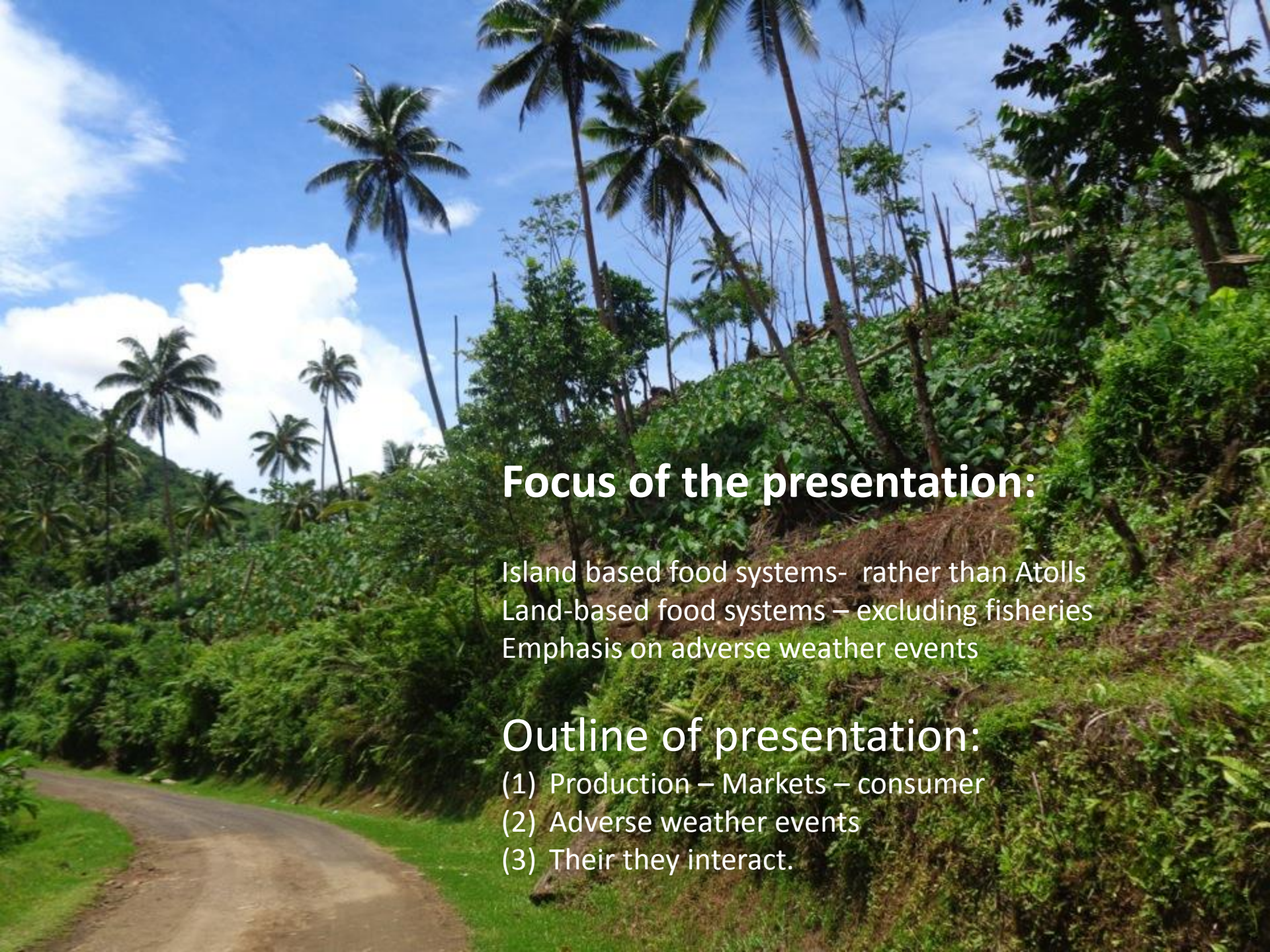
# Pacific food security under climate change

Steven JR Underhill
Professor of Horticulture
Principal Research Fellow (Pacific Agriculture)

University of the Sunshine Coast
Queensland, Australia

The University Of Queensland
AUSTRALIA



## Focus of the presentation:

Island based food systems-  rather than Atolls
Land-based food systems – excluding fisheries
Emphasis on adverse weather events

## Outline of presentation:

(1) Production – Markets – consumer
(2) Adverse weather events
(3) Their they interact.

# Food security status in the Pacific

*Throughout the Pacific, demand for food is increasingly being serviced by imports. Rice and wheat are now part of Pacific Islander's daily diet. This is a critical situation in terms of food security and nutritional security, given the volatility of international commodity prices*. ( FAO 2008)

*Food insecurity and inadequate nutrition are key issues which threaten lives and well-being in Pacific Island countries, and changes in climate are likely to exacerbate existing vulnerabilities (UN Women 2015)*

*Profound changes are needed to Pacific Island food systems to deal with the threat of climate change and more resilient food systems will have to be created* (SPC 2016)

# Food security verses nutritional security

- For most of the time and in most Pacific Islands its more about nutritional security rather than food security.
- Food security becomes a problem during periods of external shocks (normally weather-based) when local food supply chains rapidly breakdown.
- Local food production systems are often highly fragile but relatively resilient.
- This resilience, however, is dependent on frequency and predictable of external weather events.

## Food Production Systems in the Pacific

- Declining farming participation
- Land access challenges
  - limited arable land
  - customary land access
  - Short term 3-5 years land leases
- Trends towards urbanisation
  - Declining access to labor
- Poly-cultural production systems transiting to mono-cultural farming
- Declining or challenged soil fertility due to past production practices
- Reliance on rain-fed production & limited ground water
- Resource-limited technical support agencies

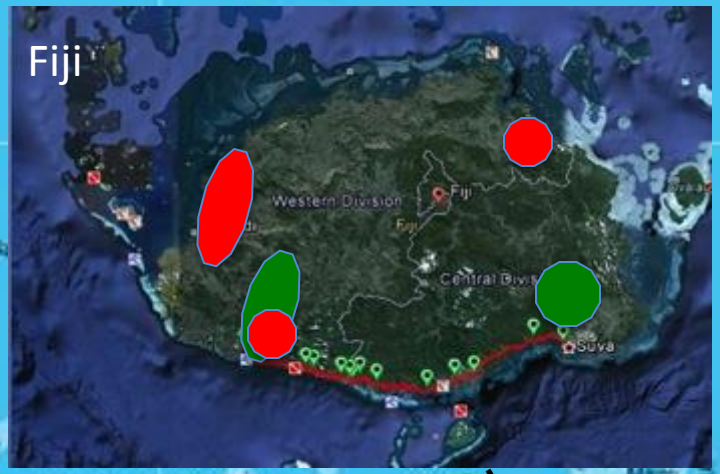
## Food supply systems in the Pacific

- Commercial food production systems are often geographically concentrated
- Few food transport options
- Transport logistics often dependent on critical infrastructure.
- Semi-centralised marketing around a network of municipal markets
- Limited inter-island fresh food supply chains
- Limited cool chain management capacity from farm to market
- Current food losses 12-20 %
- Locally produced food often more expensive than imported product

Vegetables

Root crops

Fruits





FEDERATED STATES OF MICRONESIA

NAURU

KIRIBATI

Gilbert Islands

Phoenix Islands

Line Islands

PAPUA NEW GUINEA

New Ireland

New Britain

SOLOMON ISLANDS

Bougainville

Guadalcanal

Santa Cruz Islands

TUVALU

Funafuti

TOKELAU (NZ)

