



CLIMATE CHANGE & MARKETS FOR CHANGE PROGRAMMES

BUILDING MARKET RESILIENCE TO CLIMATE CHANGE

FIJI ASSESSMENT REPORT
DECEMBER 2016



UN Women's Markets for Change project

UN Women's Markets for Change project is a key component of its Women's Economic Empowerment programme. The six-year, multi-country initiative aims to ensure that marketplaces in rural and urban areas in Fiji, Solomon Islands and Vanuatu are safe, inclusive and non-discriminatory, promoting gender equality and women's empowerment. The United Nations Development Programme is the responsible party for outcome two of the project.

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Executive Summary

Fiji is one of the most vulnerable nations to the impacts of disasters and climate change; two-thirds of the population rely on agricultural production for food and income, and almost a third lives below the poverty line, making the subsistence farming sector, and those that rely on it for livelihoods, particularly vulnerable to natural 'shocks'.

This UN Women project assesses the resilience of twelve municipal markets in Fiji (Ba, Labasa, Lautoka, Levuka, Nadi, Namaka, Nausori, Rakiraki, Savusavu, Sigatoka, Suva and Tavua) to disasters and climate change. All sites were mapped and assessed in terms of location, exposure, infrastructure, governance, services and security. Owing to time constraints, only five markets (Ba, Nadi, Rakiraki, Savusavu and Suva) were selected for further study, involving the organisation of group activities that focused on vendor awareness, preparedness and adaptability to natural hazards and climate change, and random in-depth interviews with permanent and casual vendors. The groups were tasked with compiling a seasonal calendar, historical timeline and vulnerability matrix for each potential hazard.

None of the markets had a disaster plan, although vendors in markets that experience frequent flooding were aware of warning signs and generally would be well prepared. All vendors know what to do to prepare for a cyclone, although many were caught out by the severity of Cyclone Winston, as they did not realise the impacts that a category five cyclone would

inflict, and casual vendors (who sell produce ad hoc) especially said that they were unaware that Winston was even forecast. Casual vendors need special attention in the market context, too, as they often attend only on one or two days a week and generally have little understanding of market operations and procedures. They are also not involved in decision - making processes at the market-association level.

In terms of infrastructural resilience, most markets have been at their current locations for a number of years and more buildings have been added at each site when demand requires, Nadi Market for instance, has had six phases of development at its current site. Such expansion creates ventilation and light issues for inner buildings, drainage concerns where adjacent roofs meet, and access issues because of uneven floors and inaccessible ramps between buildings. Additionally, at many markets casual vendors still sell produce unprotected from the floor, and most vendors on the periphery of buildings lack adequate shade, at least during part of the day.

The report offers key messages for disaster-risk training, and finds that market vendors would benefit greatly from the development of site-specific disaster risk management plans, in terms of knowledge and future actions; and many of the infrastructural issues present at the current markets could be 'planned out' at the design stage for the new market sites, so that the build-back-better concept can be applied to future municipal markets in Fiji.



Introduction

Over the last decade, literature has developed on the issue of climate change and food security at the global level (Ludi et al., 2007; FAO, 2015), with much focus on global commodities and international supply chains; yet food insecurity and environmental impacts are experienced largely at the local level. Within Fiji, agricultural production is vital for long-term sustainable development; it provides food and livelihood security, promotes community development in rural areas and generates income for approximately two-thirds of the population (Fiji Government, 2009).

While the sugar industry is the commercial backbone of the agricultural sector in Fiji, many people are still reliant on rural subsistence agriculture. An estimated 40% of farmers are engaged solely in subsistence farming (Asian Development Bank, 2012); and the majority of farms are small scale (over 70% of farms in Fiji are less than three hectares in size), with the majority of produce sold locally (Fiji Government, 2009). The sector is highly susceptible to economic shocks, therefore, and almost a third (31%) of the population lives below the poverty line, one of the highest rates in the Pacific (ADB, 2016).

Such economic circumstances are compounded further because Fiji is one of the most vulnerable countries to disasters and climate change, which have the potential to damage the health and productivity of critical ecosystems, and disrupt local agricultural markets extensively (Terry and Goff, 2012). Smallholders and subsistence farmers, reliant on the environment for their security and livelihoods, are especially vulnerable when disaster strikes (FAO, 2016).

"Storm and cyclone damage to equipment for processing and storing food, and to roads, rail and vehicles, can upset the effective supply of food, and goods to markets, and thus threaten the livelihoods of rural growers" (Barnett, 2007, p.33).

Vulnerability to natural hazards and climate change, however, has different, gendered dimensions, and women in Fiji are increasingly being exposed to the adverse conditions.

"Women of all ethnic groups are active in produce marketing, and growing numbers of women have become small-scale entrepreneurs, buying [...] from the growers to resell at municipal markets" (ADB, 2006, p.24).

At the sales-consumer end of the production supply chain, market vendors - the majority of whom are women (ADB, 2006) - are especially susceptible to the consequences of supply-side shocks from extreme weather events. Produce supplies are interrupted, with severe and immediate production losses post-disaster, and ongoing reduced yields during recovery, severely impacting the operations of the highly-feminised market sector. And in the immediate aftermath of an extreme event, in addition to having to cope with the disruption to the market workplace, women have greater household care concerns and responsibilities (Hallegatte et al., 2016).

This report examines the resilience of 12 municipal markets and market vendors in Fiji to disasters and climate change. It is divided into four broad sections. The first section provides information on the types and occurrence of disasters in Fiji. Then discussion of the current and future implications of climate change is briefly presented. The second section gives the background to the study, and its objectives and methodology. Subsequently, the results of the field assessments are presented in section 3, along with in-depth focus group work, before recommendations are given based on the main findings. The fourth and last section outlines a model disasters management plan for markets and market vendors in Fiji.



1. Hazard Assessment

An Overview of Disasters in Fiji

The majority of the 300-plus Fiji Islands are classed as high volcanic islands, with mountainous, rugged interiors, that are unsuitable for extensive development. Steep slopes, high rainfall and tropical weather mean that Fiji is regularly impacted by disasters, when geographical location and geophysical characteristics combine.

Furthermore, the population of the island nation is highly concentrated in coastal areas, where most towns, agriculture, key infrastructure and economic activities are located - over three-quarters of urban areas and almost 60% of agriculture are in the coastal zone (Nunn et al., 1994). Such low-lying, lineal geography in proximity to the coast further heightens the vulnerability of the island nation (Benson, 1997), resulting in Fiji being in the top ten Asian-Pacific countries in terms of exposure to natural hazards (UNESCAP, 2013). Between 1970 and 2007 a total of 124 disasters were reported, affecting almost every part of the country (SOPAC, 2009).

Half of the reported disasters were cyclones (50%), followed by floods (33%) and then earthquakes (8%) (SOPAC, 2009). Landslides and droughts make up only a small percentage - each accounting for approximately 2% of disasters (Fiji Government, 2014). Among all the Pacific island nations, Fiji has recorded the highest economic costs; prior to Severe Tropical Cyclone Winston, disasters had caused \$1.2 billion of damages in the preceding thirty years (Natuva, 2014). Equally, Fiji has experienced the most tropical cyclones (Cook, 2013).

Tropical Cyclones

Tropical cyclones are large scale, and potentially very severe, low-pressure weather systems that, in the southern hemisphere, generally form over the warm waters of the South Pacific, between latitudes 5° and 30° (Campbell, 1984). They are the most frequent and destructive natural hazard to affect Fiji in terms of the number of people affected and damage caused (Terry and Gienko, 2010). All areas of the country are vulnerable to the impacts, and generally cyclones track from the north and west (Fiji Government, 2009), however, cyclones are notorious for the unpredictability of their course (Campbell, 1984).

Cyclones are characterised by very steep pressure gradients that give rise to strong, spiralling winds around a low pressure centre. The very low atmospheric pressures at the centre of a cyclone can lead sea levels to rise temporarily by up to several metres (Campbell, 1984); the resultant storm surges can inundate low-lying coastal areas. Intensity, measured as maximum sustained wind velocity, determines the classification of a cyclone (Table 1); all areas within Fiji can expect to experience a similar number of cyclones of a similar range of severities (Blong et al. 1994).

In Fiji, the period between November and April is classified as 'cyclone season' (Fiji Government, 2012a). However, cyclones are known to form either side of this period, as early as October or as late as May (Benson, 1997). Cyclone Bebe, one of the most destructive cyclones to hit Fiji, took many people by surprise as it formed in October, 1972, and tracked over Rotuma before dissecting mainland Viti Levu. Bebe was unusual, therefore, not only in its date of formation, but also as it affected all four provinces: Northern, Eastern, Western and Central (Campbell, 1984).

