

## Goma - A City of Balance

Geography can be the most powerful driving force behind people's lives, and this can't be overstated for the city of Goma, the home to 2 million people in the Democratic Republic of Congo.

It lies on top of the East African Rift Valley, where the tectonic plates underneath Africa and the Indian Ocean are moving apart. Despite this taking millions of years, the consequences are very real for the residents of Goma who live in the shadow of two resulting active volcanos: Nyiragongo & Nyamuragira.

If you managed to find a way to be at peace with the volatile volcanos, then the politics of the local area brings a new challenge.

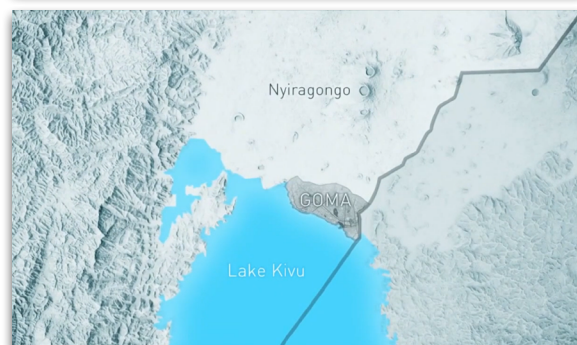
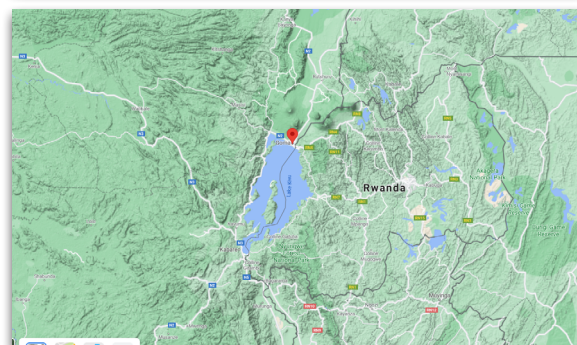
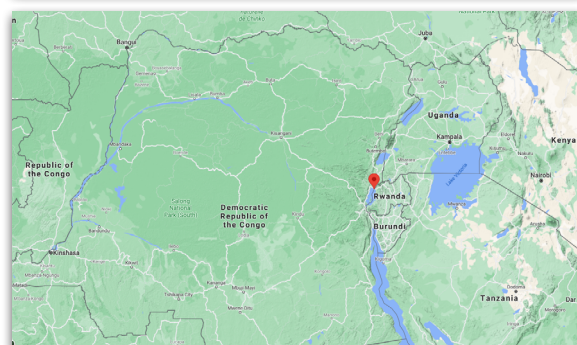
In the mid-nineties, next-door-neighbour Rwanda was in the midst of a genocide, and so 1 million refugees fled to Goma, being the nearest city over the border. Due to the inability of the city to host that many people, Cholera claimed the lives of thousands, as well as driving the closure of many businesses and livelihoods.

Since then, two wars and a large number of independent militia groups has led to instability. One can only imagine how it felt to be in the midst of all that turmoil.

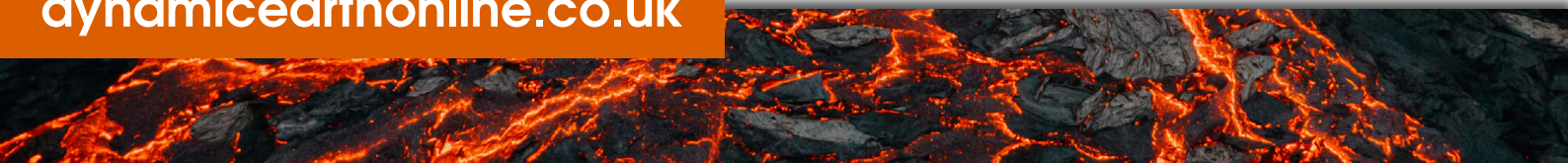
When it seemed things couldn't get any worse for the people of Goma, on the 17th January 2002, Nyiragongo began erupting, with fissures on the south side of the volcano – the side nearest the city – opening up.

Nyiragongo is unique in a having the largest open lava lake in the world, which is big enough that it could swallow the world's other 7 up with room to spare.

But the lava doesn't erupt from there, but rather pressure below the surface cause eruptions from fissures in the volcanos' sides.



The grey line shows the border between the DRC and Rwanda, with the distance to central Goma being less than 1 Km. Nyiragongo to the north sits in Virunga national park, where some of the last remaining mountain gorillas make their homes. Lake Kivu to the south is an ever-present threat due to toxic gas release





The lava that Nyiragongo produces can be particularly dangerous in that it is of low viscosity - it is quite runny, which means it flows fast, travelling up to 30 or 40 mph!

This gives people nearby less of a chance of escape, plus their livelihoods are at more risk. For example, while the farm land around Goma is highly fertile due to all the nutrients found in volcanic ash (iron, phosphorus, and potassium) plus the heat found underground, the cruel twist of fate is that the volcano can also destroy the farm land, as lava burns its way across the landscape.

Once it is safe for the farmers to return, they find the [next crop usually does very well](#); as one farmer, Tamoini, said, "The pain of what I lost kept me from coming back for such a long time. With this level of production, I'm glad I finally did". The threat, however, of another eruption is a burden hard to shake off.

In order to give as much warning as possible to people, the "Observatoire Volcanologique de Goma" ([Goma Volcano Observatory](#)) was set up in 2007.

Here, measurements are made on a daily basis to start the long term collection of data, hopefully achieving the discovery of tell-tale signs of an eruption, which could lead to an early warning system. Volcanoes in general are highly unpredictable, but new methods are being tested and validated, and at Dynamic Earth we've made a learning experience that encompasses a few of those: Expedition Volcano. There's also a great [documentary](#) by the BBC about Goma and how Nyiragongo is being monitored!