WALLIS & FUTUNA (FR)

SAMOA

COOK ISLANDS

AMERICAN SAMOA (US)

NIUE

TONGA

VANUATU

Efate

Vanua Lava

Lau Group

FIJI

NEW CALEDONIA (FR)

Loyalty Islands

FRENCH POLYNESIA

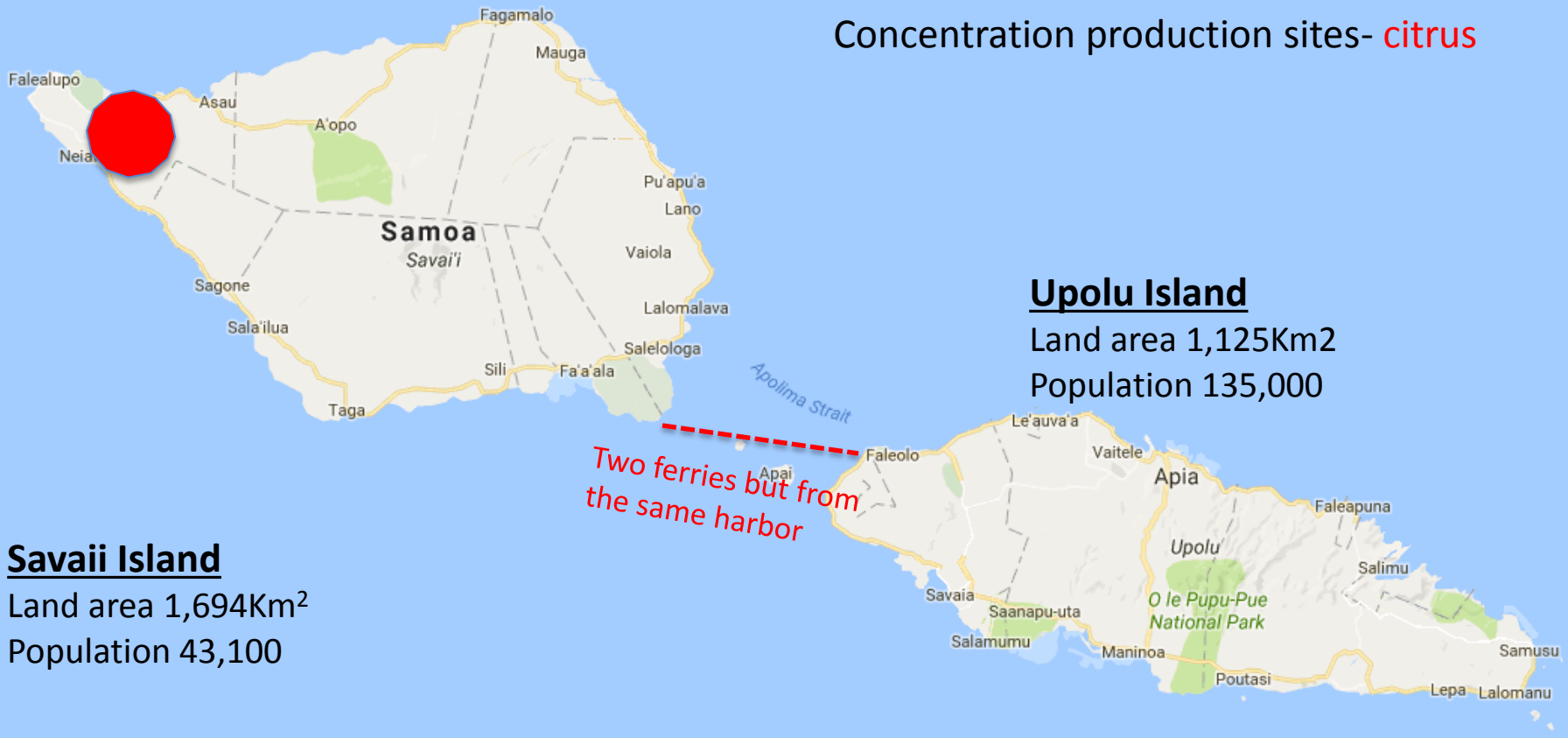
Tahiti

Society Islands

Rarotonga

# Samoa

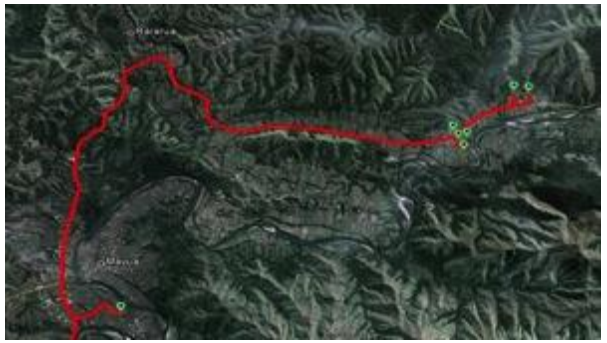
Concentration production sites- citrus




**Upolu Island**
Land area 1,125Km2
Population 135,000

**Savaii Island**
Land area 1,694Km$^2$
Population 43,100

If the Savaii to Upolu ferry is disrupted then the vast majority of the domestic citrus supply on Upolu (supporting 135,000 people) is removed. As citrus is a counter-seasonal fruit crop, this has wider food supply implications

