Predicting volcanic eruptions and coping with ash rain

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Sumatra volcano Sinabung has been releasing hot ash and gravel in the past week. Credit: EPA/DEDY SAHPUTRA

Living alongside active volcanoes in places like Japan, the Philippines and especially Indonesia can be uncomfortable.

Around half a billion people in the world live near high-risk volcanic eruption areas. Of 829 volcanoes in the world, 129 of them, or around

15.6%, are located in Indonesia.

It's scary to have to constantly wonder when an eruption will start or end. Just recently, the Sinabung volcano in Sumatra, Indonesia, has been coughing up hot ash. People living near the volcano are wondering every day when Sinabung will end its blasts.

Limited knowledge on historical eruptions from volcanoes such as Sinabung makes it difficult to precisely predict the next one.

Anticipating volcanic eruptions

Vulcanologist have attempted to predict eruptions by using a volcano's "regularity" pattern.

Volcanoes usually release volcanic material over a certain range of time, with the volume of material released being relatively constant. When a volcanic eruption happens earlier than the average interval, in theory the volume it releases will be less than the regular volume. When it erupts beyond the time range, it will release more material.

It is not that easy, however, to predict Sinabung because it has been dormant for 400 years. Deleng Sinabung, as it is called by the local Karo people, is located north of the Toba Caldera in Karo regency, North Sumatra. Before recent eruptions that took 16 lives, the last eruption was in the 1600s. Long periods of dormancy makes people forget about the danger the volcano holds.

Due to Sinabung's long slumber, there are few documents about the timing and volume of its eruptions. Indeed, before 2010, eruptions occurred rarely, with long periods in between. After 2010 they become fairly regular.

Sinabung erupted in 2010, 2013 and 2014. While this might reflect a real eruption frequency increase, such that Sinabung has entered a regime of higher activity, we cannot be sure since the earlier historical record is incomplete.

Assigning the Volcanic Explosivity Index (VEI) value of older eruptions is also difficult due to the lack of data. We also could not calculate precisely the ejected volume of older eruptions. After 400 years, there has been erosion of volcanic materials in the area.

Researchers observing the mountain since 2010 record the height of the eruption column reaching between 1.5 and 5 kilometres, with a volume of 10,000,000 cubic metres. This shows Sinabung has a VEI value between 2 and 3, with around one to three little eruptions every year. Let's hope this would be Sinabung's regularity pattern.

Researchers have applied this method of prediction with relative success. The average uncertainty level is less than 20%. This method works especially well for volcanoes with a VEI of more than 5. Researchers managed to predict accurately eruptions in Pinatubo in the Philippines in 1991 and in Raupehu in New Zealand in 1996.

Still, we need to stay alert. Sometimes volcanoes can erupt outside of this rhythm, without any precursor. Such is the case of the recent Ontake eruption in Gifu, Japan.

Deadly spectacle

In Indonesia people are attracted to live near these sleeping giants for the cool climate, clean water and beautiful views.

The land near volcanoes is very fertile. The time period between eruptions, which could go up to 100 years of more, decreases our

alertness to disaster risks.

When volcanoes come to life, they may also bring death. They release volcanic ashes. These are soft particles with a diameter of more than 2mm. Gas thrust will launch the volcanic ashes into a convective ascent, creating an eruption column. The hot ash continues to climb until it reaches a level of neutral buoyancy, creating an umbrella of ash in the air.

Japan was caught unawares when Ontake erupted in September. Credit: EPA/Ministry of Land, Infrastructure, Transport, Tourism

Rocks bigger than 2mm diameter don't usually climb up. Instead, they shoot out like ballistic bombs.

This is a fascinating spectacle that can turn deadly in a matter of seconds. Loss of pressure from the eruption column will send a pyroclastic flow down the slopes, destroying everything in its path. When this happens, areas close to the volcano should be evacuated.

People should also know how to deal with ash rain. Build-up of these ashes would later contribute to land fertility. But, when floating in the air, it could cause lung irritation.

Tips to cope with volcanic ashes

Reduce motor vehicle usage: Volcanic ashes can decrease the range of visibility, so if we need to use a vehicle we should drive it very slowly.

Reduce ash deposits inside the house: Close all the windows and doors to reduce the possibility of ashes entering. The longer and deeper we inhale, the deeper the ashes go into our lungs.

Protection: Provide glasses and masks. Use them immediately to reduce eye and lung irritation. The masks should be wet to maximise the filtering of the air.

Food and drink: It is usually safe to consume water and food after a light ash rain. You should wash the food and put it in a closed container before consumption. Stock up a week's worth of drinking water.

Cleaning volcanic ashes: Dab water to clean the ashes. Cleaning when dry will make the ashes fly. Be careful when pouring water on rooftops while cleaning. Too much water will add weight and can cause the roof to collapse.

Tips for children's protection: Children face the same dangers as other age groups. However, they have a higher risk because they are physically

smaller. Psychologically, they are not equipped to make rational choices as adults. Exposure to small amounts of volcanic ashes is not harmful. But precautions should be taken.

- Keep children inside
- Advise them not to run around to avoid ashes entering their respiratory system
- Use masks and glasses when taking refuge in a safe place
- Prepare an adequate food supply
- Try to make them feel comfortable and safe
- Asks for medical assistance when symptoms of irritation occur.

Volcanologist Robert Decker wrote:

A volcanic eruption creates a fascinating but deadly spectacle. The ashes will make the ground fertile in later years, but for now, stay away and put on the masks. Credit: EPA/DEDI SAHPUTRA

Volcanoes assail the senses. They are beautiful in repose and awesome in eruption;They hiss and roar; they smell of brimstone.Their heat warms, their fires consume; they are the homes of Gods and Goddesses,

He is right and there's no other way but to learn to live with that.

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