



To Our New Subscribers

Thank you to our new subscribers and welcome to the third issue of the ARM quarterly newsletter! We hope to make this publication valuable to you with several brief articles that provide unique insights, some ideas about how to address specific problems and introduce potential risks that may not yet be on your radar.

The primary authors are Dave Ingram and Max Rudolph. In this issue we add David Ensor as a guest author. We are active participants in the risk management, actuarial, investment and insurance spaces, and have been for many years.

Subscribers can suggest topics for articles and ask questions of the authors during our follow-up webinars and discussion sessions. Ever cognizant of regulatory requirements, leveraging them to add value to your company in practical ways will be our focus.

Published by Actuarial Risk Management (ARM), the Strategic and Risk Solutions for Executives (SRSE) subscription will consist of two paid tiers. The newsletter is free to all.

A webcast is available at either the company or individual level, as well as a follow-up one-on-one discussion with the newsletter authors that extends the general webcast. More info can be found at the final page of this newsletter.

We hope you find a solution that works for you!

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We hope you will join us on our journey!

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Super volcano

The series of earthquakes recently felt in South Carolina, called a swarm, are reminders that dormant risks can return, but typically have few global implications. A different type of seismic event, the super volcano, would be much more impactful.

There are two types of super volcanos. One results in magma flowing over large areas, creating large plateaus and simultaneously releasing greenhouse gases. These events don't happen often, but can create a mass extinction event. The second type creates the large eruption(s) that we associate with a volcano, while displacing a large amount of matter. The caldera remaining after the [most recent eruption \(631,000 years ago\)](#) above the hotspot that forms Yellowstone National Park covers much of the region. Ash that fell from an earlier event created Ashfall fossil beds, where animals at a watering hole were killed by breathing the ash, creating a snapshot of that time and place.

While the Yellowstone region has had three major events over the last 2.1 million years, with the largest displacing 600 cubic miles of material, four other global events since 1800 provide context. Mount St. Helens (0.24 cubic miles) in 1980 dropped ash far away but had limited global impact. Mount Pinatubo (2.4 cubic miles) in 1991



and Krakatoa (4.3 cubic miles) in 1883 are familiar to many, but Mount Tambora (36 cubic miles) in 1815 had global impact.

The Indonesian volcano that erupted in spring 1815 was the largest during the Holocene period (since the last ice age). The local impact was severe, with many lives lost. Sulfate aerosols released by the series of eruptions spread widely after entering the stratosphere. This reflected the sun's energy and light, dropping temperatures an additional 1° Celsius during a period from about 1810 where the natural cycle also led to lower temperatures.



Super volcano (cont'd)

This created the Year Without a Summer, as crop failures and famine led to mass migration in Europe and America. Six new states were rapidly added to the United States as people moved west toward Illinois and Mississippi.

The earth's ecosystem progresses through interactions between plants, animals and other organisms with weather and landscapes in a complex adaptive system. In addition, there are interactions prevalent between science, agriculture, finance, technology, demographics, culture and politics. Every action has a reaction. The decade starting in 1810 led to high costs of food and transportation (horses had to be fed), likely leading to the invention of the bicycle. Napoleon's brief return led to political uncertainty in Europe. 1816 was the year Mary Shelley wrote Frankenstein and Lord Byron wrote the poem Darkness, with the first sentence "I had a dream, which was not all a dream. The bright sun was extinguish'd."

The web of interactions, and their consequences, is personified by Thomas Jefferson. He advocated for the Louisiana Purchase in 1803, while president, resulting in gold payments due starting in 1818. In addition to his own debt, he co-signed a loan for an extended member of his family. The War of 1812 pressured the young nation's finances. A second national bank was formed in 1816, following the disruption from Britain's transition

to sourcing cotton from India rather than America. The crop failures stressed his debt balances, but the new bank initially followed loose policy until clamping down in 1818. His loans were called during the Panic of 1819, a deep recession. Upon his death in 1826 much of Jefferson's property was sold to pay off these debts, making it impossible for him to free all of his slaves late in his life.

While few knew the origin of the conditions experienced at the time, the Year Without a Summer provides a good example of the need for resiliency and to build up redundant supplies as a global community. Today, just-in-time supply chains are being replaced by just-in-case plans that reshore some manufacturing. We should learn from the past, when a stress of only 1° Celsius fall in temperatures led to famine and other difficulties.



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