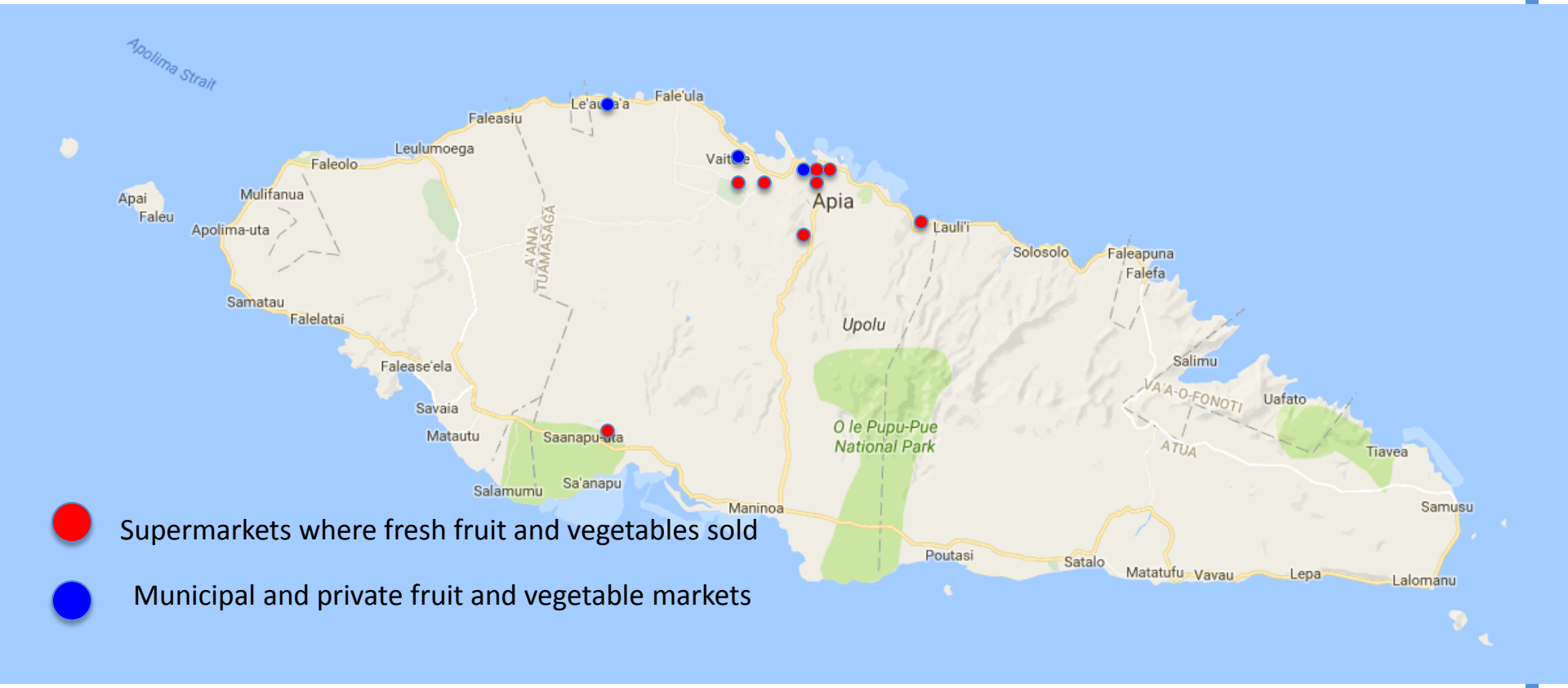



**Supply route easily disrupted.**

Most of the vegetable crops on the island of Viti Levu, in Fiji are sourced from the Sigatoka valley.

There are only three roads into the valley – all of which highly vulnerable to frequent severe flooding.

# Retail outlets and markets supplying fresh fruit and vegetables- Samoa




Supermarkets where fresh fruit and vegetables sold

Municipal and private fruit and vegetable markets

## Human element

- Strong dietary preferences
  - Low intake of vegetables
  - Limited diversity of food crops consumed.
- Trends towards urbanisation
  - Reduced food self dependence
- Heavy reliance on public transport to access food markets
- Increasing remittance dependence in some Islands

# Pacific horticulture food systems in the context of climate change

## Risk factors - Fragile

1. Localized & centralised production (time and place)
2. Few food outlets and limited distribution networks
3. Increased reliance of commercial food sources
4. Limited food transport modes – often easily impaired
5. Low horticultural crops diversity
6. Low productivity
7. Declining farm participation
8. Limited central storage capacity (3 days food supply)
9. Low self recovery capacity

## Resilient factors

1. Significant subsistence farming –alternative food
2. Short transport distances
3. Dominance of low impact crops (root crops, vegetables)
4. Secondary production locations –alternative food supply
5. Low input farming systems – limited infrastructure damage
6. Seasonal farming limiting production during high risk periods

## South Pacific (since 2010)

**Hurricanes**

- 19 severe tropical cyclones (STC)
- 118 deaths due to STC
- >US$1.5 Billion in damage
- Of which US$1.2Billion of damage in last two years (Cyclone Pam and Winston)

**Flooding**

- 113 tropical depressions leading to localized flooding
    - Flooding in Fiji (April 2016) kills 3 people
    - Flash flooding in Solomon Islands in 2014 kills 22 people and displaces 50,000.

**Drought**

- PNG Highland drought (July 2016) has 125,000 on emergency food aid.

## Case example One

## 2014 Honiara flooding (Solomon Islands)

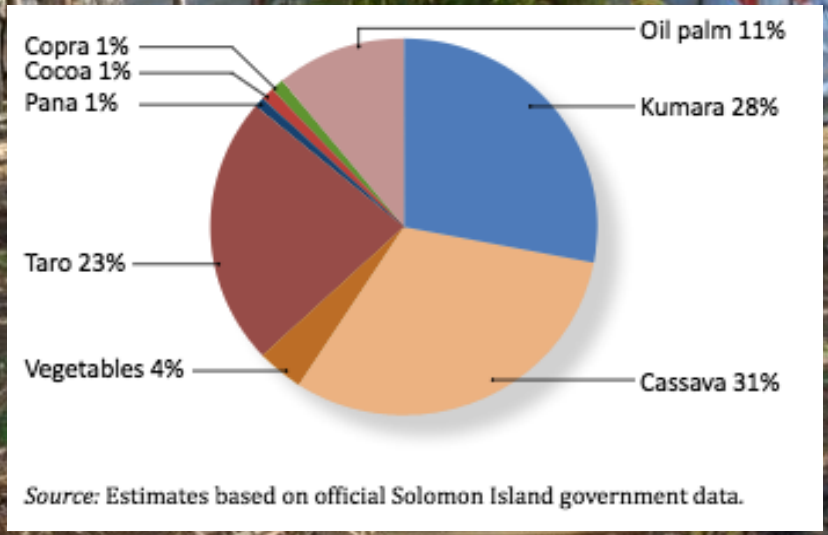
## Overview

- April 2014 – flash flooding in Honiara, Guadalcanal, Isabel, Malaita, and Makira-Ulawa due to Cyclone Ita
- 500mm concentrated rainfall in 24 hrs

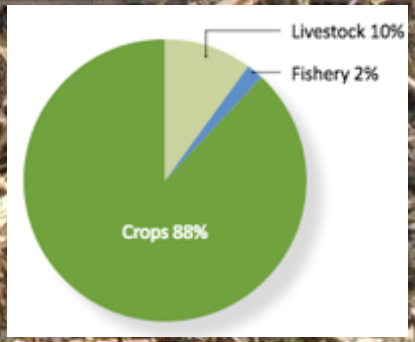
- Total damage bill US$107.8M or (9.2%GDP)
- 22 fatalities

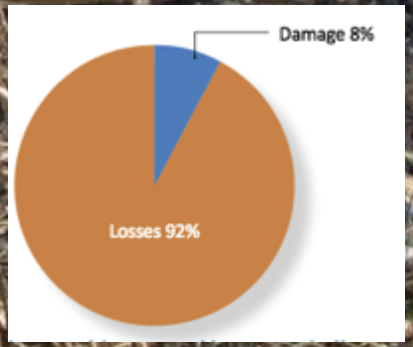
- 10,000 displaced individuals
- 7335 households directly affected
  - 89% of urban and 96% rural population grow their own food .

Resultant crops damage




*Source:* Estimates based on official Solomon Island government data.



# Physical impacts

Most of the commercial horticulture production from the Guadalcanal delta destroyed

E-W Road network into Honiara destroyed

Road access within Honiara limited due to destruction of one of the main access bridge

Population displacement

Horticultural product alternatively sourced from secondary outer Islands

- Increased boat and ferry supply routes
- Increased losses due to prolong transport

