

THE CATASTROPHIC ERUPTION

BACKGROUND:

On January 15, 2022, the Hunga-Tonga Hunga-Ha apai volcano was responsible for a large-scale eruption. The eruption triggered tsunami warnings across the Pacific, and its impact was felt as far as Japan, Peru, and Chile. As a result, significant damage was inflicted on Tonga's environment and industry, prompting support from many countries to help rebuild. Further volcanic activity is anticipated as the volcano remains active.

INTERNATIONAL DEPLOYED ASSISTANCE FOR TONGA

KINGDOM OF TONGA
Hunga Tonga Hunga Ha'apai Volcanic Eruption: International Deployed Assets

As of 3rd March 2022

OVERVIEW

Several dozen governments have been providing international humanitarian aid for Tonga to support the Tongan Government with its response to the Hunga Tonga Hunga Ha'apai volcanic eruption. All incoming relief supplies are subject to COVID-19 protocols and all personnel and equipment are subject to health screening. All incoming relief supplies are subject to COVID-19 protocols and all personnel and equipment are subject to health screening.

AUSTRALIA

NEW ZEALAND

UNITED KINGDOM

JAPAN

CHINA

FRANCE

FIJI

NEW ZEALAND

National Assistance

2022 Foreign aid: **107,950,00 \$**

Australia: **150 tons**

Fiji: **200 tons**

France: **40 tons**

New Zealand: **180 tons**

VOLCANIC ERUPTION OFF THE ISLANDS OF TONGA

THE IMPACT OF TONGA VOLCANIC ERUPTIONS

INTERNATIONAL IMPACT OF VOLCANIC ERUPTION

ERUPTION OF A GIANT UNDERWATER VOLCANO IN THE PACIFIC OCEAN HAS TRIGGERED TSUNAMI WARNINGS ACROSS THE REGION. THE ERUPTION WAS FELT AS FAR AS JAPAN, PERU, AND CHILE. AS A RESULT, SIGNIFICANT DAMAGE WAS INFLICTED ON TONGA'S ENVIRONMENT AND INDUSTRY, PROMPTING SUPPORT FROM MANY COUNTRIES TO HELP REBUILD. FURTHER VOLCANIC ACTIVITY IS ANTICIPATED AS THE VOLCANO REMAINS ACTIVE.

INTERNATIONAL DEPLOYED ASSISTANCE FOR TONGA

THE IMPACT OF TONGA VOLCANIC ERUPTIONS

Number of Displaced

- 500
- 100
- 50

Impact Zones:

- High Impact 50-100km
- Moderate Impact 100-150km
- Low/Undetermined Impact 150-250km

TONGATAPU Displaced population breakdown

- 1352
- 253 Children Under 16
- 413 Adult Male
- 452 Adult Female

ESTIMATED PEOPLE IN NEED: 50,326

AGRICULTURAL FAMILIES AFFECTED: 12,000

SALTWATER INVASION CONTAMINATION OF WATER AFFECTED SHORELINE

DESTRUCTION:

- 280 DESTROYED HOUSES
- 1 HEALTH CENTRE DESTROYED
- 1 UNDER WATER COMMUNICATION CABLE DAMAGED

STATISTICS:

- AFFECTED POPULATION: 84%
- PEOPLE AFFECTED: 85,000
- PEOPLE DISPLACED: 2,390
- PEOPLE INJURED: 14
- DEATHS: 4
- CASES: 5

Country / City China / Chongqing

University / School Chongqing University / College of Art

Academic year 2022 / 2023

Title of the project Disaster, Diverging Point

Authors Shuai JIANG, Ziyun YAN, Xinyue LIU, Yujing WU, Sibe DONG

TECHNICAL DOSSIER

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Title of the course Landscape architecture
Academic year 2022 / 2023
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University / School Chongqing University



Written statement, short description of the project in English, no more than 250 words

MIRAB is a unique economic growth model of Pacific island countries, which mainly carries out self-financing through some international rescues. But some researches show that over-reliance can lead to aid traps.

On January 15, 2022, a serious volcanic eruption disaster caused Tonga to be fully covered with volcanic ash, accompanied by local phenomena such as the collapse of houses and the pollution in water and soil resources. In addition, invisible items have been destroyed also, such as industrial circle and surrounding ecological environment.

Our project takes volcanic eruption as a diverging point for Tonga's transformation, exploring all the reusability of volcanic ash in three land use (coastal, agricultural and urban area). Introduce a small industrial chain through volcanic ash to enhance the local economic resilience, while using products to enhance the local ecological resilience also.

