The Warren Centre
& Professor Ron Johnston

Humanitarian Innovation Hackathon

6 CLEAN WATER AND SANITATION

Ensure availability and sustainable management of water

Executive Summary

Access to clean water is essential for human survival. Several natural disasters have struck Tonga in the past, including the recent Hunga Tonga Hunga Ha-apai underwater volcanic eruption on 15th January 2022. The eruption resulted in large concentrations of volcanic ash that generated acid rain, contaminated several local water supplies (such as rainwater collection tanks), inhibited growth of local crops and vegetation, thereby potentially leading to severe long-term issues such as poverty. Whilst there is a treated reticulated water supply in the major centres, additional measures were required in Tongatapu, Ha'apai and `Eua to ensure potable water was available. More remote villages and isolated islands who rely on rainwater harvesting for water source suffered as they had no other water source. Several international humanitarian partners, such as Australia, China, New Zealand and the United States, have attempted to provide aid by, for example, developing water stations and distributing bottled water around the country for easier potable water access. Nonetheless, given the long-term effects of ash contamination and the issue of plastic bottle pollution from water bottles, further attention is required to purify affected local water sources.

Hackathon Challenge D

What can be done to ensure safe, reliable water sources for all Tongans following natural disasters, especially ash contamination of the local water supplies following volcanic eruptions?

Persona

Fotoula, 10-year-old boy.

Hi, my name is Fotoula. I am 10 years old and live in a rural area on Ha'apai Island, along with my three brothers, two sisters, parents and my grandfather. Our normal source of drinking water is collected from the roof and stored in an open rainwater tank beside the house.

After the volcano erupted, ash and other material landed on the roof and then washed into our water tank, making the water taste yucky and not drinkable. No-one in our village is connected to the town water system because we are informal settlers and can't access the reticulated system. So now after the volcano, my little brother Vili and I walk 1km to the school where we fill up our water bottles.

Some strange people are hanging around those taps at night-time, in the dark. Dad has asked my eldest brother, Etuate, to leave school this year and find work so that we can instead buy water and medications for our family.

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Resources

Global Times News: Tonga suffers from wide damage to houses, water
https://www.globaltimes.cn/page/202201/1246415.shtml

Tonga: Volcanic Eruption Situation Report No.2
https://reliefweb.int/report/tonga/tonga-volcanic-eruption-situation-report-no2-28-january-2022

Tonga: Volcanic Eruption - Flash Update # 5
https://reliefweb.int/report/tonga/tonga-volcanic-eruption-flash-update-5-20-january-2022

Tonga: Volcanic Eruption Situation Report No. 4
https://reliefweb.int/report/tonga/tonga-volcanic-eruption-situation-report-no-4-10-february-2022

Background

Many island nations in the Pacific region are exposed to natural disasters, ranging from seasonal cyclones to effects from other weather systems such as La Nina and El Nino, as well as earthquakes and volcanoes and unfortunately the effect of global warming. While some of the consequences of these extreme events can be mitigated through appropriate design, such as structures designed to be durable for cyclones, events such as volcanic eruptions are impossible to predict and generally occur with little warning to find an appropriate mitigation strategy. This is especially true following the eruption of the Hunga Tonga Hunga Ha-apai underwater volcano on 15th January 2022, which resulted in a significant tsunami affecting the island nation and thick volcanic ash to fall over Tonga. A key consequence in remote island populations would be subsequent access to potable water following the event.

The volcanic ash has contaminated local fresh water sources and could even result in large quantities of acid rain (containing acidic gases such as sulfur dioxide and nitrogen oxide) to resultantly harm local people, infrastructure or ecology directly with no currently known end date. For example, the ash would contain aluminosilicate, which could reduce or prevent growth of plants or crops and contaminate the water supplies. If the acidic gases reach the water, this will over time generate aerosol particles. For local inhabitants who rely on rainwater tanks to collect their fresh water supply, key immediate needs (KINs) to assist with the recovery could include new rainwater tanks, imported fresh water, water purifiers (vessels or tablets), water testing kits, toilets for sanitation and cleaning equipment. The most affected villages include Tongatapu, Ha'apai and `Eua and around 50,000 people from close to 8,500 households required WASH (water, sanitation and hygiene) assistance, thereby making intervention necessary.

As part of the mitigation strategy, NEMO (i.e., Tonga's National Emergency Management Office) and other humanitarian partners, such as Australia, China, New Zealand and the United States, to Tonga have helped to establish 16 water stations (as of January 2022) around the island of Tongatapu, as well as to deliver fresh drinking water (415,000 litres) to the local community. This of course does not mitigate the need to treat the local fresh water. Furthermore, they have provided other non-food items (NFIs) such as hygiene or dignity kits, shelter tool kits, latrines, etc. Other charitable ventures such as the Tongan Red Cross Society have also been trying to help.