Table 1: Australian and South Pacific Tropical Cyclone Categorisation		
Category	10-Min Mean Wind	Maximum 3-Sec Gust
1	63-87 km/hr (34-47 knots)	Less than 125 km/hr
2	88-117 km/hr (48-63 knots)	125-169 km/hr (destructive winds)
3 Severe	118-157 km/hr (64-85 knots)	170-224 km/hr (very destructive winds)
4 Severe	158-200 km/hr (86-110 knots)	225-279 km/hr (very destructive winds)
5 Severe	Over 200 km/hr (Over 110 knots)	More than 280 km/hr (very destructive winds)

Source: Fiji Meteorological Service (2009)

Some seasons, however, have no cyclones - between 1953/4 and 1992/3 almost one in four seasons were cyclone-free (Benson, 1997), and there was a five year-period during the 1930s when no cyclones were recorded (Blong et al. 1994) - and others can have four (1982/3) or five cyclones (1992/93) (Fiji Government, 2012a).

El Niño events also tend to be associated with increased cyclone frequency in the South Pacific. Compared with the per-season average of 9-10 cyclones, the El Niño years of 1992/3 and 1997/98 brought 16 and 17 cyclone events respectively (Asian Development Bank, 2011).

Cyclones can be accompanied by intense rainfall, strong winds, extensive flooding and multiple landslides, and the drier - than-average western parts of Viti Levu can experience very heavy rainfall in relatively short periods of time (Fiji Government, 2009). Coastal areas are also prone to extreme waves, storm surges and storm tides.

Floods

Floods are the second most prevalent natural hazard in Fiji as a result of high rainfall, steep topography, relatively large river catchments and intensive use of lowlands for agriculture (SOPAC, 2008). Storm events, often associated with tropical depressions, including tropical cyclones,

cause widespread and common flooding, and the accompanying heavy rainfall tends to occur in brief, intense periods. Delta regions experience particularly severe flooding when high tide (especially a spring high tide) coincides with the passage of a tropical disturbance. During La Niña events there is often the added complication of higher than normal sea levels (McGree et al., 2010). Figure 1 illustrates the main islands, rivers and towns in Fiji.

There is no difference in the amount of rainfall recorded between cyclones and major storm events; both systems can provide a deluge (Greenbaum et al., 1995). Storm surges in coastal areas can intensify flood levels, as can high-tide levels coinciding with the flood peak (SOPAC, 2008).

A couple of incidences of severe flooding have occurred in recent times. During late December 2007 and early January 2008, flooding caused the loss of 11 lives and almost a fifth of the Fiji population was affected directly (150,000 people). The resultant damage to public assets and agriculture was put at \$76 million FJD, which was considered a conservative estimate at the time (Fiji Government, 2010a).

Figure 1: Main islands, rivers and towns in Fiji



Source: McGree et al. (2010)

In 2012, Fiji experienced two severe floods affecting the areas of Ra, Tavua, Ba, Lautoka, Nadi, Nadroga, Sigatoka, and Rewa. These events caused five fatalities and affected around 14,000 people, with approximately 12,000 people staying in evacuation centres at some point during the floods. The Government of Fiji estimated that the damage from the 2012 floods was USD 36 million (Cook 2013).

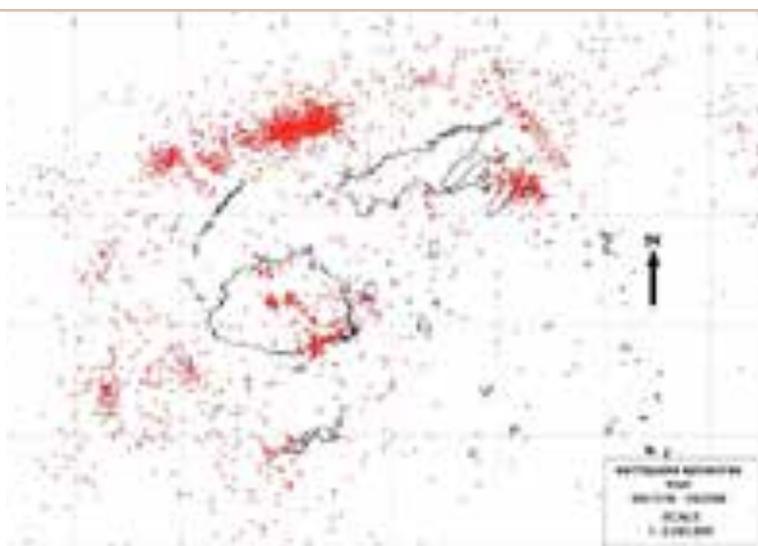
Earthquakes

Fiji lies in the region of plate convergence between the Australian and Pacific plates (Rahiman, 2006), and, as a result, earthquakes are a major

geological hazard (Singh and Whippy, 1987). Seismic activity in Fiji can be broadly grouped as follows: offshore seismic activity occurs to the northeast and east of Vanua Levu and Taveuni, north of the Yasawas and Vanua Levu, to the west of Viti Levu and around Kadavu. Other belts of seismic activity include southeastern Viti Levu, and a less clearly defined zone extending from near southwestern Viti Levu through Koro, then doubling back southwestward to south of Kadavu (Singh and Whippy, 1987).

The seismicity in the area of Fiji to 2005 is shown in Figure 2; nearly 50 large earthquakes ($M > 6$) have occurred in Fiji over the last 150 years (Rahiman, 2006).

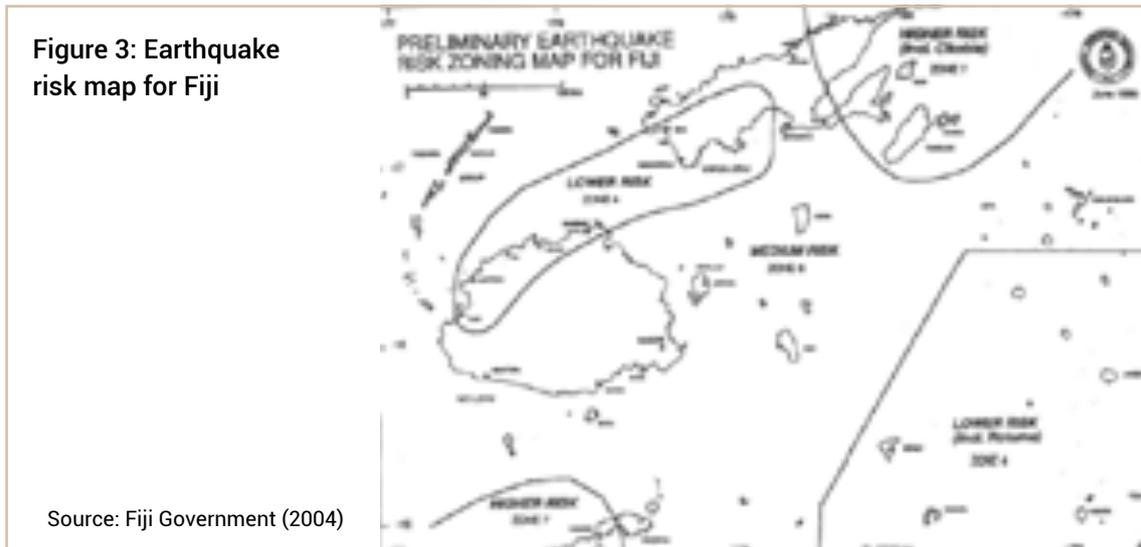
Figure 2: Earthquake epicentres, Fiji, 1918-2008



Source: Taganesia (2009)

The most active zone is that to the northeast, where the largest earthquakes have been recorded. Rabi Island and northern Taveuni were severely shaken by the earthquakes of 1919, 1932 and 1979 (Singh and Whippy, 1987). The second most active area is the northern zone with large quakes regularly felt in northern

Vanua Levu, the Yasawas and Nadi-Lautoka-Ba area, and occasionally Suva. Kadavu also has a considerable earthquake risk (Figure 3). Currently, there is no effective early warning system for earthquakes, therefore knowing what to do should an earthquake occur is vital (SOPAC, 2006).



Tsunamis

Tsunamis (or tidal waves) are fast-travelling, broad waves, generated by submarine earth displacement (Benson, 1997). In deep ocean, the waves are very low (1m or less) and travel at velocities of 1000km/hour; as they approach land, however, the waves slow down and wave height increases considerably, before they strike the coast in a series of waves (South Pacific Disaster Reduction Programme, 2002). The first wave to arrive is often not the largest.