The project cycle is roughly divided into three stages, the disaster stage, the post-disaster reconstruction stage and the long-term development stage. Deeply refine the urban part, we improve the transformation and ecological benefits of three stages. Finally, it will provide Tonga with a sustainable development path of economic and ecological coexistence, gradually reduce dependence on international support, and finally get rid of MIRAB aid trap.

For further information

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12th International Biennial Landscape Barcelona

Barcelona November 2023

SCHOOL PRIZE

TONGA'S NEED FOR AID AND MIRAB DILEMMA

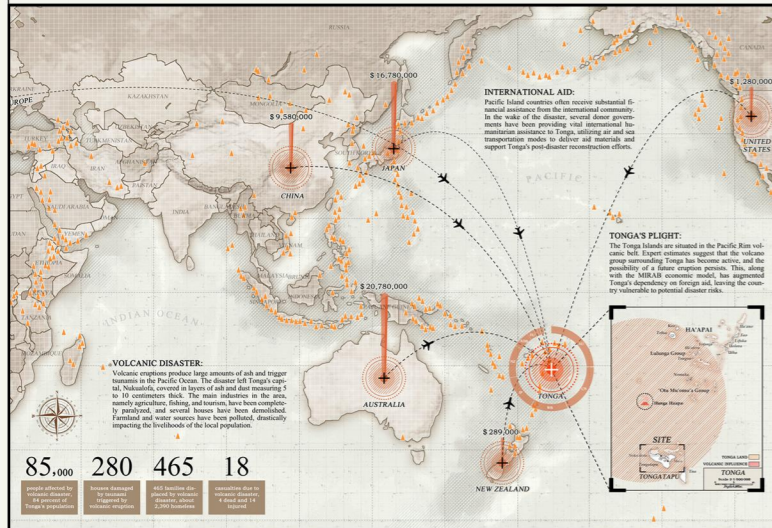
AID DEMAND TO AID DEPENDENT

MANY PACIFIC ISLAND COUNTRIES ARE CAUGHT IN THE MIRAB TRAP

MIRAB

MIRAB is a major potential economic structure for PIC Pacific Island countries, with four main elements:

- MIGRATION
- REMITTANCES
- AID
- BUREAUCRATISM



1. MIGRATION AND REMITTANCES



MIGRATION

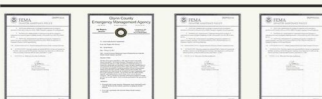
Go to other countries for better employment opportunities or higher income by participating in seasonal employment or immigration in other countries.

REMITTANCES

The remittances sent home by those who are employed outside the country contribute a lot of additional income to participating families each year.

PROBLEM: Migration and remittances contribute to income growth and development. But this could lead to a "remittance trap," which would leave economies trapped in low growth, high immigration. Countries receiving remittances may become dependent on exporting labor instead of goods produced with that labor, while leaving their countries short of working-age labor.

2. AID AND BUREAUCRACY



AID

Aid refers to the financial assistance and technical assistance provided by the international community to Pacific island countries.

BUREAUCRACY

High levels of international aid support high levels of public employment, raise wages in the public sector, and even involve governments in the production of private goods and services.



PROBLEM: Too much aid may reduce the government's incentive or need to address underlying economic problems and make necessary structural reforms. At the same time, public-sector pay and range inflation have undermined the ability of private firms to attract skilled workers at wages commensurate with their productivity. High levels of aid can even undermine good governance.

