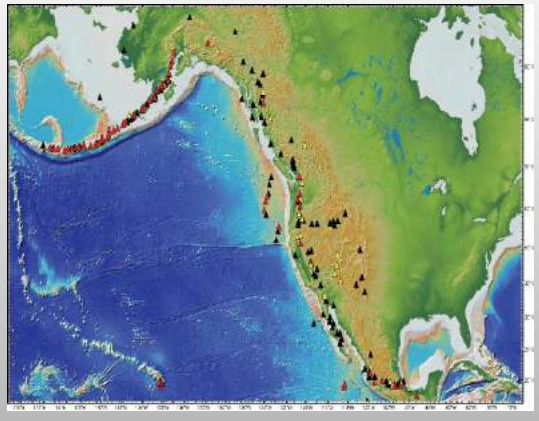
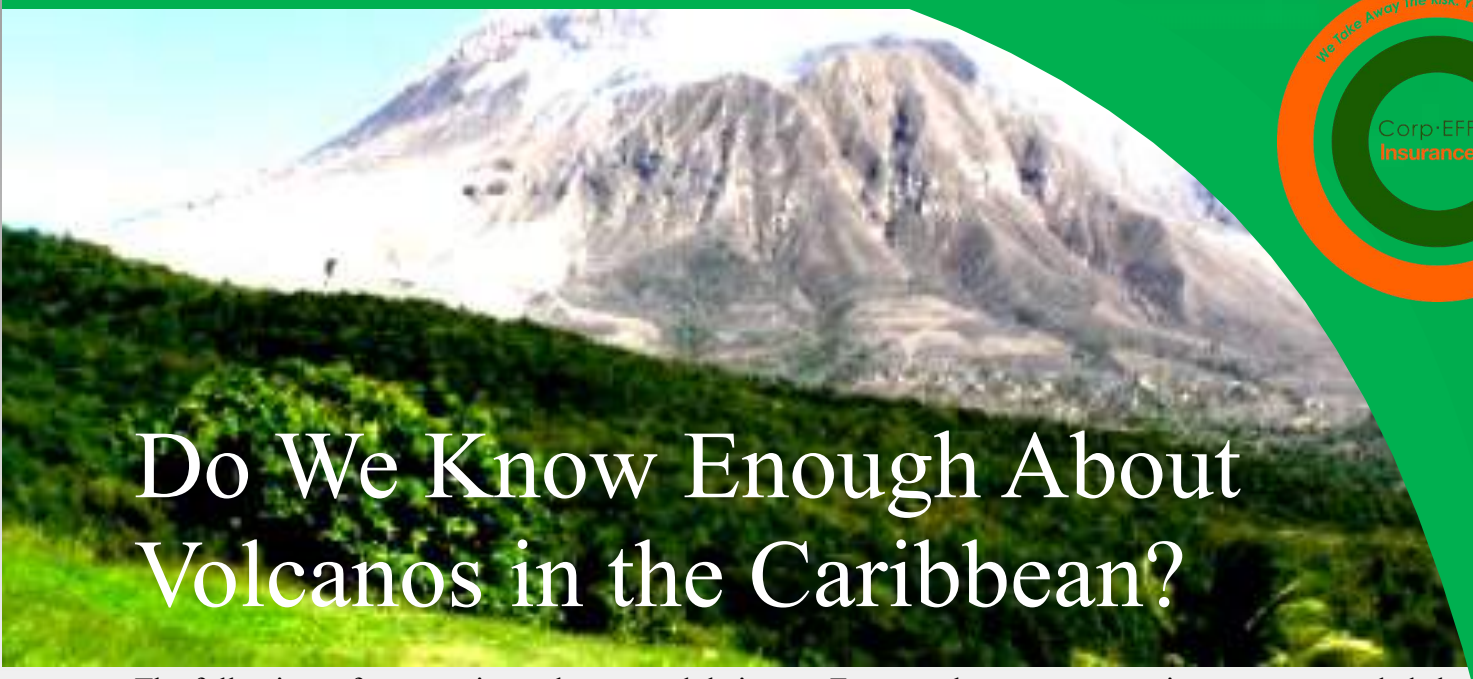


Figure 3 Active Volcanos in the United States



Do We Know Enough About Volcanos in the Caribbean?

The following refers to active volcanos and their locations in the Caribbean.