There are two sources of origin for tsunamis that affect Fiji. Some tsunamis may be generated some distance away (tsunamis of distal origin), and travel across the Pacific before reaching Fiji's shores - the Chile earthquake of 1960 is an example, and advance warnings may be possible in such cases. Alternatively, tsunamis may be generated more locally (within the Fiji Islands group) (Rahiman, 2006; Blong et al., 1994), and therefore, there is little or no time to prepare

before the arrival of the waves. Local tsunamis often have a submarine-landslide source, and as a result, pose a significant threat, especially along southeast Viti Levu (Rahiman, 2006).

The largest tsunami recorded in Fiji accompanied the Ms 6.75 earthquake of 14th September 1953, and coincided with the timing of low tide. The wave height reached 1.8m in Suva Harbour and 4.6m at Nakasaleka, Kadavu. Considerable damage ensued, and five people drowned - three others were killed from the impact of the quake (Singh and Whippy, 1987) and there were 61 reported injuries (South Pacific Disaster Reduction Programme, 2002). The waves penetrated at least 100m inland, and Suva Wharf, bridges, buildings and water reticulation suffered severe damage (Rahiman, 2006). In the interval between the earthquake and the arrival of the waves, the sea receded along the entire Suva foreshore to below the low - tide mark; the first wave at Laucala Bay, arrived 15 - minutes after the main shock (Rahiman, 2006).

Because of the high concentration of population around the coastline of Fiji, tsunamis are of particular concern (Hamburger et al., 1986). All structures (port facilities, roads, buildings and seawalls) in close proximity to the coast are at risk, and owing to the inherent inability to detect locally-generated tsunamis early, there is a constant need for readiness to these events (Fiji Government, 2010a).

Landslides

Most landslides are associated with heavy rain. Cut-slopes in urban areas and road-side cuttings are particularly prone (Blong et al. 1994). Campbell (1984), quoting from the Fiji Times of the day, noted that following Cyclone Wally, 45 'huge' landslides occurred along a 20km-long stretch of road between Navua and Yarawa.

Droughts

Fiji is included in the top four countries affected by drought (along with Solomon Islands, Papua New Guinea and the Marshall Islands). Prolonged dry spells usually last less than one year, but sometimes as long as two years (McGree et al., 2010).

More than 80% of El Niño events result in meteorological drought (McGree et al., 2010), and some of the worst droughts have been associated with the occurrence of the periodic phenomenon. In 1997/98, about 75% of Fiji was affected by a severe, El Niño-induced drought, which left an estimated 15,000 farm families with no income for 15 months, and 90% of people in western Viti Levu and the Yasawa Group on food rations (UNOCHA, 1998).

The most recent 2015-2016 El Niño event affected many communities, with farmers losing crops, and water shortages in the western, eastern and northern divisions resulting in the trucking of emergency water supplies to these areas. The Government estimated that 30,000

people were impacted in September 2015 (UNOCHA 2015a). Droughts of the magnitude of the 1997-98 event could well be the norm in the future (World Bank, undated); however, the slow-onset nature of droughts makes calculating the costs difficult (Cook, 2013).

Climate Change Projections

"The effects of climate change have shed light on the forces of regression, where the most marginalised among us are trapped in a constant cycle of rebuilding, and are trapped in poverty as a result..."

Prime Minister, Voreqe Bainimarama,
8th September 2016

Alliance for Financial Inclusion (AFI) Global
Policy Forum 2016, Denarau, Fiji

Climate change is expected to intensify disaster risks (SOPAC, 2009). Coastal areas (where it has already been noted that the majority of the population in Fiji lives) are most at risk from sea-level rise and associated flooding, saltwater intrusion into freshwater (subterranean) aquifers, and the salinisation of gardens and cash crops. Inundation incidents are increasing, as sea-level rates have accelerated since the 1900s (IPCC, 2013a). And with increased frequency of inundation events, recovery times between events are shortened (Weir and Virani, 2011). Consequently, the daily routines and livelihoods of low-lying communities are already being challenged, and in extreme events, lives threatened.

Climate change is expected to affect the coast of Viti Levu - 86% of which is less than 5m above current sea level - through a rise in sea levels, higher temperatures and more intense cyclones (World Bank, undated). In the worst case (high emissions) scenario, sea levels are predicted to rise by up to 0.98m by 2100 (IPCC, 20113a). Annual maximum temperatures in Fiji have increased since 1950, in line with global patterns

of warming, higher sea levels, and greater ocean acidification. To date, average sea-level rise in Fiji has been measured at 6 mm per annum since 1993 (Pacific Climate Change Program Partners, 2011). Average air and sea temperatures are expected to increase in the future (Fiji Government, 2012a), though at a lesser rate than average global temperatures (between 1.1°C-2.6°C by the end of the 21st century [RCP 4.5].) Warmer seas will lead to continued sea-level rise and more intense cyclones and related extreme sea-level events, such as swell waves and storm surges (IPCC, 2013b). More regular coastal inundation will intensify coastal erosion, reduce crop yields (and recovery times between events), impact on other economic activities, such as fishing, and lead to more frequent flooding of shoreline towns, villages and coastal infrastructure.

In addition, it is predicted that over the twenty first century the frequency and intensity of extreme days of heat will increase - leading to increased heat exposure for outdoor workers and indoor market vendors - and more days of extreme rainfall. Return periods of very intense rain (400mm in 24-hrs) have already shorted considerably, from 191 year return period during 1946-1965 to 46 year return period during 1986-2005, and these are likely to shorten still further in the future (Hay, 2006).

There will be more rain in the wet season (Pacific Climate Change Program Partners, 2011). Flooding during the wet season may increase, therefore (Cook, 2013).

It is also anticipated that climate change will significantly increase the frequency, severity and spatial distribution of mosquito-borne epidemics. Higher temperatures would also increase the biting rate of mosquitoes and

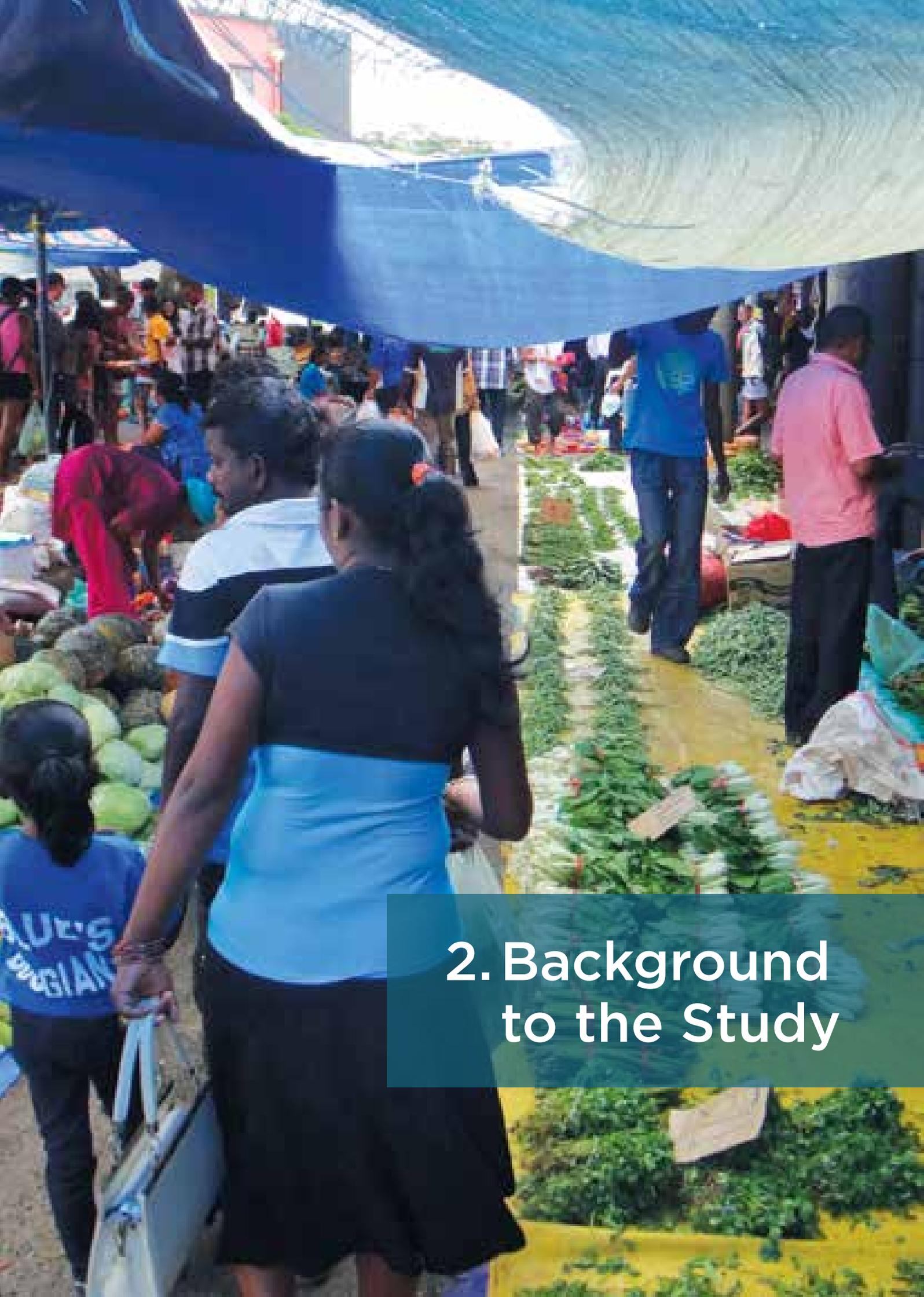
decrease the incubation period of the dengue virus (World Bank, undated). Economically, Fiji is expected to incur, on average, F\$158 million (US\$85 million) per year in losses associated with earthquakes and tropical cyclones, and there is a 50% likelihood that the nation will experience a loss exceeding F\$1.5 billion (US\$806 million) over the next 50 years, and a 10% chance that the loss will exceed F\$3 billion (US\$1.6 billion) (Fiji Government, 2016b).