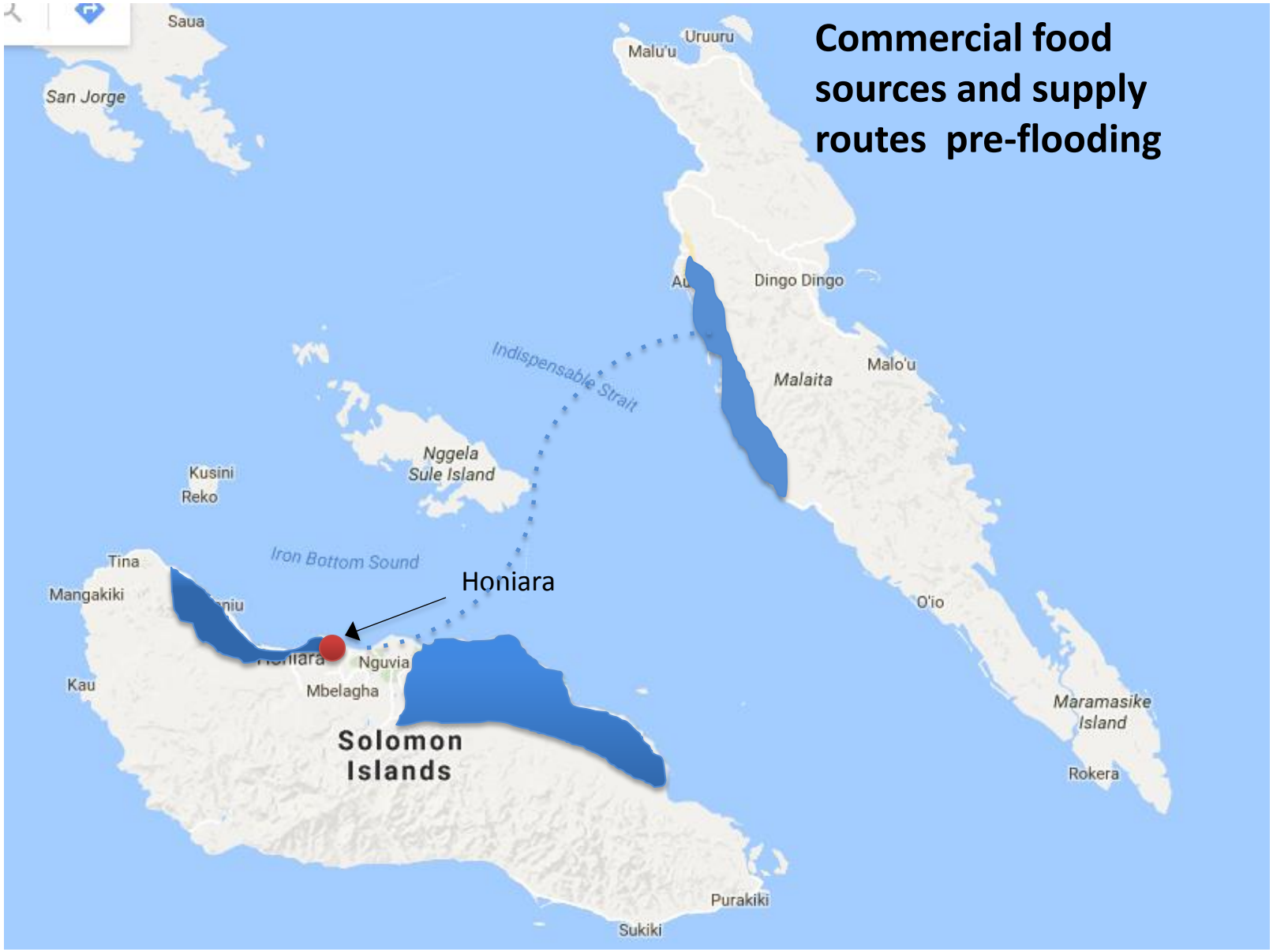
Transport costs go up.

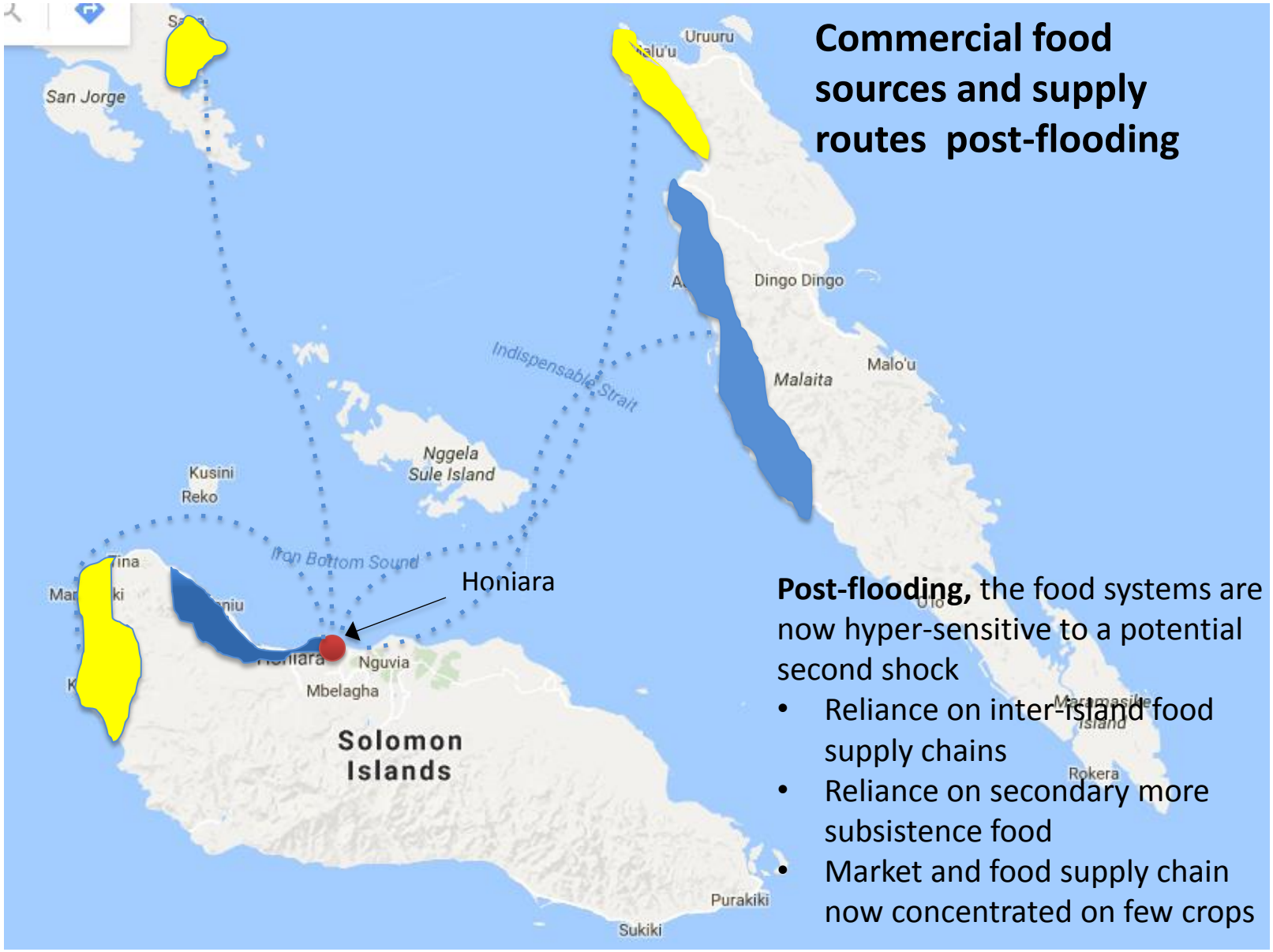
- local community road use fees
- Reduce farmer access to trucks
- Greater reliance on small local buses