MIRAB REFLECTION

MIRAB MODEL



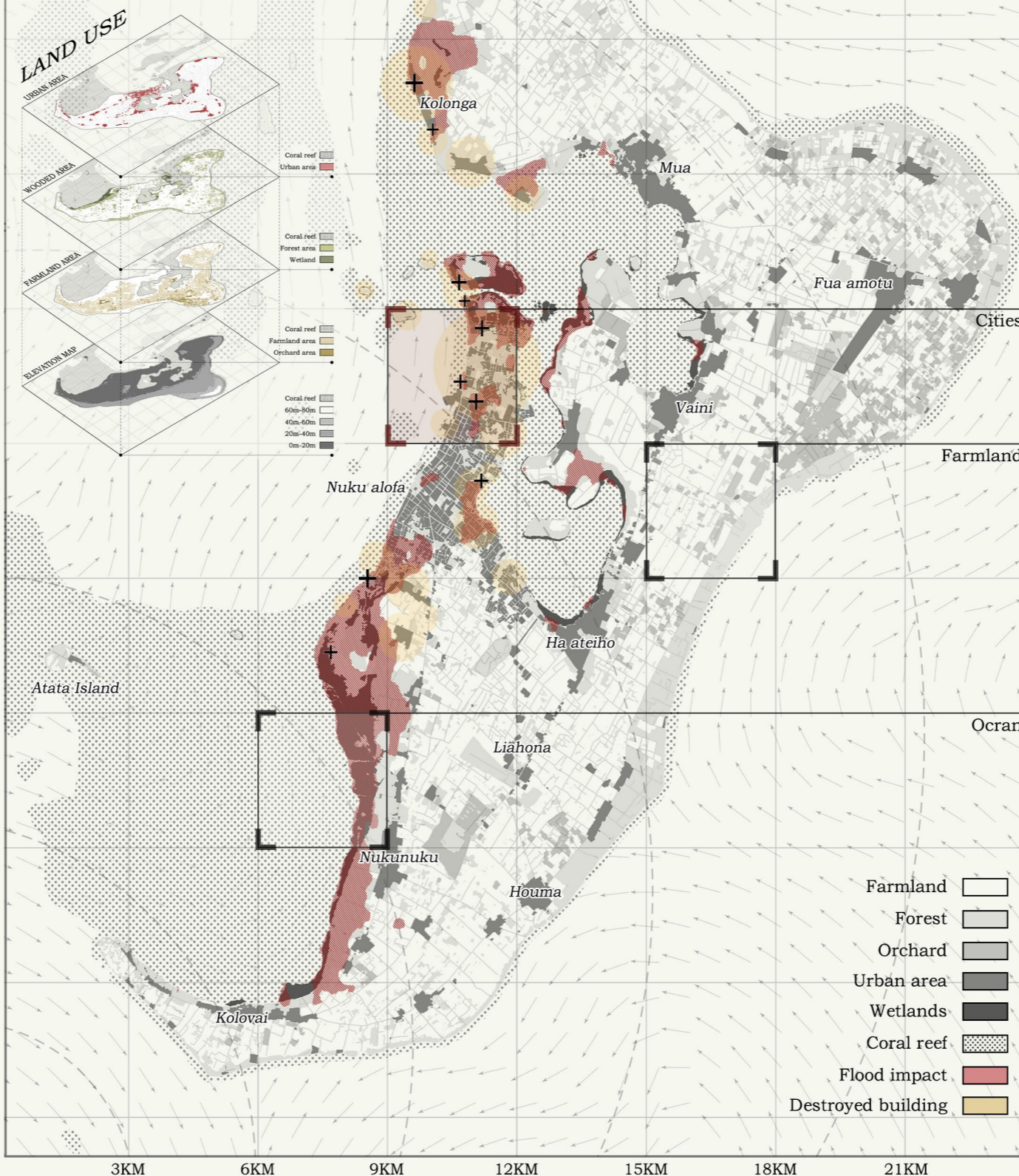
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Is there no viable alternative?

The MIRAB economic structure has brought short-term economic growth to many Pacific island countries, including Tonga, but is reliance on aid, remittances and rents a healthy, sustainable and preferable model for the long-term economic growth and development of islands or any society in the long run? Is there really no viable alternative?

SITE DAMAGE ANALYSIS

Through the analysis of the land use and disaster situation of Tonga's main island, we can know that various disasters caused by volcanic eruptions have had a serious negative impact on Tonga's environment, and buildings in many coastal cities have been damaged by tsunamis. Acid rain and volcanic ash pollute farmland and marine areas, and floating volcanic ash in the air can also threaten the lives and health of local people. Tonga's main industries are agriculture, fisheries and tourism, which were devastated in the wake of the disaster.



