

# Humanitarian Innovation Hackathon

9 INDUSTRY, INNOVATION  
AND INFRASTRUCTURE



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## Executive Summary

Immediately following a major disaster, first responders look to the priority task of saving lives. The requirement for communications quickly follows. Modern communications (one to many or one to one) are sensitive to disasters and are often impacted.

However, people need to be able to quickly contact family members, loved ones, and request government and specialist agency assistance. Governments and agencies need to be able to quickly communicate what has happened, and what is being done to support the population and mitigate the disaster. The establishment, operation, and maintenance of robust stand-by means of communication will invariably reduce trauma, improve response efforts, and save lives and livelihoods.

## Hackathon Challenge B

**How can we assist populations affected by a disaster event to establish, operate, and maintain reliably robust stand by communications?**

### Persona

Carrie Vaea is a 12-year old girl living with her mother, father and two brothers in Nukuleka, a small fishing village, and possibly the oldest human settlement in Polynesia, on the main Tonga island of Tongatapu. Carrie's older sister Laveni is away studying ocean science at USP Laucala in Fiji. Their house is a timber framed, CGI roofed, four room, low set structure near the mouth of the main lagoon. The family harvest their own rainwater, cook on bottled LPG, and the house has AC power connected, and a long drop toilet.

On Saturday afternoon, just before dinner, the family was waiting for their father to come home, from his work as a police officer in the capital Nuku'alofa, when the neighbors' dogs went berserk, barking and howling. The next moment there was a sonic boom, a massive explosion that shook the house and was felt as far away as Alaska. There was a second louder explosion, and the rumbling sounds went on for nearly 10 minutes.

Running outside after the first explosion, to see what was happening, Carrie noticed that the sea was draining away. Having done two village evacuation drills and having had NEMO awareness training at school, she recognised this as a warning sign of a possible tsunami.

Calling to her mother and brothers, Carrie warned the family of a tsunami and, grabbing her cat, joined them on the track behind the village to higher ground. All around them now, other families were rushing from their homes with little or nothing in their hands, to join the evacuation. The Village Emergency Committee were using loud hailers to warn the villagers and were door knocking from house to house...

# Humanitarian Innovation Hackathon



## Persona

As the villagers reached the top of the small hill, they were aware of crashing waves, a continuing noisy rumble, and ash falling from the sky. That night the sky to the north was lit up like a forest fire and before long it was passed around that a volcano, probably Hunga Tonga Hunga Ha-apai, 70 kilometres away to the north, had erupted. It had been very active since before Christmas. Attempts to find out for sure what was happening, by the few people who had mobile phones and had evacuated with them, came to nothing as there was no reception.

Much later the next day, Carrie, her family, and the other villagers were told by the Village Emergency Committee, who had completed a quick initial damage assessment of Nukuleka, that they could return to their houses but were to be alert to any further eruptions and possible tsunamis. The Committee did not have a sat phone, which would not have worked under the ash cloud anyway, and their HF radio had been left unrepaired after most members procured mobile phones and some got internet at home.

In the village, older style fales had been destroyed, but more modern structures, like Carrie's house, were still standing. The cement block Fale Koloa in the centre of the village was undamaged. Most other dwellings had had about 1.2 to 1.5 meters of salt-water surge through them and flush back out again, all furniture and other possessions were saturated, and most things, especially electrical items, were ruined. Ash about 10cm deep covered everything outside, including kitchen gardens and water tanks were swept away.

Power to the village was out, the few land-line phones were down, televisions and radios were ruined, and mobile phones still had no reception. The three village motor vehicles had been tossed about, submerged and were unusable. One of the fisherfolk used his boat to scout across the lagoon but returned to say that the capital was buried in ash, and the two main bridges linking the village to Nuku'alofa were unusable.

Carrie and her family were unsure what had happened to their father, were not clear on what exactly had all but destroyed their village, did not know if another tsunami was coming or another eruption was likely, and needed help. They were also desperate to tell Laveni, in Suva, that they were alive but their father was missing.