In response to climate change, the Fiji Government has committed to the following actions: seawalls will be constructed, rivers dredged, mangroves reforested and flood-warning systems installed (Fiji Government, 2016c).

Implications for markets and market vendors

Natural hazards can impact small-scale vendors significantly, with producers/sellers being particularly badly affected. A rapid assessment of market vendors in five markets following Cyclone Evan, 2012, found that 80% of those questioned had lost produce, and 65% reported that their financial situation had worsened and that they were then in debt (Fiji Government, 2012b).

Food security will be reduced by adverse impacts on food production, food quality, nutritional availability, affordability and access (Fiji Government, 2013), and although climate change affects all sectors of the economy, the burden will be borne by the rural population (Fiji Government, 2013).



2. Background to the Study

The UN Women Markets for Change project is a six-year, multi-country initiative. Part funded by the Department of Foreign Affairs and Trade of the Australian Government, the project aims to ensure that municipal markets in rural and urban areas in Fiji, Solomon Islands and Vanuatu are safe, inclusive and non-discriminatory places of work; the promotion of gender equality and women's empowerment are crucial aspects. This component of the project, 'Resilience of Markets to Climate Change' combines two UN Women programmes: Women's Economic Empowerment (WEE) and Climate Change and Disaster Risk Reduction (CCDRR).

Objectives

"In recognising that men and women face different social, economic, and environment situations, gender issues are to be considered in all planning and implementation processes. A better understanding of the vulnerabilities and capacities of different gender groups to deal with climate change is to be promoted" Policy Principle 10 (Fiji Government, 2012, p.20).

- To assess the resilience of structures, amenities and the vendors and their livelihoods to climate change at each market;
- To formulate appropriate and gender-responsive adaptation measures to reduce vulnerability of the markets to climate change;
- To formulate recommendations and key messages to be incorporated into a model site specific disaster-risk management plan which will then be developed for each market to build awareness among vendors of a range of disaster risks.

Methodology

Other than anecdotal accounts, there is little in the way of detailed information at the local level about the impacts of disasters and climate change on the actual operations of municipal markets in Fiji, and the abilities and coping strategies of market vendors to respond to the environmental challenges posed.

This report provides a summary of the findings for field visits to twelve municipal markets in Fiji: Suva; Sigatoka; Nadi; Namaka; Lautoka; Ba; Tavua; Rakiraki; Nausori; Levuka; Savusavu; and, Labasa.

A desk-based hazard assessment was undertaken to provide an overview of the hazard threat to the markets and their vicinities, before individual vulnerability assessments were conducted for each of the market sites in the study. The vulnerability assessment consisted of a mapping, walkover exercise and completion of a checklist at each site in order to identify the key hazards, risk zones and market and market vendor vulnerabilities. At all sites at least one female market vendor and one male market vendor independently accompanied the assessor during the process. Findings were noted with the use of google maps, and sketch maps were annotated, where appropriate.

Five key market sites were then selected for further in-depth analysis: Suva (capital city); Nadi (large tourist town); Ba (rural town); Rakiraki (rural, small town); and, Savusavu (rural, small town/tourist); and situational analyses of exposure, sensitivity and local-adaptive capacity of vendors were captured for each of these market sites.

The qualitative information gathered was drawn from five focus groups (total participant n = 103), and interviews with representative market personnel, including market masters and assistants (n = 11), CEO municipal government officials (n = 7), and market vendor in-depth interviews (n = 30; 23 women, and 7 men) over the period August - October 2016. An important consideration at each site was the construction of gender responsibilities and needs in the context of disasters and climate change.

The study established current knowledge and practices, and identified ways to improve market vendors resilience to disasters and climate change at each site by further raising awareness of the risks, and assisting in the education of market vendors for better coordinated, collaborative and gender-responsive preparedness, adaptation and response to disasters.

Once the key challenges were established for each market site, the information was used to design and develop a model disaster preparedness and response plan, with the aim

of active engagement and mobilisation at each market, so that the vendor community can act appropriately to early warnings and respond responsibly post-disaster.

"Lost food-crop production not only affects subsistence farmers but may be felt throughout the nation, especially in the towns." Campbell (1984, p.40).

With more than half the population living in urban areas and reliant on markets for fresh produce (Fiji Government, 2008), and with produce shortages reported on occasion, during non-disaster times (Fiji Government, 2015a) this project is vital, not only to build vendor resilience prior to and after a disaster, but also to ensure the health and vitality of the heavily market-dependent urban population.





3. Vulnerability Assessments of Twelve Municipal Markets in Fiji

Ba Market

- Frequent, severe flooding
- No plans to redevelop or relocate market
- Dry goods inside market building; fruit and vegetables outside, sold undercover and along corridors
- Corridors have little shade from rain or sun; vendors use own coverings to protect themselves
- Rafters of market very dusty
- Open drainage ditch around circumference of market building - health and safety issue
- Vendors watchful and adaptable to flooding



Location, history and development

The town of Ba, in north-western Viti Levu, is well known for its regular flooding events. Over a 111-year period between 1892 and 2002, the neighbouring Rarawai Mill, one kilometre upstream of the town, was flooded 28 times - a major flood on average once every four years (Yeo et al., 2007). Most notable was the flood of February 1931 that claimed the lives of at least 225 people - Fiji's worst natural hazard in terms of loss of life (Yeo and Blong, 2010). Ba Market, located in the town, is less than 400m away from the eastern banks of Ba River. Elevuka Creek, a tributary of the river, is also located to the east (rear) of the market, and, independently of the river, can cause flooding to the market and much of the town (Yeo, 2015).

As the catchment of Ba River is steep and mostly un-forested, rapid runoff tends to be promoted in intense rain (Yeo, 2015). The market has experienced three major floods in recent years: 2009, 2012 and in 2016. The situation seems to have worsened with substantial building development since about 2000 to the west and south of the market. This has effectively redirected the river flow (Yeo, 2015).

The market dates from 1983 at its current site, and the building was officially opened in July 1984, and the market and Ba Town, along with much of the northwest of Viti Levu, is in a low earthquake risk zone (Hamburger et al., 1986). The underlying geology of the area comprises of a thin sequence of sandstone, dating mostly from the Tertiary period (Rodda, 1967). Such bedrock would be vulnerable to ground shake in the event of a significant earthquake.

Physical structure and produce sold

The main market is open plan, and consists of a metre-high encasing wall, with chain link above. Most of the inside area is devoted to the sale of

dry goods (kava, spices, dhal etc.), although there are a few stalls that also sell fruit and vegetables. Most fruit-and-vegetable sales occur in either the undercover fruit-and-vegetable section, located between the main building and the kava building (the 'grog palace') or in the 'corridors' around the main market building. The fruit - and - vegetable extension was constructed about 15 years ago and recently received a refit, with seven rows of permanent, secured, metal tables replacing the eclectic range of private stalls that used to be washed away during each flood. In one particular part of the roof to the extension clear Perspex panels are fitted, and they have been covered with cardboard to block out the sunlight. Vendors say that the panels act like a magnifying glass, cooking both the produce and people below.