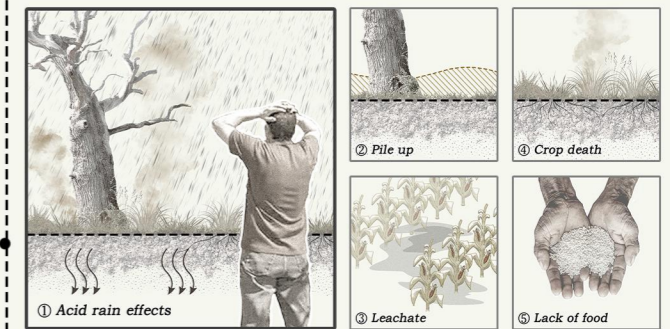
DISASTER ANALYSIS

Effects of volcanic eruptions on cities



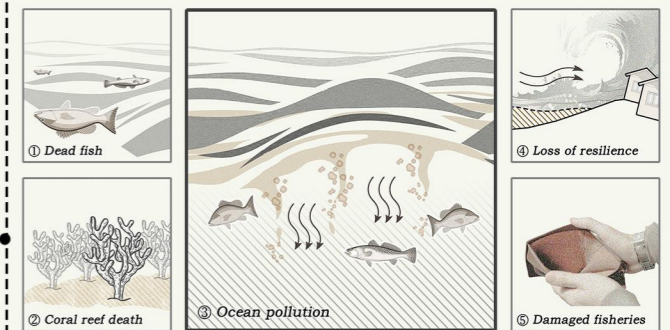
Volcanic ash from volcanic eruptions floats and accumulates in cities, posing a threat to the lives and health of local people. In addition, the tsunami caused by the volcanic eruption damaged infrastructure and buildings along Tonga's coast, leaving many people homeless.

Effects of volcanic eruptions on farmland



Volcanic ash from volcanic eruptions can cause acid rain and leachate contamination, which can seriously threaten Tonga's fresh water supply and agricultural activities, and soil erosion makes the soil unsuitable for crop growth. Tonga's agriculture has been hit hard.

Effects of volcanic eruptions on the ocean

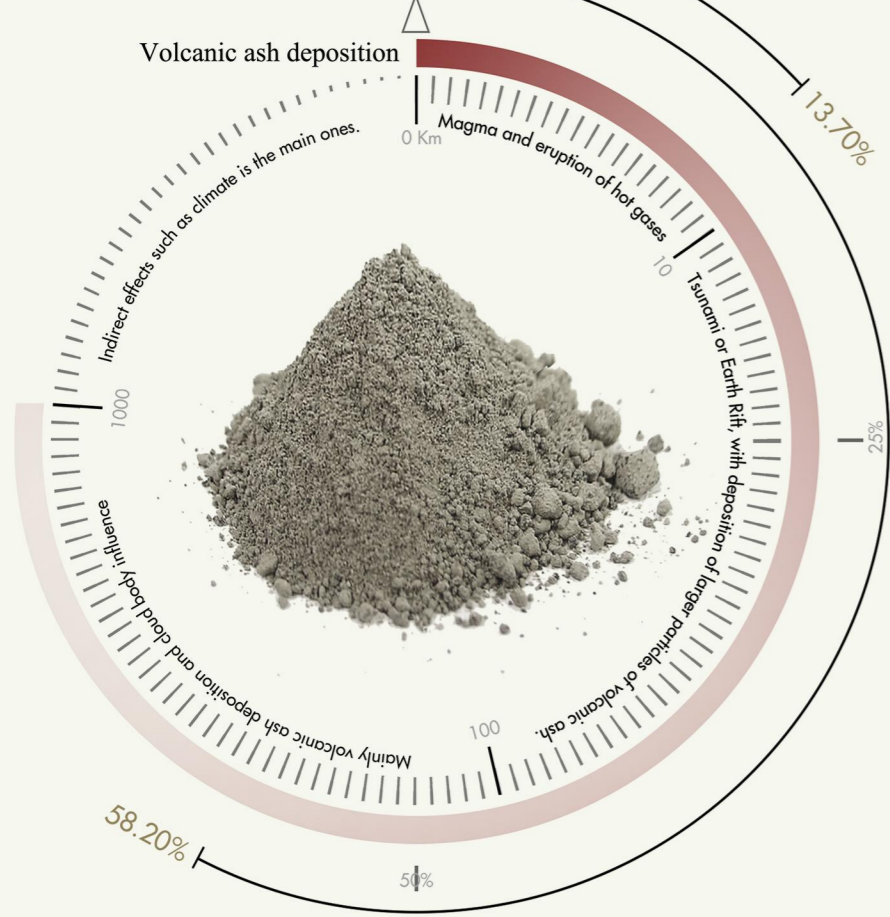


Volcanic disasters have caused serious damage to Tonga's marine ecosystem. The sea polluted by volcanic ash may lead to the death or migration of a large number of fish, while the death of coral reefs will further weaken Tonga's ability to cope with disasters in the future.