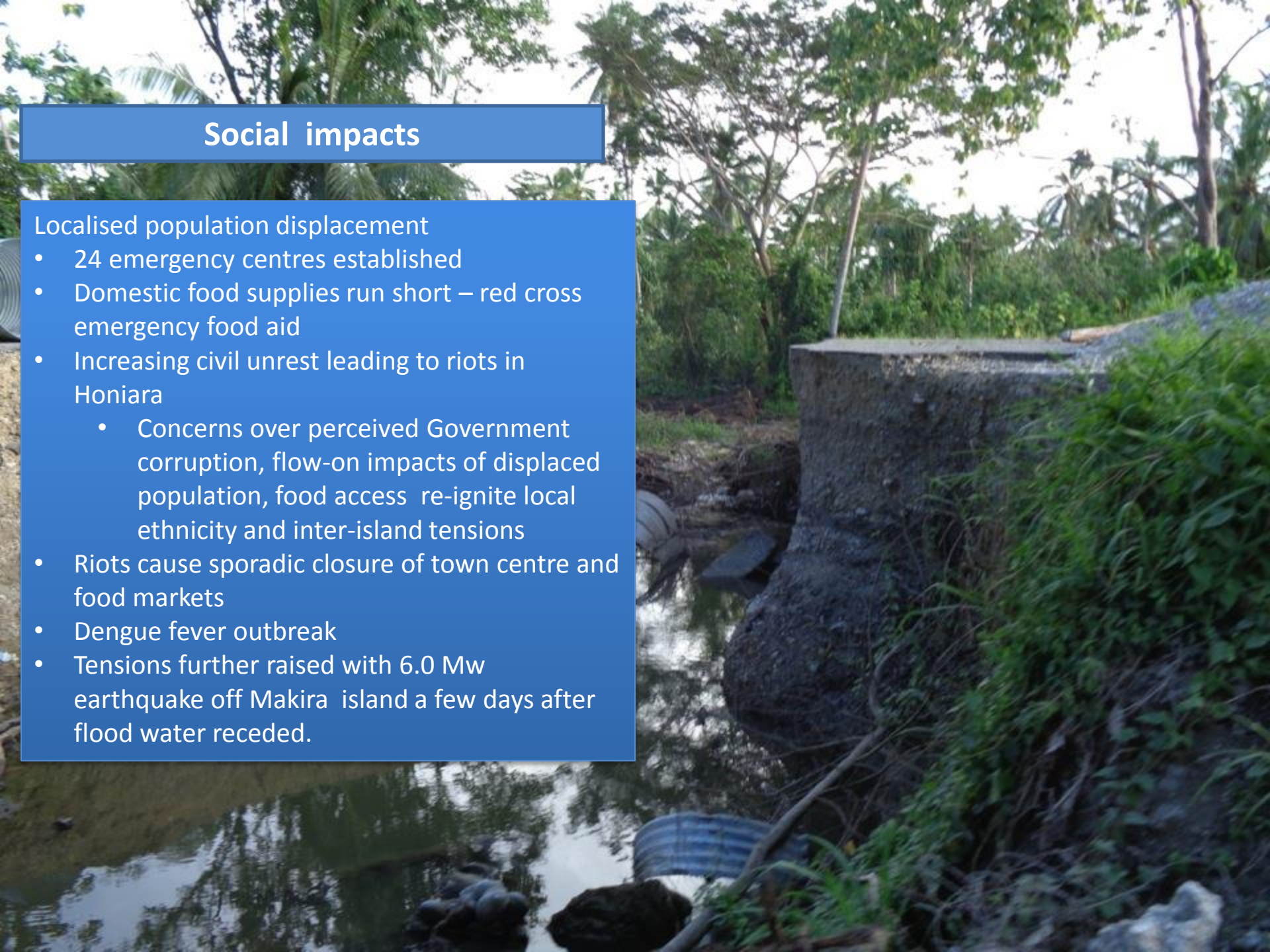
Greater portion traditional commodities sold on market

Seed supply constraints impair recovery

Increased vendor participation municipal market


Commercial food sources and supply routes pre-flooding
Saua
San Jorge
Uruuru
Malu'u
Dingo Dingo
Malaita
Malo'u
Indispensable Strait
Nggela Sule Island
Kusini
Reko
Tina
Mangakiki
Iron Bottom Sound
Honiara
Nguvia
Mbelagha
Kau
Solomon Islands
O'io
Maramasike Island
Rokera
Purakiki
Sukiki


Commercial food sources and supply routes post-flooding
San Jorge
Uruuru
Dingo Dingo
Malaita
Malo'u
Indispensable Strait
Nggela Sule Island
Kusini
Reko
Iron Bottom Sound
Honiara
Nguvia
Mbelagha
Solomon Islands
Purakiki
Sukiki
Rokera
Post-flooding, the food systems are now hyper-sensitive to a potential second shock
• Reliance on inter-island food supply chains
• Reliance on secondary more subsistence food
• Market and food supply chain now concentrated on few crops



# Social impacts

Localised population displacement

- 24 emergency centres established
- Domestic food supplies run short – red cross emergency food aid
- Increasing civil unrest leading to riots in Honiara
    - Concerns over perceived Government corruption, flow-on impacts of displaced population, food access re-ignite local ethnicity and inter-island tensions
- Riots cause sporadic closure of town centre and food markets
- Dengue fever outbreak
- Tensions further raised with 6.0 Mw earthquake off Makira island a few days after flood water receded.

Adverse climatic events have dramatic impacts on food systems in the Pacific – exposing underlying food security challenges.

But as was the case in Solomon Islands, they can also trigger a sequence of complex events that can lead to riots, re-emergence of ethic tension, and public insecurity.

## Honiara burns as rioters return

Looters set a store ablaze in Honiara today.
Photo: *Rev Kevin Rietveld*

## Solomon Islands capital Honiara calm after riots by flood victims

Posted 19 May 2014, 11:33am

**Solomon Islands' police say the situation in Honiara and other parts of Guadalcanal is calm after two nights of rioting at the end of last week during which several people were injured and five were arrested.**

Police say most of the rioters were people affected by last month's flood disaster, with many coming from a temporary evacuation centre at the national university.

According to reports, a crowd of more than 400 people started looting an area near the King George VI secondary school on Friday night. At least one shop in the area was burned down.

World Vision Country Program Director, Andrew Catford, says the situation has now stabilised.

"The good news is it was a fairly calm and stable weekend, and our hope is that continues," he told Pacific Beat.

**PHOTO:** People sheltering at the evacuation centre at "Panatina Pavilion" in the Solomon Islands capital of Honiara.
(AFP: World Vision/Rachel Skeates)

**RELATED STORY:** Solomon Islands govt denies it's withholding flood aid

**RELATED STORY:** Police deployed to prevent riots in Solomons capital

**MAP:** Solomon Islands

Print | Email | Facebook | Twitter | More

## Solomons businesses close amid fears of further riots in Honiara

Updated 20 May 2014, 2:56pm

**Fears of further riots in Solomon Islands' capital, Honiara, has led to most businesses closing their doors on Monday.**

At least four buildings were reportedly looted and torched on Friday and there were further disturbances again on Saturday, leading to at least five arrests.

Riot police are again patrolling the streets after the city returned to calm on Sunday.

According to reports, a crowd of more than 400 people started looting in an area near the King George VI High School in eastern Honiara on Friday night.

Police say most of the rioters were people affected by last month's flood disaster, who are unhappy with the government's relief program.