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## Resources

### **OCHA, 10th Feb 2022, Tonga: Volcanic Eruption Situation Report No. 4**

[https://reliefweb.int/sites/reliefweb.int/files/resources/OCHA Sitrep %234 Tonga Volcanic Eruption 2022\\_02\\_10\\_Final 2.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/OCHA%20Sitrep%20234%20Tonga%20Volcanic%20Eruption%202022_02_10_Final%202.pdf)

### **IFRC, 5th April 2022, Tonga, Asia Pacific/ Volcano and Tsunami Revised Emergency Appeal**

[https://reliefweb.int/sites/reliefweb.int/files/resources/MDRTO002\\_rea.pdf](https://reliefweb.int/sites/reliefweb.int/files/resources/MDRTO002_rea.pdf)

### **GRADE report Jan 2022**

<https://thedocs.worldbank.org/en/doc/b69a-f83e486aa652d4232276ad698c7b-0070062022/original/GRADE-Report-Tonga-Volcanic-Eruption.pdf>

### **Rising, D. and Press, A., 2022. Communication restored in Tonga 5 days after volcanic eruption.**

<https://www.pbs.org/newshour/world/communication-restored-in-tonga-5-days-after-volcanic-eruption>

### **Emergency Communications Network for Disaster Management**

<https://www.nature.com/articles/d41586-022-00394-y>



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[bit.ly/hack-live](https://bit.ly/hack-live)



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## Background

Immediately following a major disaster, first responders look to the priority task of saving lives. In Tonga and elsewhere, first responders are the affected population mobilising to assist themselves.

The requirement for communications quickly follows. Modern communications are sensitive to disasters. However, impacted populations need to be able to quickly contact family members, loved ones, and request government and specialist agency assistance. Governments and agencies need to be able to communicate what has happened, and what is being done to support the population and mitigate the disaster. This will invariably reduce trauma, improve response efforts and save lives and livelihoods.

Within a day of the eruption, the capital Nuku'alofa (including the airport) was covered in a two-centimetre layer of volcanic dust and ash. The waterfront was seriously damaged. Huge ash clouds hampered satellite communications and the single undersea fibre optic cable connecting Tonga to the world was cut.