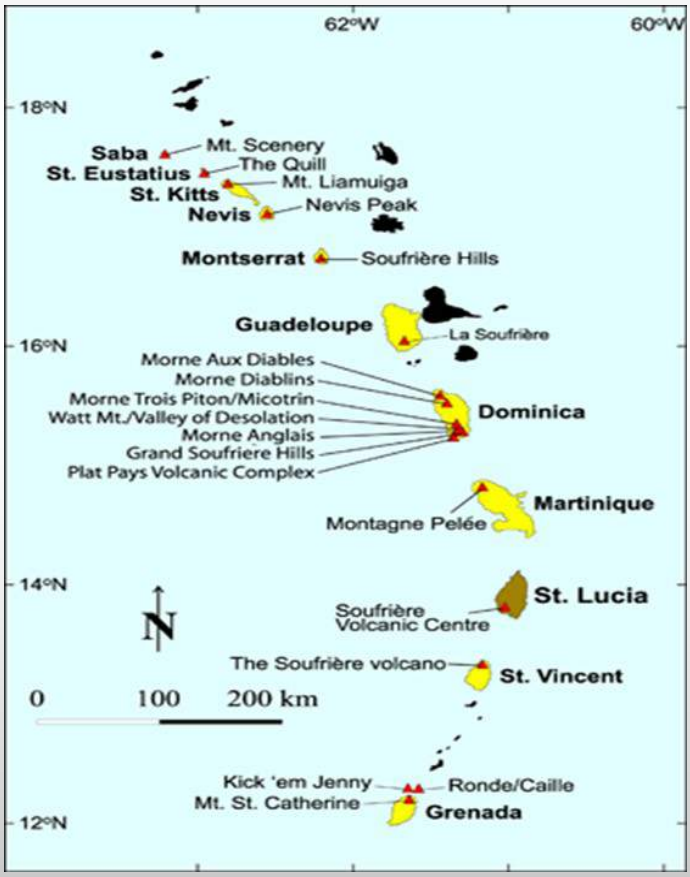


Figure 4Active Volcanos in the Caribbean

This means eruptions are common worldwide. Though less frequent in the Caribbean, these eruptions can have devastating economic and social consequences, even at great distances from the volcano, and are extremely costly.

Fortunately, many eruptions are preceded by turbulence that can be detected using ground, airborne, and space-borne instruments. Data from these instruments, combined with a basic understanding of how volcanoes work, form the basis for forecasting eruptions—where, when, how big, how long, and the consequences.

Many deaths have been associated with volcanic eruptions in the Caribbean according to the University of the West Indies Seismic Center. Approximately 30,000 deaths have been attributed to Volcanic eruptions over the last 300 years versus 15,000 each from Hurricanes and Earthquakes, therefore the threat to life and livelihoods is of serious concern and cannot be overlooked or understated. The table below refers to deaths from the listed events:

Type of Event	No. of deaths caused
Volcanoes	> 30,000
Earthquakes	Approx. 15,000
Hurricanes	Approx. 15,000
Tsunamis	Approx. 50

Figure 5 Credit http://uwiseismic.com/

Do We Know Enough About Volcanos in the Caribbean?

From 1718 to the present, there has been 8 registered volcanic eruptions in the Caribbean. According to the US Seismic Center, 5 of the 8 volcanic eruptions occurred on the island of St. Vincent.

Actual volcanic disasters in the Eastern Caribbean over the past 300 years. (Credit: (http://uwiseismic.com/)

Year	Volcano	Nature of Disaster (costs in the year 2000 dollars) *
1718	Soufriere (St. Vincent)	Major explosive eruption. An unknown number of casualties amongst indigenous Caribs.
1812	Soufriere (St. Vincent)	Major explosive eruption. About 80 deaths. Considerable damage to the sugar industry. The economic cost is unknown.
1902	Soufriere (St. Vincent)	Major explosive eruption. About 1600 deaths. Considerable damage to the sugar industry. Economic cost estimated at US$200,000,000.
1902	Mt Pelé (Martinique)	Major explosive/effusive eruption. Over 30,000 deaths. Complete destruction of the city of St. Pierre. Other damage to agriculture considerable. Economic cost about US$1,000,000,000.
1976 - 77	Soufriere (Guadeloupe)	Minor phreatic eruption. No casualties but economic cost estimated at US$1,000,000,000
1979	Soufriere (St. Vincent)	Moderate explosive eruption. No casualties but economic losses to the order of US$100,000,000
1995 -	Soufriere Hills (Montserrat)	Moderate explosive/effusive eruption. About 20 deaths. Complete destruction of capital, Plymouth. Economic cost not yet estimated but over US$500,000,000. Complete destruction of the economy.
2021	La Soufriere Hills (St. Vincent)	Moderate explosive eruptions. No casualties but economic losses to the order of US$100,000,000

Do We Know Enough About Volcanos in the Caribbean?