**PHOTO:** Rioters threw rocks and burned shops in the capital, Honiara, on May 16, 2014.
(Facebook: Forum Solomon Islands International )

**RELATED STORY:** Honiara calm after weekend riots

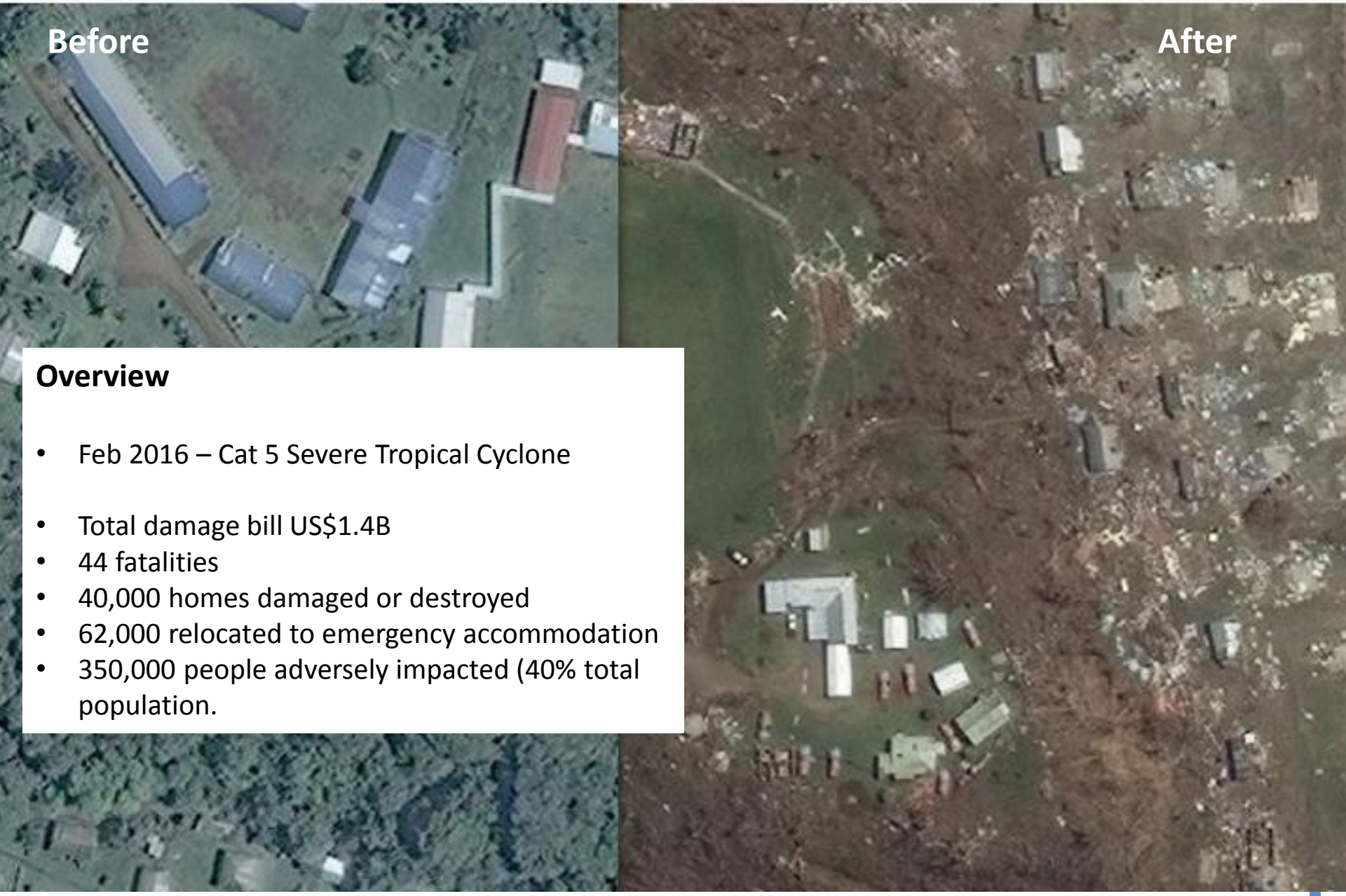
**RELATED STORY:** Police deployed to prevent riots in Solomons capital