There is a separate toilet block and large bure, opened in 2011, that houses a meeting room, handicraft sales and women's accommodation. In an attempt to alleviate the flooding risk, the bure is raised, with 10 steps (and a ramp) for access. It cost approximately \$50,000 (Fiji Government, 2010).

The prevailing wind direction generally brings rain from the east (the direction of the bure), and vendors along the corridor in that section complain about getting wet; equally, strong morning sunshine affects some of the stalls as the roof at this point has a curious cut-out design. Conversely, in the afternoon the front of the market receives hot sunshine, and the vendors there bring a variety of covers to shade themselves. There is much evidence of temporary materials having been previously tied to the frontage.

After Cyclone Winston the main market building was closed for a week-long clean up, as the apex to the roof at either end of the main hall was damaged. The area beneath was cordoned off, even after the dry-goods hall reopened.

During the market closure, the fruit-and-vegetable vendors, who usually sell around the outside of the market, relocated to Rajendra's supermarket to sell produce. They were there for approximately one month. No significant flooding accompanied Winston - according to one of the vendors, Winston produced 'dry rain' - although the flooding did reach to about 30cm in the fruit-and - vegetable section requiring a general floor-clean afterwards.

Vendors

The market has a capacity for 500 vendors (UN Women, 2011), although at the end of the first quarter of 2016, only 365 vendors were in attendance, 48% of whom were women. Vendors travel up to 50km to come to the market (UN Women, 2011). Some of the vendors live in remote villages in the interior of Ba, four-hours ride from the market.

Most of the women vendors either buy produce from wholesalers - who usually arrive between 2 - 5am - or directly at the farm gate.

Vendor Security

The market is open from 7.30am to 5.00pm Monday to Friday, and 5.00am to 4.00pm on Saturdays. The Ba Town Council has constructed a multi-purpose bure to accommodate women vendors who overnight at the market (UN Women, 2011). It can house 20 women in two rooms of bunk-beds. Unlike many markets, children are also permitted to stay, and the women can cook food on the premises.

The separate toilet block (men access the end closest to the kava building, and women the end nearest the bure) have two sets of three cubicles each, and there is one shower tap in each. The vendors say that it is only recently that both sets of toilets have been opened during the day.

The vendors contribute money to the employment of a night - time security guard at a rate of \$20 per night. During holidays, two security guards are employed, costing \$40 per night. For the few weeks prior to the assessment, the council had been contributing to the cost of the security guard, at \$75 per week.

There is a PA system for the market, and two fire hoses are located along the external wall between the main hall and the fruit-and-vegetable section. The electricity box is also located along this section of the market.

Services

Water Security

There are two external taps and one internal tap near the *kai* section of the main building; there are no sinks, however. The vendors with the stalls nearest to the external taps complain that the taps can smell as waste vegetable matter can fall between the grids and rot. Vendors also report that the fire hose leaks.

The vendors believe that only three taps is too few for the number of vendors. There is no alternative water tank, should the main supply fail.

Energy Security

The market is fed by mains electricity, and there is no back-up generator in the case of power failure. The vendors say that the supply is good.

Drainage

The external guttering has recently been replaced because of damage caused by Cyclone Winston. The downpipes flow into the open ditch that runs around the market between the 'corridors' and the encircling car park. At the time of the visit, the ditch contained stagnant water, especially in the area to the front of the main market hall; there was also evidence of organic debris in the drain that could cause a blockage at the grids.

Waste Management

Vendors are encouraged to segregate their waste into organic matter and other materials, for the local composting of the green waste. Compost bins have been constructed at the back of the market near the women vendors' accommodation. However, the procedure is not well adhered to. The vendors also say that the cleaning of the market (mopping of the floors) used to be a weekly event, now it happens infrequently. The rafters of the market are very dusty and full of cobwebs, and the vendors complain about the dust affecting vendors with respiration problems and covering produce.

Accessibility and Transport

The main loading and unloading area is to the front of the main market, and parking spaces are available for vehicles all around the market. However, also surrounding the main hall is the open, market drainage system, and the vendors say that they have seen several instances where

a car has ended up in the ditch having parked too close to its edge. The vendors also expressed fears that casual vendors may be injured in any future incidents, as the vendors tend to perch on the edge of the ditch to sell their produce.

The council charges vendors to park their vehicles (\$19 per vehicle per month); there are no security staff to supervise the site, and vendors say that there have been instances of theft from vehicles. Equally, there are no casual 'barrow boys' to transport produce to the stalls, and vendors have to either carry the goods themselves or pay \$2 a sack for carriage.

Governance

Currently, there is a vendors' interim committee, and the vendors say that they use UN Women to negotiate with the Ba Town Council. The Ba Town Council is responsible for the management of the market.

Labasa Market

- Frequent, severe flooding because of proximity to Labasa River
- Plans to relocate market to Subrail Park - still within flood - risk zone
- Currently sited on reclaimed land
- Heat and ventilation in produce halls main ongoing issue
- Hot sun affects casual vendors and permanent vendors located near perimeter of halls
- Flies and mosquitoes near river an issue
- Dusty car park near cooked - food vendors
- No back - up generator



Location, history and development

Labasa Market is located in Labasa Town, in north-eastern Vanua Levu. The market is to the north-east of the main commercial area, and immediately adjacent to Labasa River - the furthest market building is only 50m from the river, and the nearest just a few metres away. The mouth of the estuary is three kilometres downstream, and it is six kilometres to the unprotected northern coastline.

Despite the present river bank being 1m above the ground (Chang, 2015), Labasa Market and its surrounds have experienced several flooding incidents in the past. This is in part because of the low-lying topography of the local area and the geography of the wider region. Vanua Levu historically has experienced severe flooding associated with extreme rainfall during tropical cyclones. Other factors further compound the likelihood of flooding in Labasa Town: the northern coastline of Vanua Levu is convoluted with many bays, increasing the likelihood that storm surges will combine with river flooding; three rivers (Labasa River, Qawa River and Wailevu River) rise in the high volcanic mountains and have their estuaries in the Labasa area; the river basins face the general direction that cyclones arrive; and, sugar-cane plantations have replaced the natural vegetation on lower catchment slopes exacerbating the runoff and erosion (Terry et al., 2004).

Cyclone Ami in 2003 left parts of Labasa Town under 1.8m of flood water, and in January 2009, Labasa Town was flooded to a depth of 1.2m (McGree et al., 2010).

While most of the geology of Vanua Levu is volcanic, and comprises of lava flows, breccias and conglomerates (Terry et al., 2004), the underlying bedrock of the Labasa area is unconsolidated silts, clays, sands and gravels (Rodda, 1967). The market, close to Labasa

River, is believed to be sited on reclaimed land (Chang, 2015). Labasa is located in a medium-risk earthquake zone (Hamburger et al., 1986).

There are plans to relocate the market and bus stand to the nearby Subrail Park owing to overcrowding (Naidu, 2016a), although the development would need to be raised (soil filled) (CEO Labasa, 2016). The proposed site is flood-prone and less than 50m from Labasa River.

Physical structure and produce sold

Labasa Market is made up of several buildings. The oldest section of the market consists of two adjoining produce halls that front onto Jaduram Street and the bus station. Vendors sell kava and dry goods, including tobacco in these two halls. There is also an integral kiosk and canteen in the south-east section, accessed from outside, and three kiosks to the north-western end. Six air flow vents have been added to the roof, but air movement is limited within the produce halls and at the time of the assessment, it was very hot. Apparently, on the day of the assessment, one customer had collapsed within the hall, and had to be taken to hospital due to heat exhaustion. All the vendors complain about the temperature, and one commented that, as the air was hotter outside the halls in hot weather, the vents were only drawing in warmer air from outside, adding to the temperature within.

Along the length of the produce hall that faces Nambawan Supermarket, an overhead curved roof extension has been constructed to offer vendors protection from the elements - previously vendors sold fruit and vegetables underneath tarpaulin. Hot afternoon sun affects the vendors selling from the last couple of tables at the Jaduram Street end of the extension. There is a canopy at the other end of the extension that offers some early morning protection to the vendors positioned there.

There is one canteen, located in a separate building across from the taxi-stand area, and closer to the main road.

Across the service road are four more produce halls: three older, low-ceiled sheds and a new, two-storey development. All have cement floors and the three single-storey halls have low concrete walls, with chain link above. The low-rise sheds appear to have been constructed in two phases, as the smaller two sheds to the north have a step up to access the southern produce halls; they also have uneven, worn floors, and the wooden tables, often propped to counter the floor imbalance, are tightly packed, and only a hip-width apart in places. The low ceiling also means that air circulation in these two sheds is poor, and vendors complain about the heat.