PROCESS ABOUT VOLCANIC ASH

VOLCANIC ASH COMPOSITION ANALYSIS & DISTRIBUTION RANGE

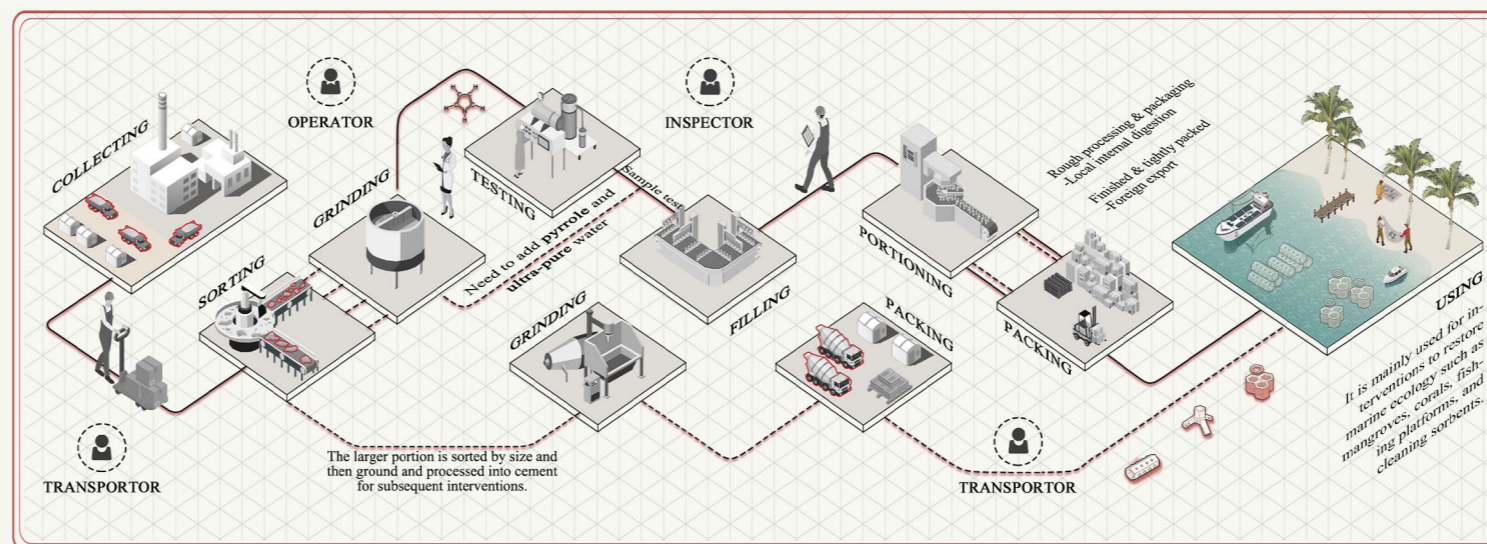
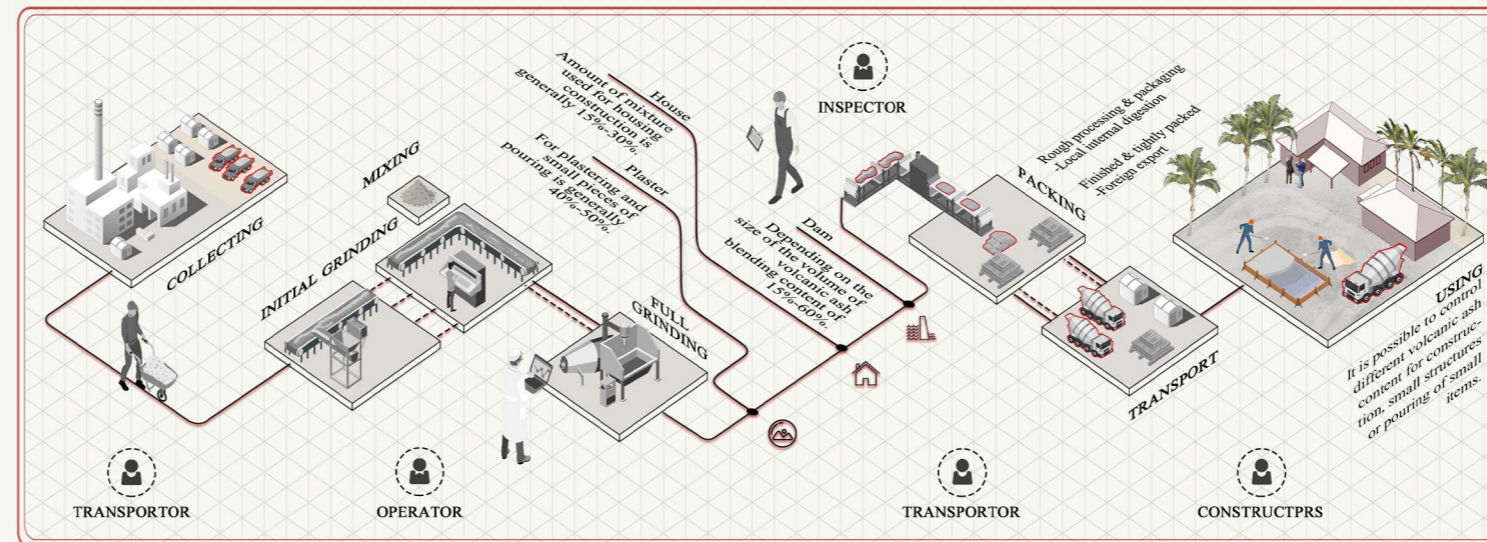
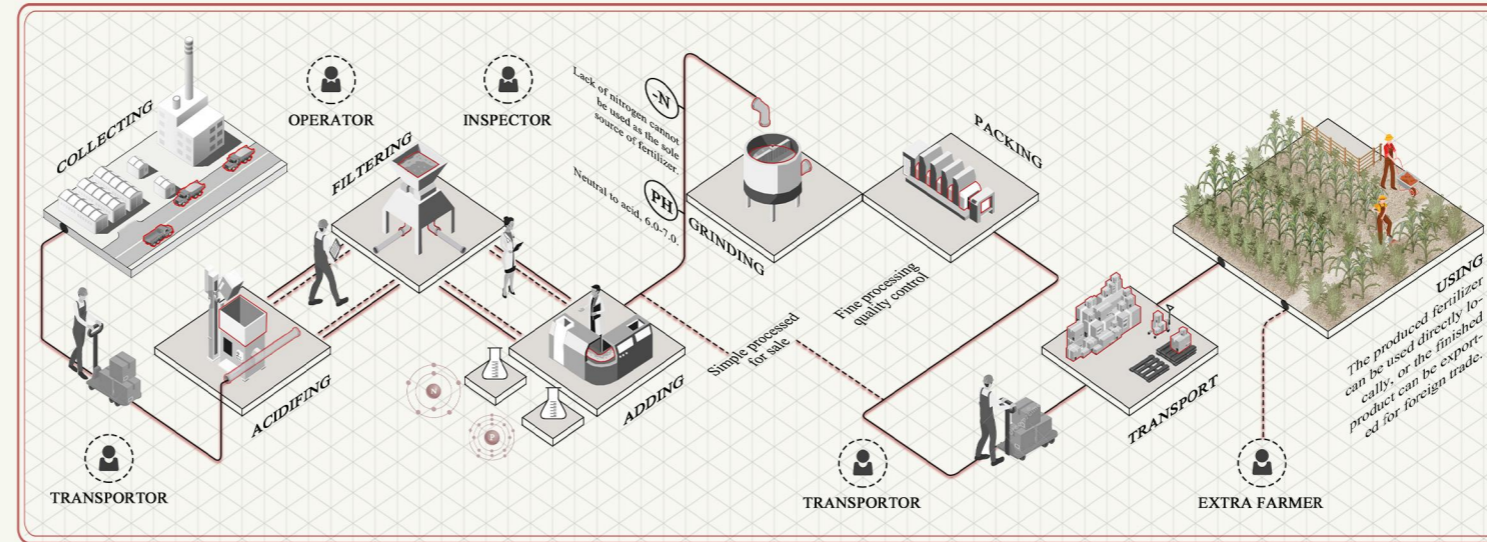
P	----- Anidride fosforica -----	0.80%
K	----- Potassium oxide -----	2.10%
Ca	----- Calcium oxide -----	4.65%
Na	----- Sodium oxide -----	4.75%
Mg	----- Magnesium oxide -----	6.55%
Fe	----- Ferric oxide -----	8.95%
Al	----- Aluminum oxide -----	13.70%
Si	----- Silicon dioxide -----	58.20%