**MAP:** Solomon Islands

## Case example Two

### 2016 Cyclone Winston (Fiji)


Source. Digitglobe



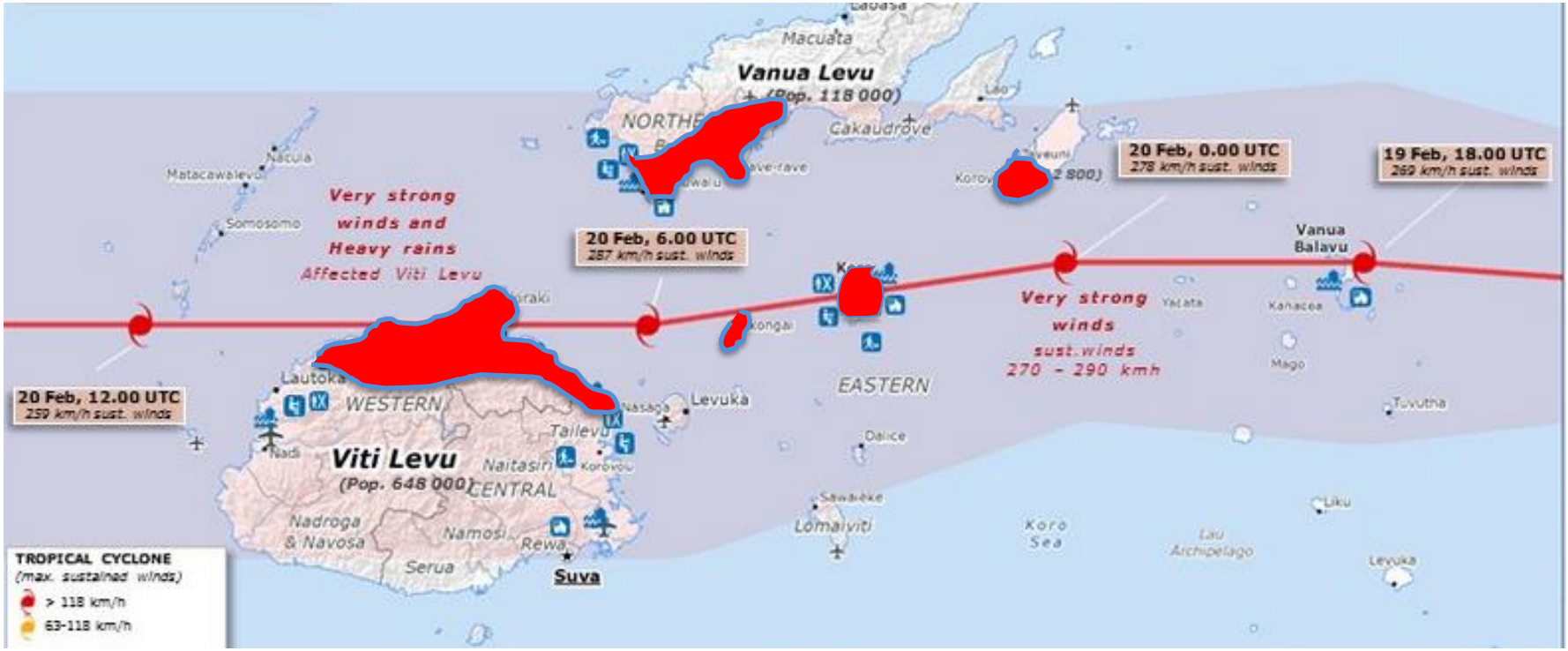

## Overview

- Feb 2016 – Cat 5 Severe Tropical Cyclone

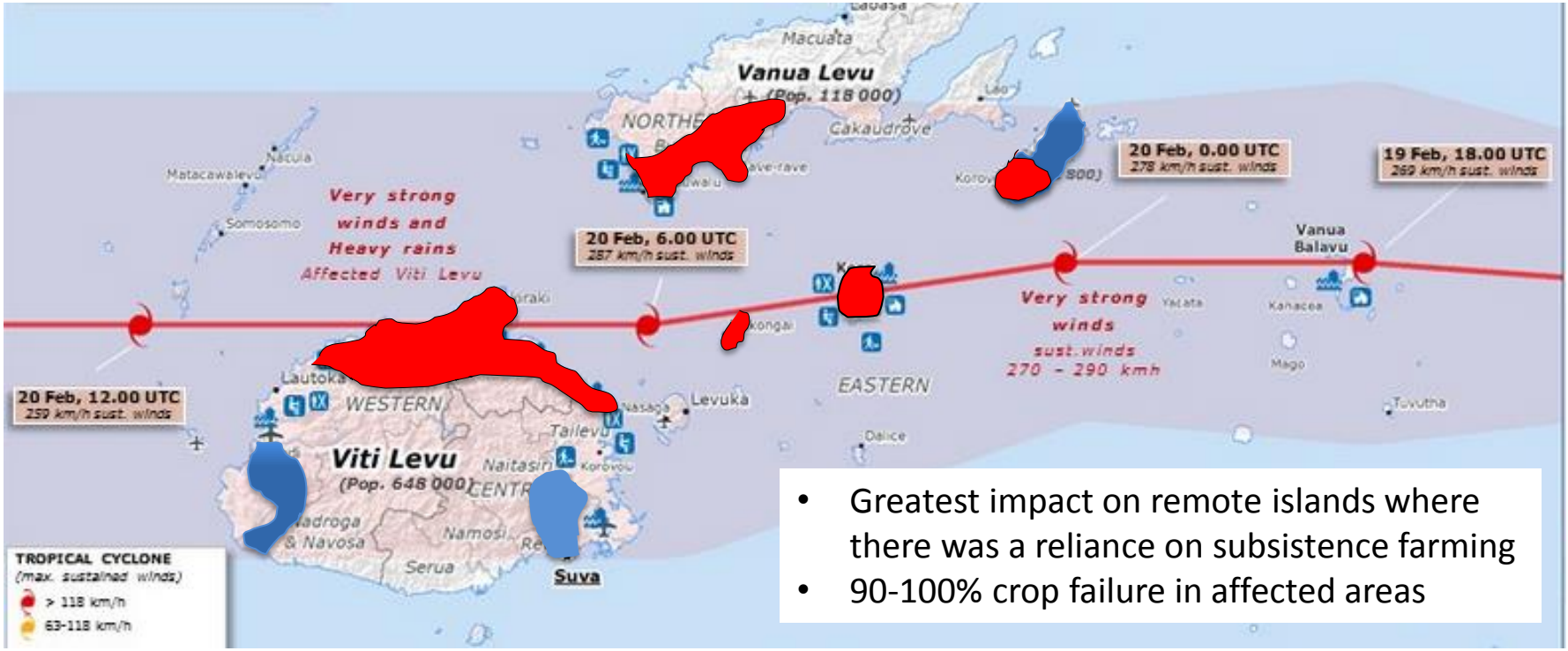
- Total damage bill US$1.4B
- 44 fatalities
- 40,000 homes damaged or destroyed
- 62,000 relocated to emergency accommodation
- 350,000 people adversely impacted (40% total population.

Source. Digitglobe

Where most of the food security impacts occurred



# Where most of the food security impacts occurred

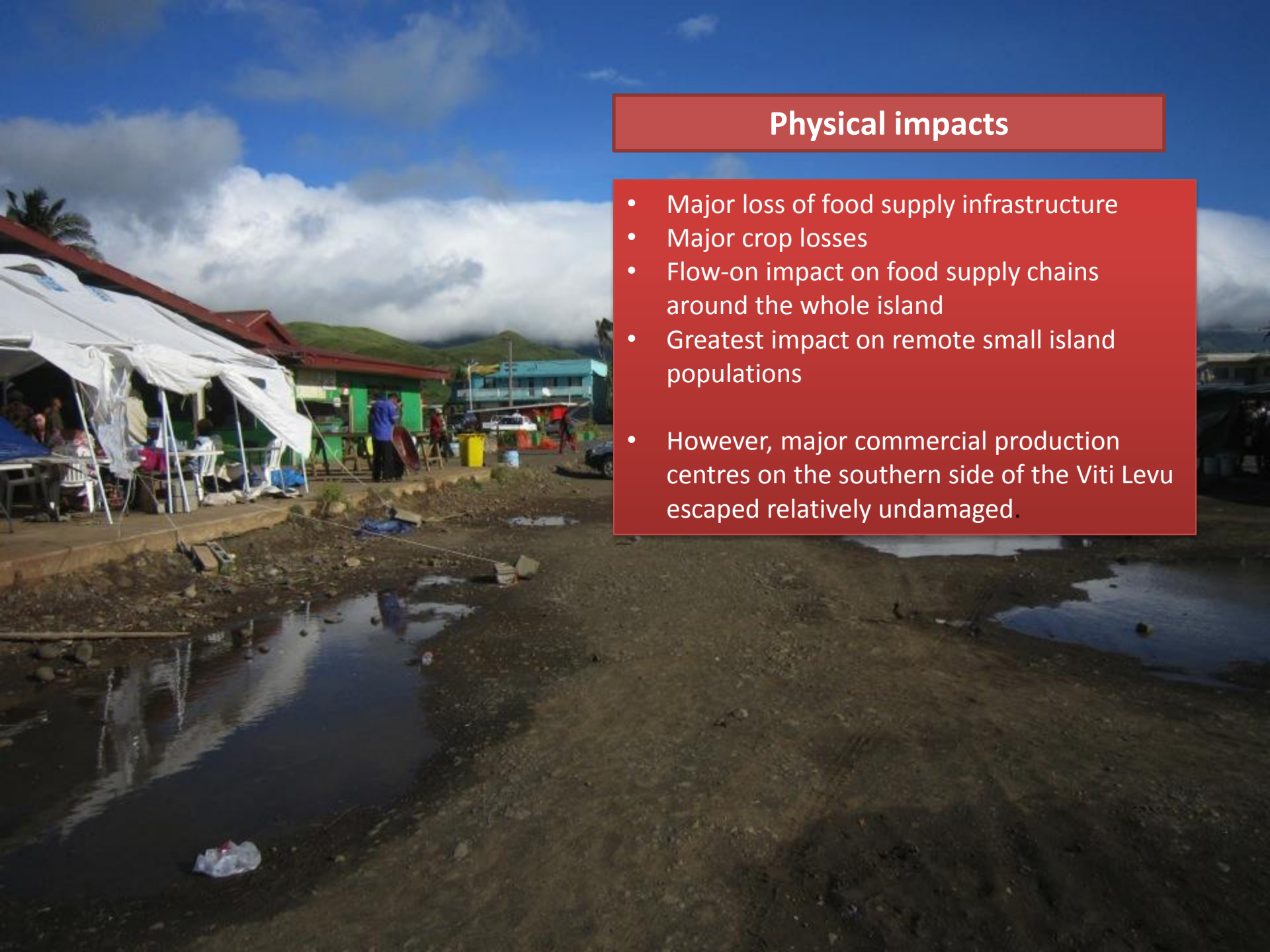



- Greatest impact on remote islands where there was a reliance on subsistence farming
- 90-100% crop failure in affected areas