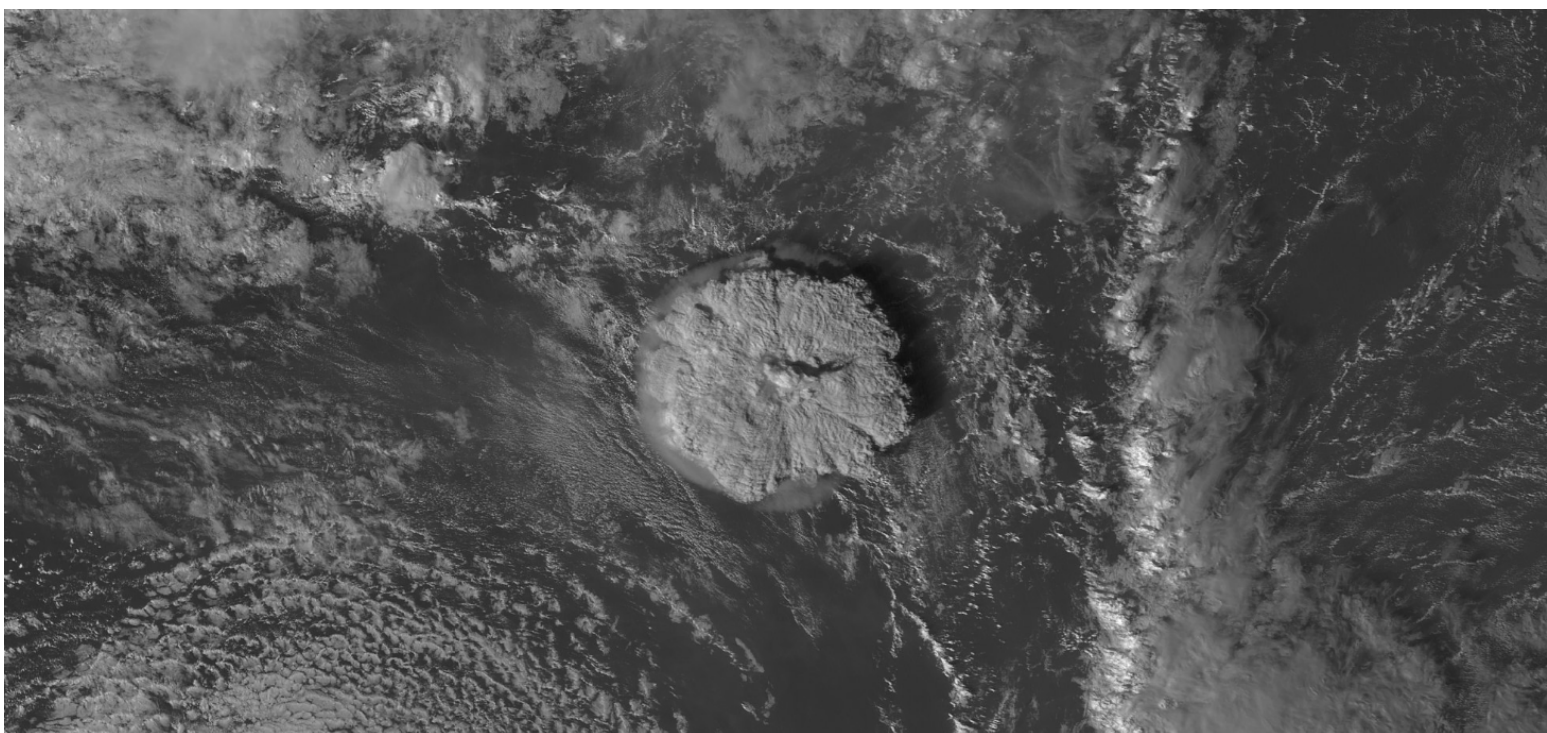
The first flight into Tonga, aid from New Zealand and Australia, landed 5 days after the eruption. Aid by ship followed.

This challenge relates specifically to communications systems that could be used during the time between the event and the re-establishment of external contact, global communications and support services.

### **First layer of difficulties and ash clouds/satellite phone cost complication**

The eruption, earthquake or tsunami had severed not only the undersea cable that connected Tonga to the outside world, but also the domestic one that connected all the islands within Tongan archipelago.

The event itself presented as the first layer of communication issues challenging the global humanitarian efforts trying to access and assess the situation of Tonga. Families on the ground could not reach their loved ones in Tonga or in the rest of the world. Satellite phones were the sole communication tool the government and response efforts could rely on at the first instance and for days. However, the ash cloud had been reportedly blocking/interfering with the use of satellite phones, in addition to the high cost of using satellite phones, they were restricted to be used by government officials and some businesses only...





## Background

### The second layer of difficulties and COVID complication

While after weeks of effort the external undersea cable was repaired on 22nd February 2022, the domestic undersea cable remained far from being repaired. The restoration of common inter-islands communications was not expected in the foreseeable future.

The impact of COVID restrictions further complicated the situation. Several humanitarian groups such as Red Cross and TRCS providing Restoring Family Links (RFL) efforts were shut down or restricted, as the second wave of COVID-19 lockdown was implemented during 18th March to 2nd April. Families relying on these support efforts to make connections to their family members on other islands and/or outer world were once again disrupted.

RFL had helped 150 families connect with their relatives, families, or friends on the other islands or overseas prior to the lockdown.

The use of short-wave radio was introduced but was used for broadcasting promotion of nutrition and hygiene programs, which did nothing to provide fundamental communications systems to help Tongans trying to reconnect and restore their normal life.