VOLCANIC ASH

VOLCANIC ASH consists of fragments of rock, mineral crystals, and volcanic glass, created during volcanic eruptions and measuring less than 2 mm in diameter. Volcanic ash is formed during explosive volcanic eruptions when dissolved gases in magma expand and escape violently into the atmosphere.

VOLCANIC ASH COMPOSITION ANALYSIS



POSITIONS OFFERING

Newly introduced positions while creating the processing chain.

- COLLECTORS**
A position that only appeared in the pre-stage.
- TRANSPORTERS**
Transportation of volcanic ash and its output, etc.
- OPERATORS**
Work mainly at the nodes of the processing chain.
- PACKERS**
Responsible for packaging output and by-products.
- TRADE MERCHANT**
The surplus produced can be sold by foreign trade.
- SERVICE STAFF**
Mainly provide services after the transformation of the factory.



RESILIENCE BOOST

Enhancing local resilience on multiple fronts.

- ECONOMIC RESILIENCE**
A quick response to the short-term economy to keep society running.
- DISASTER RESILIENCE**
Significantly reducing the damage caused by the next disaster occurrence.
- ECOLOGICAL RESILIENCE**
Enhancing resilience to the next disaster through ecological ways.

DEPENDS ON MIRAB

① DISASTER EMERGENCY PHASE

By integrating transregional volcanic ash industry with local agriculture, fishery, and tourism, we create a sustainable industrial model that receives technical assistance instead of financial aid overseas and optimizes the industrial structure. Thus, such measures could bridge the employment gap and help local labor return.

② AFTER-DISASTER PHASE

The volcanic ash and its processed products are widely applied to the reconstruction process of Tonga and the restoration of the eco-environment through landscape intervention. It could not only reshape the resilience of successfully adapting to adversity, but also make it possible for the recovery of the local industries.

③ LONG-TERM DEVELOPMENT PHASE

As Tonga's pillar industries are revitalized in the ecological restoration process, we seek other directions of development, such as combining industries with the three pillar industries to form new economic models, as a way to ensure the sustainability of the chain.

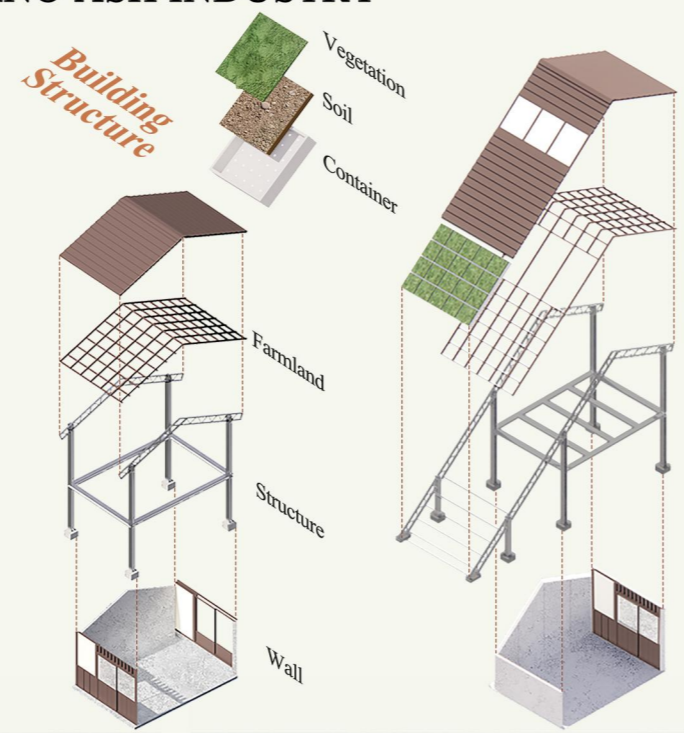
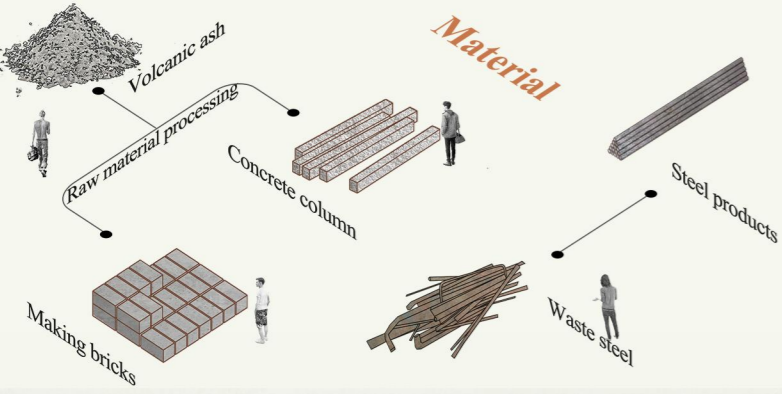
A ROBUST ECONOMY BASED ON VOLCANO ASH INDUSTRY

STRATEGY STATEMENT

Volcanic ash and other materials produced by the disaster are collected and roughly processed and become a shelter for people who have lost their homes in the process of post-disaster reconstruction. At the same time, different types of food supply modes are configured. After the disaster, the structures of these shelters will be preserved, and fields will be transformed into green spaces to carry out more functions.