Major commercial horticulture production locations

High impact locations

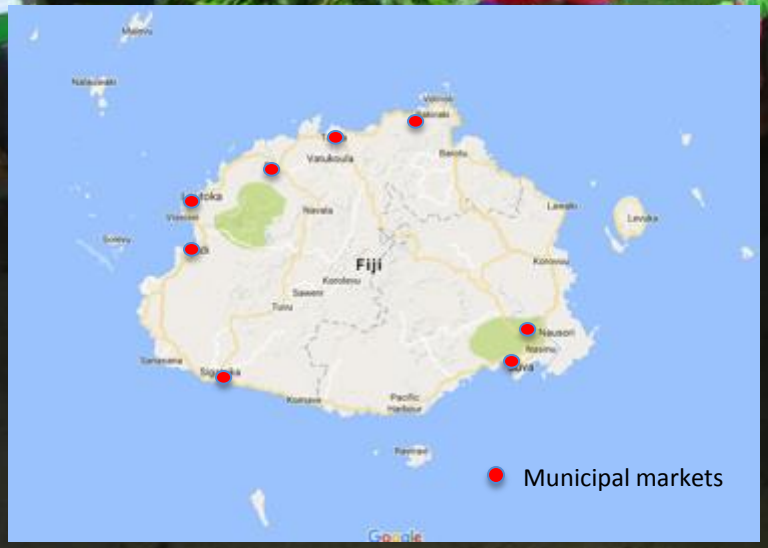

Rakiraki municipal markets, North Viti levu
June 2016



## Physical impacts

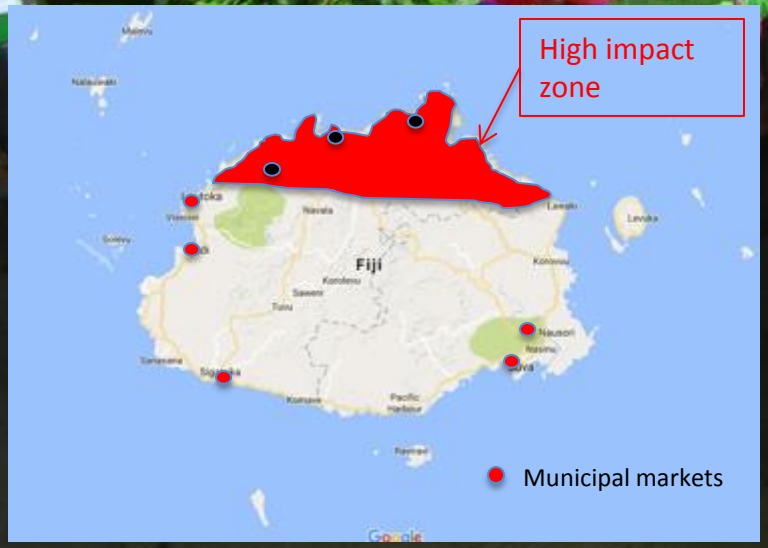
- Major loss of food supply infrastructure
- Major crop losses
- Flow-on impact on food supply chains around the whole island
- Greatest impact on remote small island populations

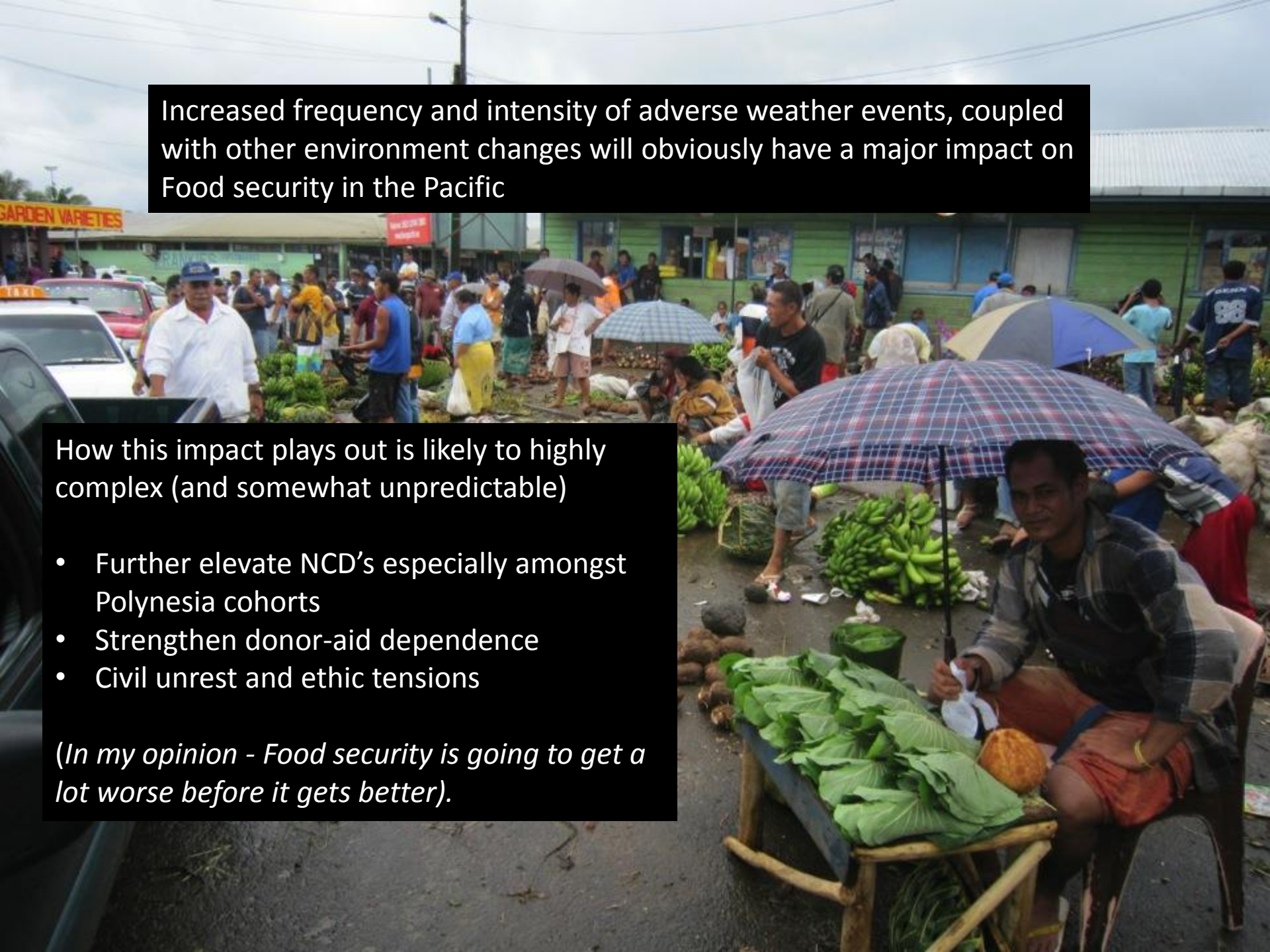
- However, major commercial production centres on the southern side of the Viti Levu escaped relatively undamaged.


Fiji
Municipal markets

# Supply chain impacts

- In-market postharvest loss reduced (8.2% to 2.5 %)
- Vendors stockpiling due to difficulty in sourcing product
- Product held longer in markets (high ambient conditions) to recover higher purchase price – nutrition implications
- Consumer prepared to buy poor quality product
- Change in commodities sold – Govt. cessation of exports to re-direct product thru domestic market (ginger)
- Perceived higher pesticide usage - crop more valuable.
- Increased number of farmers direct selling in the markets
- Gender participation in market changes in favour of males
- Vendor to vendor purchasing cycle
- Elevated ethnicity impacts on supply chain
- Product moving between markets (South to North)






Increased frequency and intensity of adverse weather events, coupled with other environment changes will obviously have a major impact on Food security in the Pacific

How this impact plays out is likely to highly complex (and somewhat unpredictable)

- Further elevate NCD's especially amongst Polynesia cohorts
- Strengthen donor-aid dependence
- Civil unrest and ethic tensions

(*In my opinion - Food security is going to get a lot worse before it gets better).*


WITH GOD, EVERYTHING IS POSSIBLE