The latest extension to Labasa market, a two-storey development, was opened in early 2016. It has space for 110 wooden vegetable stalls at ground level, with a small area of lower wooden tables for seafood (Saturdays only) at the rear. The area above is used for the new handicraft centre, with 50 stalls set out in 14-table rows, and at the rear, the women vendors' accommodation centre, where up to 20 rural women can stay overnight. In the middle of the upper floor is a training centre/meeting room (Naidu, 2016b). Just after the opening, in January 2016, it was reported that there were 36 vendors selling in the handicraft centre (Vafo'ou, 2016). Probably half that number were present on the day of assessment.

The newest development is light and airy, especially the upper level that contains the handicraft market - this is achieved partly by the addition of opaque Perspex tiling to the roof. However, vendors complain that too much light is being let in and the colours of the handicrafts are fading, especially those hanging at height, closest to the roof. There are no fans.

At ground level, vendors closest to the river comment on the mosquito nuisance, and those nearest the toilets, on the number of flies, especially during the hot season. All vendors with stalls in the older, single-storey halls say that tin roofs can get very hot - the resultant temperatures inside the produce halls cause vegetables to dry out and rot quickly (Vafo'ou, 2016). Strong sunshine also causes problems for vendors on the edges of the produce halls, and temporary sheeting is often erected to attempt to offer shade.

Of the array of wooden stalls lining the banks of the Labasa River, that make up the privately-owned fish market, only one was selling fish on a Friday, and all were closed during the assessment visit earlier in the week. Discussions for a new fish market are still ongoing (Siwan, 2015).

The detached cooked-food section of the market is located behind Shop N Save supermarket. The L-shaped row of stalls consists of 15 cooked-food vendors, overlooking a gravel car park to the side of the supermarket used for carrier parking. Two additional tarpaulin - covered stalls are in a separate area. There are also three separate, non-segregated toilets, two of which were padlocked at the time of the visit. The vendors say that the car park generates a lot of dust.

Vendors

Labasa Market has over a thousand vendors (n = 1015), the majority of whom are permanent (57%). Casual vendors account for one fifth of vendors at the market, and farmers approximately 23% of vendors. Across all categories, women make up the majority of sellers - and overall, two-thirds of vendors at Labasa Market are women.

Permanent vendors pay \$2.05 per day per table, and casual vendors \$1.60 per day.

Vendor Security

Labasa Market is open from 7.30am until 5.00pm Monday to Friday, and from 7.00am until 2.00pm on Saturdays. A last bell sounds to indicate the market will close. There is no secure fencing around the perimeter, although, as the produce halls are locked at night, and two council security staff employed, vendors say that stealing is not a problem.

There is a well-maintained toilet block located next to the river. It was built in 2009 with funding from the Government of Japan (Embassy of Japan in the Republic of the Fiji Islands, 2009). It contains 17 cubicles (11 on the women's side), plus disabled accessible toilets, and male and female shower facilities. The entrance fee is the highest of the municipal markets in Fiji, at 25 cents, plus 10 cents for toilet paper. A shower costs 50 cents. The facility closes at 8.00pm.

There are no exit signs above doorways in the main sheds, nor security cameras. There is a PA system for announcements.

Services

Water Security

The produce halls nearest the river have four external taps - two near the toilets, and two further taps close to the Provincial Council offices. Vendors comment that the taps are open to the elements as there is no overhead cover at either tap site. Four external taps are also present on the southern and eastern sides of the older produce markets, but none on the north-western section.

The toilets benefit from twin rainwater tanks should the main water supply fail.

Energy Security

Fluorescent strip lightings illuminate the produce halls. Aside from the new two-storey development, the other produce halls are

quite dark, and vendors say that they are too dark. According to an undated notification at the council office, the Labasa Town Council promotes the use of energy-saving lighting for its municipal properties as part of its five year development plan. As yet this policy has not been implemented at the market. There is no back-up generator should the mains power fail.

Drainage

The overhead, internal guttering between the two oldest produce halls leaks in several places; and externally, there is no guttering to collect rainwater along the service - road side of the halls; the rainwater collects in an open, shallow paving between the road and the pavement that runs around the edge of the market. Metal grids, or makeshift, narrow wooden ramps, covered the drain only at the market entrances nearest the taxi stand; and standing water and organic matter were present along the length of the system.

Additionally, the taps adjacent to the toilet block have a complicated, dog - leg drainage system. There is an open, shallow drain between the last produce hall and the Provincial Council building, which had canvas sacks partly blocking it at the time of the assessment. At the cooked - food area, there is a drain in front of the stalls that carries rain-water from the roof. It contained standing water, and is a hazard for customers trying to access the stalls.

Waste Management

Rubbish is collected every morning and afternoon, and currently disposed of by Labasa Town Council at the approved Namara Rubbish Dump, across the river (UN Women, 2009). Namara, labelled as the first "climate-proof" landfill in the Pacific, has been upgraded recently to better withstand natural hazards and to manage waste during disasters (SPREP, 2014).

Posters in the Labasa Town Council offices indicate a waste-segregation programme is operational at the market; however, the application of the scheme on the ground was less apparent. The numerous yellow, red and green bins, dispersed around the market buildings, all contained mixed waste.

Accessibility and Transport

The bus station is adjacent to the market on Jaduram Road and to the north of the market is an area set aside for taxis. Beyond Nasekula Road, away from the market, is a paved area for vendor and customer parking. There is no charge to park there, although it does require the crossing of the busy main road to access the site; otherwise, drivers park on-street in the vicinity of the market. The car park closest to the market, near the fish market, belongs to the Shop N Save supermarket. Vehicles that park there are limited to 30 minutes only.

The service road from the taxi stand to Jaduram Road, where farmers and middlemen unload goods, is closed to vehicles on Saturdays. Generally, it is reported that there is not a problem with the unloading of produce. When the road is open to vehicles, there is no crossing point for pedestrians between the market halls.

There are two vendors attending the market who use wheelchairs for mobility, although neither vendor was present at the time of the assessment. Wheelchair access around the market would be difficult owing to steps into or between most produce halls. Only the new, two-storey development has a wide, smooth ramp suitable for wheelchair use.

Governance

The market is the responsibility of Labasa Town Council, and it is reported that the market master "comes around and talks to the vendors". The Market Vendors' Union has approximately 100 members.

Lautoka Market

- Tsunami risk because of proximity to coast
- No major rivers in the vicinity
- No plans to redevelop or relocate market, but restricted site in down town Lautoka
- New shed has too many windows - too bright and hot
- Casual vendors sell fish and seafood from floor with customers walking past
- Juice vendors on Namoli Green have no protection from elements
- Old market uneven flooring, range of selling tables and poor ventilation
- *Kai* section - tables drain into buckets, creating wet floor surfaces



Location, history and development

Lautoka Market is the largest municipal market in the Western Division. The shoreline is only 250m away, The market is in down-town, central Lautoka, the second largest city of Fiji. It serves the north - west part of Viti Levu and the Yasawa group, and is an important source of additional income for the seasonal workers in the sugar industry. Lautoka, known as the Sugar City, is home to a large sugar mill and a seaport.

To the northern end of the market is the bus station, and to the south, the central business district. The market is bound on the east by the shopping mall, Sugar City Mall, and on the west by Vakabale Street. The original market building was constructed in 1952. Recently, there have been two major changes to the market: in 2014, separate accommodation and resource centres opened for women vendors, and in 2015 a new shed extension to the market was built, at a cost of \$1.5 million (Fiji Government 2015b). Previously, about 200 vendors sold produce, often from the floor, while sheltered under tarpaulin sheets.

This part of Lautoka is low-lying, and because of the proximity of the coast, is at risk of tsunamis. One of the vendors, who has been selling at the market for the last seven years, recalls two occasions when tsunami warnings had closed the market. Flooding, however, was not mentioned as an issue for the market, in part because no river runs through the city. The nearest water channel of any note is almost four kilometres to the north. Lautoka, nevertheless, is vulnerable to coastal flooding, with over three-quarters of the population (79.6%) living within the coastal zone (Nunn et al., 1994). However, the presence of a seawall in the city means it has a higher resilience to coastal flooding (Gravelle and Mimura, 2008) than its location might suggest. Lautoka is located in a low-risk earthquake zone (Fiji Government, 2004), and soft sandstone and marls are the underlying rocks that make up the area (Geological Survey Department, Suva, 1965).