Many people in the Caribbean wonder if volcanoes are connected beneath the earth's surface in any way, and if one erupting volcano on one island will cause another volcano nearby to erupt. According to *USGS Volcano Hazards Program*, some Volcanoes share common magma reservoirs which can sometimes trigger unrest at each other like the 1912 eruption of Alaska's Novarupta volcano (the largest eruption of the 20th century) was fueled by magma that came from a magma reservoir beneath Mount Katmai, 10 kilometers (6 miles) away. Mount Katmai did not erupt, but after the eruption of Novarupta, Mount Katmai collapsed into the emptied magma chamber below it. Some individual volcanoes or vents are considered to be part of a larger volcano complex. In some such cases, one eruption doesn't really "trigger" a nearby vent to erupt, but moving magma finds its way to the surface at multiple sites. For example, Tavurvur and Vulcan cones are vents within Rabaul in Papua New Guinea that erupted at nearly the same time in 1994.

According to the University of the West Indies Seismic Center, volcanoes in the Caribbean are not connected. Volcanoes on individual islands are formed by the same process, i.e. subduction at the plate boundary, but they do not share the same magma chamber and are not linked by long underground magma conduits. A volcanic eruption on one island, therefore, is unlikely to trigger an eruption on another island.

Is the Caribbean sufficiently prepared or preparing for future Volcanic Eruptions?

Future eruptions will occur in the Caribbean, according to Nasa research Center and the UWI Seismic Center. Despite major advances in scientific methodologies, monitoring techniques, and modeling capability, many aspects of volcanology research remain empirical; in particular, the anticipation of "what could happen next." As a result, those in charge of handling new volcanic hazards, as well as those in charge of communications and crisis management, face a huge challenge, according to "Part of the Advances in Volcanology book series (VOLCAN)".

Do We Know Enough About Volcanos in the Caribbean?

The UWI Seismic center reports of using Instrumental records of volcanic eruptions in the past, together with input from the scientific community to provide a contextual image of what may have occurred, to create a narrative with which to engage countries and communities in the region, who may be impacted by volcanic activities in the future. The most recent eruptions in the region to benefit from the center's forecasting capabilities are the recent eruptions in St. Vincent, which could have ejected an ash and gas plume as far as the stratosphere, where strong winds may theoretically carry it to greater distances. While no lives were lost, the property damage and economic losses are estimated to be over $100M.

How quickly can the financial system recover from a Volcanic eruption?

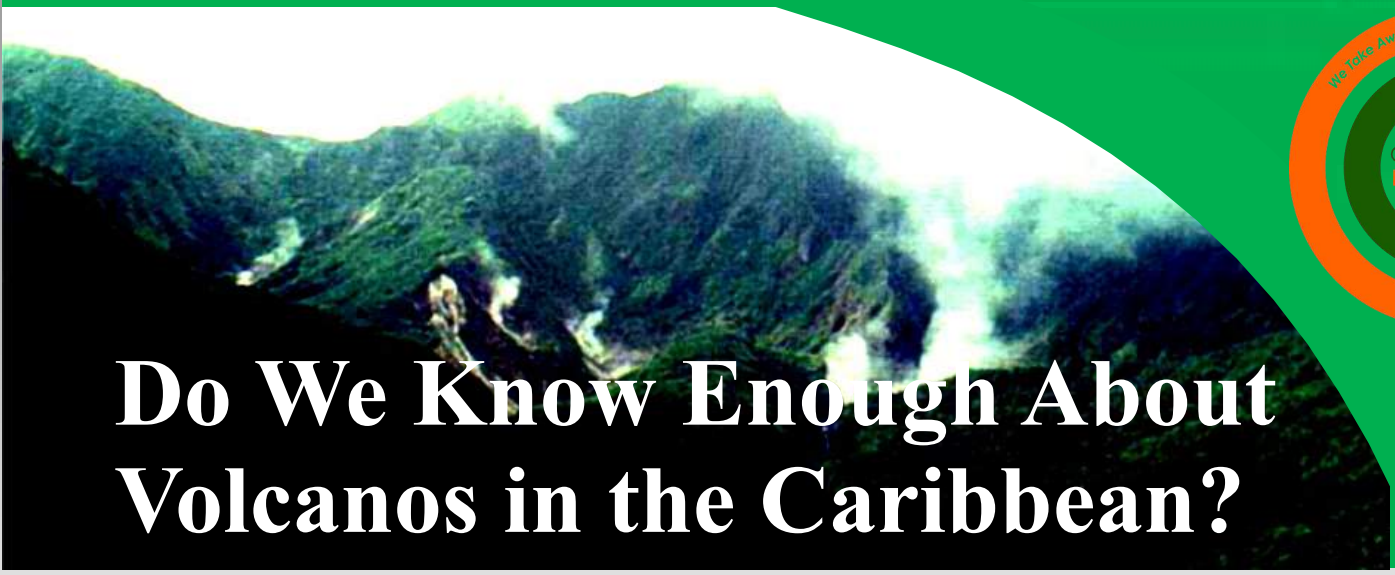
The UN, in collaboration with its partners, assesses the economic, social, and environmental costs of volcanic eruptions in all countries affected, including ash removal and improved environmental health provisions, which the Caribbean Islands benefit from.