*The lava lake of Nyiragongo*

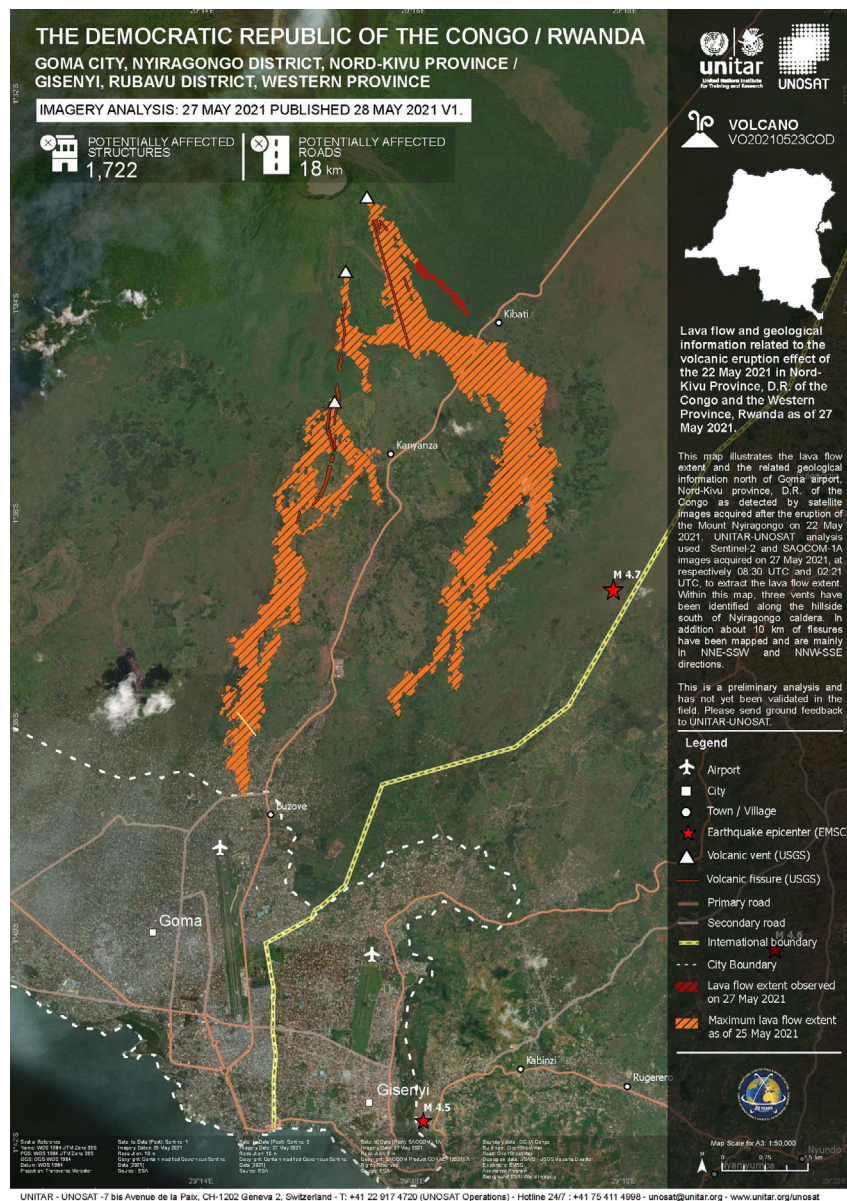
*Image credit: Cai Tjeenk Willink (Caitjeenk) via Wikimedia Commons*

It turns out that the movements of huge volumes of magma lead to the compression and expansion of air, which makes sound. Therefore, magma makes sound, but generally at frequencies that are too low for humans to detect. An [infrasound sensor](#) is a custom microphone that can pick this up, and scientists at Boise State University, Idaho are discovering how effective this is. Imagine the volcano as a vertical tube, up which the magma can flow. When the magma is low down, there's lots of room between it and the top containing a mixture of gases, which leads





to low-frequency sound. If the magma then moves up the tube, then the air is compressed, and the frequency starts to increase. You would hear this as the pitch rising, as shown in [this example](#). Thus, a rise in pitch of the volcanos' infrasound means magma is rising, possibly leading to an eruption. This is similar to a Trombone, where bringing the slider closer to your face increases the frequency.



Orange: lava flows in the May 2021 eruptions of Mt Nyiragongo  
Click the image to see a PDF version with more detail

While it is still within our power to limit the damage that a century of carbon based industrialisation has caused, we must still work to build resilient towns and cities. Looking to cities such as Goma that have not only survived disaster before but are also likely to again, perhaps we can learn a thing or two.

Nyiragongo has erupted roughly every 10-15 years for the [last 50 years](#) and, as expected, it erupted in 2021. Nyiragongo began erupting on the 22nd of May, residents of Goma were ordered to evacuate the city on the 28th, and only given permission to start returning on the 7th of June. The official death toll is 32, although there were a lot of people still missing, and over 1000 homes were destroyed.

Understanding how the people of Goma have adapted to crisis of an eruption might also help other cities and settlements around the world that are facing a crises of a different sort: climate change. As the planet heats up, the frequency and severity of natural disasters is already being seen and is set to worsen further, placing millions of life at risk.



A Chukudu is a form of scooter invented in Goma, being an affordable and sustainable, and allowing large cargo to be moved around the city with relative ease. Their low cost makes repairs much more approachable than any motor vehicle, which holds the potential for how cities around the world could change how large cargo is transported sustainably.