Physical structure and produce sold

The older market building is irregular in outline, with a high ceiling. The roof is supported by sturdy inner columns, and as it rises to an apex, the interior roof appears somewhat octagonal in shape - although the arrangement of stalls does not reflect that shape on the ground. The area houses fruit-and-vegetable sales, a kava section (mixed and dry) and groceries, all set out on a range of mostly covered, wooden tables of uneven sizes. Some parts of the old market have poor ventilation. There are some wall-mounted fans, although only one was operational at the time of the assessment, and their reach would not cover the entire hall. The large handicraft section of the market is located along Naviti Street, and the separate fish market along Vakabale Street.

There are male and female public conveniences - 20 cents entry, free for registered vendors, and a shower (wash room) - 50 cents. The market master's office is located up a flight of stairs, and from that elevated position overlooks the main market.

The attached new shed is very light and airy, although because of the expanse of windows at height, the council was in the process of fixing 'greenhouse' netting around the top windows in an attempt to block some of the heat and direct sun. This action may restrict air circulation and limit natural light to a certain extent. Again, this area has sales of fruit and vegetables, and also a *kai* section and cooked foods section set against the older market wall. The area around the *kai* section is constantly wet, and because the cement floor throughout the shed has been finished (intentionally smoothed) it is very slippery when wet, and people have fallen over. Slips occurs especially when it is raining.

The new metal tables from which sales are made, are not fixed, and in places the alignment had altered, leaving non-straight spaces between stalls. However, the greatest concern expressed by the vendors was that the tables are too high for

vendors to sit comfortably and serve customers. Vendors either have to stand or when seated, raise the seating - many vendors chose the latter option and were using a variety of boxes, palettes and platforms under the seats and benches. Towards the bus-stand end of the shed is a rather cramped mixed kava section. Previously, the kava vendors located there were selling from the open area near the outside juice section. On Saturdays, what is an open area during the rest of the week, is used by casual vendors to sell farm produce from floor - level. One vendor commented that weekdays this area was a "soccer field for children". Only three flower vendors were present on the Saturday of the assessment, and they brought to market the flowers that they had grown themselves. They also commented that the ongoing drought in western Viti Levu was affecting business, and accounted for so few flower vendors at the market. Additionally, around the inside perimeter of the new shed, casual vendors also sold produce from the floor, and vendors of fresh fish and seafood tended to concentrate along this strip in very close proximity to passing market pedestrians.

Juice stalls are located in the Namoli Green open, gravelled area, where vendors supply their own tarpaulin to offer protection from the elements. They say that the area under the tarpaulin is very hot in hot weather, and there were numerous flies in the vicinity of the stalls during the assessment visit.

Vendors

On average, there are 480-600 permanent vendors at the market, and 600 casual vendors, with an average of between 400-600 vendors. At Easter, numbers increase to approximately 800 vendors and at Christmas, the busiest time of year, there are between 800-900 vendors (market master, 2016, pers. comm.).

The majority of vendors are women: 66% of the total 755 vendors were casual, as of mid-May 2016, with 62% of them women. Of the 300 permanent vendors, again 55% were women. Casual vendors

can travel up to 100km to sell produce at Lautoka (UN Women, 2011), and many come from as far as Wainibuka, Ra, Nadarivatu, Navosa and the Yasawa Islands (Fiji Government, 2015b). In the new shed, each vendor is charged \$2.10 per stall/area. Vendors say that the area defined as a 'stall' is too small (an 8ft table contains three stalls).

Vendor Security

Mondays to Fridays the new market shed is open 7am to 7pm, although the original market building closes at 5pm; on Saturdays, the market opens at 6am and closes at 5pm (new shed) and 3pm (older market). An overnight accommodation centre opened for casual women vendors in 2014, to cater for female vendors who sell at the market Thursdays to Saturdays (UN Women, 2014). The building can house up to 60 women at a time. Casual vendors, therefore, no longer sleep on the streets, alongside the produce; however, vendors often set up the produce the night before and now the incidence of theft overnight is common. On the day of the assessment, two women vendors on NaViti Street had lost plates and produce overnight. And earlier in 2016, the market master had had a briefcase containing a laptop stolen when three boys broke into his upstairs office. In a separate incident, the padlocked chain to the handicrafts section was cut overnight and vendors lost handicrafts and money. One vendor said that although surveillance cameras have been installed, it is general knowledge that they have not been operational for about two years. Council security staff are employed to secure the market at night, although their presence does not seem to be a deterrent. A police post located on Vakabale Street is integral to the market. The market also benefits from a PA system, evacuation plan for the new shed and strategically located fire hoses.

Male and female toilets are located in the older market hall, and attached to the bus station along Vakabale Street (20 cents for non-registered vendors, otherwise they are free to vendors with ID). Vendors say that the Vakabale toilets become very crowded mid-to-late afternoon, when the

children come out of school. Only the two toilets next to the police post are open at night.

Services

Water Security

There are two rows of two taps (two sets back-to-back, four in a block) in the original hall, though two of the four taps at each location had been turned off (capped). Outside, near the police post, there are six taps (three either side – all operational). In the new shed, the tap had been capped recently (in the last two months) and vendors were unsure why. There are also two taps in the vicinity of the juice sellers. Vendors comment that there are too few taps in the market. The mains water supply is reasonably reliable, though there had been service disruption during the week prior to the assessment. There is one alternative water tank, raised aloft in the new shed, but it is used only to supply the bus-station toilets during a water stoppage.

Energy Security

The original market hall has strip lighting, although it does not illuminate the hall particularly well and the tubes get hot. According to the market master, the Fiji Government, being proactive in environmental matters, has a directive for the use of solar power for lighting, and the market master hopes, therefore, that the market and adjacent mall will soon be powered by solar.

Drainage

The new extension has a dip in the roof towards the centre of the building and therefore, downpipes carry rain water from the roof structure into the centre of the hall. Currently, they are well maintained. The *kai* section has tables in the new shed, adjacent to the older market wall, and they were placed there to use the existing drains. However, the market master says that the layout design is not ideal. The *kai* tables slope slightly, and the water used to keep the *kai* fresh drains off the tables into an assortment of buckets and containers that the vendors have placed under the water flows.

Waste Management

Vendors are responsible for collecting their own waste, and taking it to the green wheelie bins, positioned around the market. There are at least eight bins. Vendors say that more are needed. Council workers periodically empty the contents of the bins into a truck located at the entrance nearest the bus-station toilets. Segregation of waste appears limited prior to collection. The market master says that Lautoka City Council has won the award for 'reduce, reuse and recycle' for the last three years in a row.

Accessibility and Transport

Owing to age, the main market has uneven floors, and because of the haphazard nature of the tables, wheelchair access would be difficult. At the time of the assessment, one man in a wheelchair was visiting the fish market, having accessed the area via a separate wheelchair-friendly doorway. There are male and female disabled toilets as part of the older market toilet block; however, access for either is via the corridor between the market and the shopping mall, and both wheelchair-accessible gates were locked at the time of the assessment, with casual vendors selling immediately outside. Signage is good in the new shed, although the haphazard serving area, especially in the mixed kava section, could cause delay for vendors and customers in the event of evacuation. A small-print evacuation plan is posted on the wall between the new shed and the adjacent, older dry and mixed-kava section. An area is marked on the plan as 'Namoli Green assembly area', although it is unclear when this area was to be used. It is very unsuitable if evacuation was prompted by a tsunami warning, for instance. The bus stand is immediately to the north of the market, and vendors load and unload goods on the Namoli Green side of the market. Customers can park in the adjacent shopping mall where there are about 90 spaces available.

Governance

The Vendors' Association is well organised, and appears to have a good relationship with market management.

Levuka Market

- Only casual vendors, and all sell on just one day a week, with no overlap between communities/days
- Sales are made along Beach Street, with no protection from the elements
- Immediate proximity to the coast
- Plans to upgrade, extend and reopen the municipal market for produce sales, but vendors very reluctant to move to northern end of town (400m)
- Arrival and departure times for vendors from Moturiki Island are dependent on high-tide times
- No tap other than a public drinking tap on Beach Street
- No apparent drainage outlet for market building, nor tap
- Building is listed on World Heritage list (No.76)



Location, history and development

'Levuka Historical Port Town', on the eastern coast of Ovalau Island, was inscribed on the UNESCO World Heritage List in 2013 and is Fiji's first World Heritage site. Levuka Market (National Heritage Register Number 76) is located on Beach Street, to the northern end of the town, and only a short distance from the sea (20m). The Royal Hotel is next door, set back a little from the shoreline.

