

Humanitarian Innovation Hackathon



3 GOOD HEALTH
AND WELL-BEING



Ensure health
lives and promote
well-being

Executive Summary

Access to clean air is essential for human survival. Several climate-induced natural disasters have struck Tonga in the past, including the recent Hunga Tonga Hunga Ha-apai underwater volcanic eruption on 15th January 2022. From the latter, large concentrations of volcanic ash have contaminated the local atmosphere (reached 103 AQI, much larger than the cap of 50 representing good air quality) from the generation of toxic gases or fine ash particles which can easily be carried by the air and subsequently harm the airways if inhaled, especially silica. Ash landed on the runways and tsunamis have prevented air or sea travel for suitable international aid. Such aid could include supply of face masks, goggles or other protective clothing or monitoring devices or stations or suitable infrastructure material to prevent seepage of ash. Linked to the high level of NCD's (Non-Communicable Diseases) in the Pacific nations, which result from poor diet and lifestyle, are breathing difficulties from associated diseases, such as Chronic Obstructive Pulmonary Disease (COPD), which in turn are exacerbated by the presence of volcanic ash in the atmosphere.

Hackathon Challenge E

Many Tongans were affected by the volcanic ash in the air, especially those with respiratory issues. Since volcanic activity is unpredictable and infrequent, what could be done to minimise inhalation of ash?

Persona

Sione, 75-year-old, retired fisherman with asthma.

Hi, my name is Fotoula. I am a 10-year-old girl 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 a rainwater tank beside the house. After the volcano erupted, ash and other material landed on the roof and infiltrated the air.

Our Grandfather, Sione, tries to walk with us down to the school at night to protect us, but he has trouble breathing. He is an asthmatic and finally gave up smoking a few years ago, but with all the ash in the air, he is struggling to get out of his bed each day.

Dad has asked my eldest brother, Etuate, to leave school this year and find work so we can buy water and medications for our grandfather.



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Resources

Plume Lab: Air Quality in Tonga

<https://air.plumelabs.com/air-quality-in-tonga-aw-1043311>

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 (As of 28 January 2022)

<https://reliefweb.int/report/tonga/tonga-volcanic-eruption-situation-report-no2-28-january-2022>

Volcanic Ash: More than just a science project

https://serc.carleton.edu/NAGTWorkshops/health/case_studies/volcanic_ash.html

Volcanic ash impacts & Mitigation

https://volcanoes.usgs.gov/volcanic_ash/respiratory_effects.html#:~:text=The%20most%20hazardous%20eruptions%20are,and%20impairment%20of%20their%20function

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 clean air following the event.

The current air quality in Tonga can be monitored from 'Plume Lab's Air Quality in Tonga'. As of May 2022, it has reached 103 AQI (air quality index), which is much higher than 0 to 50 representing good air quality. Naturally, inhalation of fine ash particles or even the toxic gases emitted can harm airways, as they can induce heavy coughing and irritation if breathed more deeply into the lungs, especially if any crystalline silica is inhaled as it can cause scarring of the lungs. As the ash particles are relatively small, with enough wind, they can travel a very long distance. Combined with the impact of COVID-19, this has prevented people from leaving their homes unprepared (e.g., without a mask) for their health and safety. This has required an urgent delivery of face masks for health protection.

Furthermore, ash covering the runways and the tsunamis have hindered sea and air travel for local or international aid. This has impacted the ability for the local Tongans to secure clean water or air purification resources for an extended period of time during and following the eruption.

Monitoring of the airborne particles such as silica should be continued to ensure that they do not become extensively inhaled and thereby damaging. Mitigation strategies could include providing protective clothing, such as dust masks or goggles or remaining indoors with well-developed housing materials to reduce or even prevent seepage of ash.