The UN mobilizes resources to assist countries like St. Vincent in their recovery process, together with sister islands and other partners. This organized disaster recovery strategy aids in the circulation of capital in the society, which helps to cushion the financial impact of companies closing and recovering from losses.

In times of great crisis, the Caribbean and its financial system have proved to be resilient and dependable over hundreds of years. The residents of the region's enthusiasm and ability to rebuild after a volcanic eruption or catastrophe are unmatched anywhere else in the world, so we expect the citizens of St. Vincent to rise from the ashes like a phoenix.

Looking ahead

Countries in the Caribbean region identified as being at risk on some level, seem to be planning and preparing for potential eruptions. While many may already have National Evacuation and sheltering plans in place, more effort must now go into public education similar to what is done for hurricanes for instance.



Do We Know Enough About Volcanos in the Caribbean?

Going above and beyond the "Drop, Cover, and Hold" tag line for Volcanic Eruption Preparedness will be beneficial, as the region prepares for future eruptions and catastrophes.

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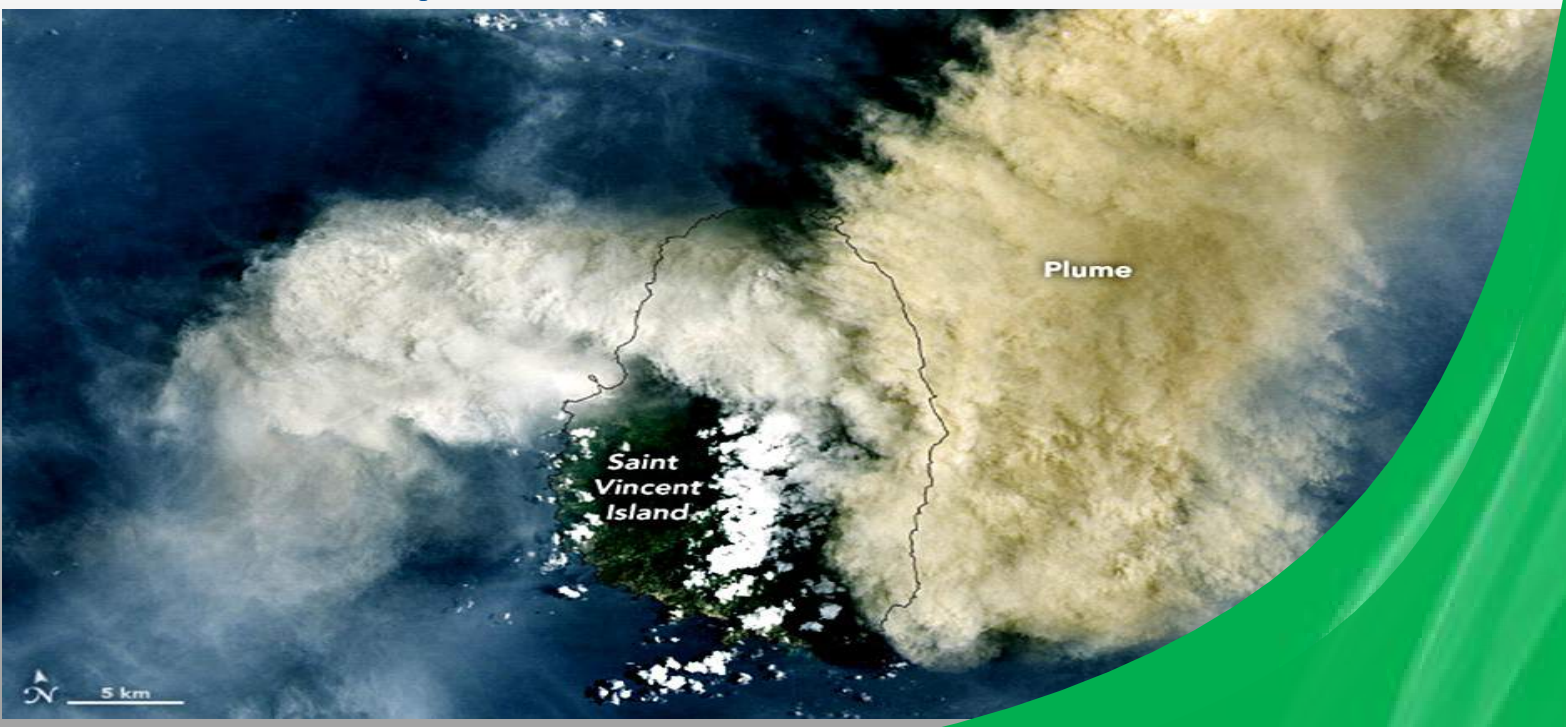

Figure 6 Nasa earth observatory