VOLCANIC ASH UTILIZATION

The collected volcanic ash is made into customized bricks, which can be used to build the outer wall of the shelter. Another part of the collected volcanic ash can be used as pillars. In addition to forming structures such as shelters, it can also be used for planting pots. The waste steel produced by the destroyed houses can be used to support the structure of the shed after recasting.

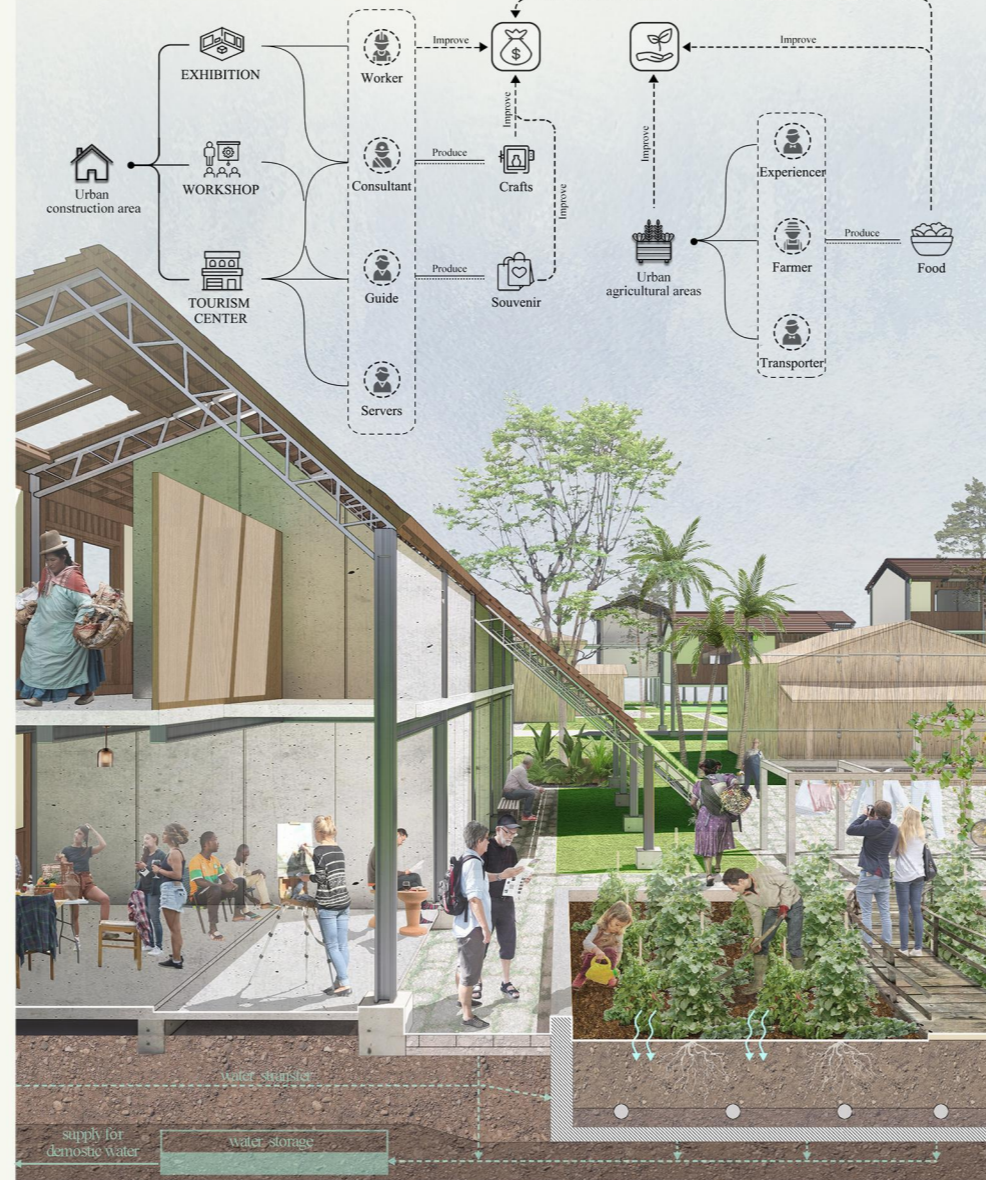


- DISASTER RESILIENCE
- ECONOMIC RESILIENCE
- ECOLOGICAL RESILIENCE

PHASE 1: AFTER-DISASTER PERIOD



PHASE 2: LONG-TERM SUSTAINABLE PLAN



PHASE 3: DISASTER EMERGENCY OCCUR