The market was established during the 1940s, although for some of the period since, the Levuka Reserve Unit was located in the building. More recently, the market again functioned as a place to sell produce (Fiji Government, 2012c), although at the time of the assessment, and apparently, for a number of years (see quote), vendors have preferred to sell produce in the middle of town, and not to use the market. The distance between the furthest town-based vendor and the market is approximately 400m.

"The Levuka Town Council has had problems over the years with market vendors who try to move away from the market proper to sell the produce on the waterfront in the middle of the town [...] On several occasions, the Council has called upon the police to stop this activity. Vendors did not stop until the Council put up a wooden signboard stating that it was illegal to sell produce on the waterfront." (People of Levuka, 2001, p.100)

The CEO of Levuka Town Council, Josese Rakuita, has plans for the extension of the market, and to draw vendors back to the building. Currently, the architect-assisted proposal is before the Ministry of Lands. The plans include an extension of the awning, to provide space for a food outlet to serve both early morning vendors and Patterson Brothers bus passengers - buses to Suva leave the adjacent Patterson Brothers' depot at 4.00am daily.

There is no major water channel in Levuka Town, however, to the immediate town side of the market is Totogo Creek. The creek flows alongside the market into the sea; it is tidal and a popular swimming spot for children, although authorities warn of shallow waters as swimming accidents do occur. Traffic is carried over the creek by the one-lane Levuka Market Bridge. Fibre-glass boats ('fibres') also moor in the lower reaches of the creek. There is no suggestion that the creek has caused flooding in the town.

The immediate foreshore is well protected in places by a buffeted seawall, and a little to the north, the seawall structure was being reinforced, after damage from Cyclone Winston. During Cyclone Winston, the vendors say that the police arrived to tell people to go home. After the cyclone, vendors sold wind-fall coconuts and mangoes for the first couple of weeks, and then once that supply had gone, the island-based vendors turned to the sea for produce, and started to sell seafood.

Levuka Town is in a medium-risk earthquake zone, and the igneous basalt and associated andesites rocks comprise the surrounding landscape (Geological Survey Department, Suva, 1965).

Physical structure and produce sold

Market building: The structure has a lower concrete wall with wire mesh above, and there is a slightly domed corrugated iron roof with gable ends - no point to the central apex. The condition of the roof forming the awning is satisfactory, with some holes generated by rust damage. The main roof appears in excellent condition. There are timber shutters to the side windows and a wooden, padlocked side door; the roof has no guttering.

Inside, there is a concrete floor and along the back wall, four lockable kiosks, one of which was being used by a tailor at the time of the assessment. The main area is open plan, with rows of chairs

and three large tables. There is lockable storage inside at the northern end of the building and a bar-type lockable booth at the other.

The area outside, to the front and town-side of the market, is surfaced and compartmentalised into 25 stalls, each with concrete sides raised a few centimetres to demarcate dimensions. Ten of the stalls are unprotected by the overhead awning and so, if in use, would be open to the elements.

Beach Street: On the Saturday of the assessment, produce included root crops (cassava), fruit and vegetables, fresh and smoked seafood, with one male vendor selling from a portable cooler, and kava. There were 13 tables (12 plastic, council-owned, and one wooden, privately - owned table) lining Beach Street. Each plastic table is set out by council staff at about 5am, and allocated on a 'first-come first-served' basis. In between, vendors also sell produce from the floor, spreading cloth, tarpaulin or banana leaves beneath the goods. There were approximately 19 floor-based 'stalls' on the Saturday.

There was one council-owned tent, otherwise, there is no shade, other than the few *baka* trees, and some of the vendors brought their own umbrellas. On sunny days, produce sit out in the hot sun. During wet weather, the vendors sell produce from under the shop awnings on the shop-side of Beach Street.

That Saturday, three cooked - food vendors and one juice vendor were selling from council tables under the awning.

Vendors

All vendors in Levuka are casual and all return home at the end of each selling day; most sell produce only on one day a week, and the vast majority are women (estimate 80% plus). Saturday is the busiest day, with, on the day

of the assessment, vendors coming from the villages of Taviya and Lovoni in Ovalau and from some of the 10 villages in Moturiki Island (six 'fibres' came from Moturiki alone). To hire a boat, for the 30-minute crossing to and from Levuka, costs \$20 or \$6/7 per person one way. Ideally, the crossing is timed at high tide, so that boats can land at the beachfront. Alternatively, the owner lands at Nagele wharf, and a carrier (\$2.30) brings the vendors into town. On the morning of the assessment the timing of high tide had been favourable, enabling the vendors to arrive at 5.30am for an early start. When high tide is later, the vendors say that it can be as late as 9.30am – 10.00am before they can set up.

On Fridays, vendors are drawn from the villages of Tokou, Bureta, Navuloa and Naikorokoro. There does not appear to be overlap between vendors and days.

Most vendors had sold out by 1.00pm. Vendors are charged \$2 for a table and \$1 to sell from the floor.

Vendor Security

In a town where everyone knows everyone, theft is not a problem. For instance, at the end of the market day, many hours after the vendors have sold out, the tables were just left 'abandoned' along Beach Street, awaiting council collection. They were collected at about 5.00pm. The non-produce vendors, who currently use the lockable kiosks at the market, have their own keys and lock up at the end of each day.

There are public conveniences near to the FEA (Fiji Electricity Authority) end of the seawall - two cubicles in the women's and one in the men's (20 cents). When they are closed, the vendors can use the upstairs toilets at the Kim Restaurant (50 cents) or walk around to the free toilets at the wharf.

A fire hose is located opposite, between the Kishore Investment Ltd. supermarket and Whale's Tale Restaurant, and a small stream runs between the two premises.

Services

Water Security

Market building: No water supply was obvious within the market building.

Beach Street: There is a water tap for public use on Beach Street, although the design is for drinking purposes only, rather than for the preparation of vegetables.

The public-conveniences block does not appear to have an alternative water tank should the mains supply fail.

Energy Security

Market building: There is a mains electricity supply to the building, and internal strip lights and power sockets are available within the kiosks. Under the awning, outside, there are two additional external lights.

Beach Street: There are street lights during the hours of darkness.

Drainage

Market building: There does not appear to be any external drainage outlet from the market, although a ditch runs the length of the front, and could feed the creek if the gradient was favourable.

Waste Management

Raised waste bins for general public use are located along Beach Street; although, as each has only a small receptacle and limited capacity, larger bins have also been placed at ground level, and vendors use those to dispose of rubbish. There is no waste segregation.

Accessibility and Transport

Virtually all the 24 villages or settlements in Ovalau have their own carrier in which to transport people and produce either to or from market. There are also plenty of taxis that can pull up to load or unload along the shore side of Beach Street. There is no bus service in the island.

The grass verge of Beach Street is raised from the road, and has a shallow, pebble retaining wall (painted white), that is interspersed with access points. Access is not disabled-friendly as it involves negotiating a couple of quite deep and irregular steps.

The market building has a shallow ditch running immediately along the main entrance, that requires a ramp to be fitted to allow wheelchair access.

Governance

There is currently no vendor association for Levuka, although there are a couple of keen vendor representatives from the Saturday group of vendors. No contact has been made to date with the vendors who sell on other days.

Nadi Market

- Frequent, severe flooding, with flood waters approaching market from two directions - site positioned in meander of Nadi River
- Eclectic mix of produce halls and extensions, and no plans to redevelop or relocate market
- Muduliar Wing - leaking internal guttering crisscrosses ceiling
- Oldest section - low ceiling and poor ventilation, and also poor access because raised platform
- Casual vendors sell from floor in open area of market, between Khatri Wing and restaurant
- Poor plumbing associated with restaurant; stagnant, rancid drain
- *Kai* section sell from floor
- No waste segregation apparent



Location, history and development

The low-lying, coastal town of Nadi, in western Viti Levu, is the tourist centre of Fiji, and Nadi Market is located in the central area of the town. Nadi is in the dry zone of western Viti Levu, on the leeward side of high volcanic mountains, and has a large seasonal and inter-annual climatic variation. Annual rainfall is on average 181cm, and there is a well-developed west-by-northwesterly sea breeze during the day (Mataki et al., 2006), which was noticeable during the assessment.

The market was established in 1966, with various additional developments being made to the site over the years; however, flooding has been a major issue with major flooding events in 1999, 2009, 2012 and 2016. The flood of 1999 reached 7.25m above mean sea level (amsl) in Nadi Town, and 80% of stores reported damage, with half losing all stock; although, the flood of 2009 was worse, with an estimated 8.05m amsl in town (McGree et al., 2010). Both flood events were eclipsed, however, by the 2012 flood, when the flood waters reached 3.8m at Nadi Market - the height above mean sea level is unknown. Stored produce are destroyed, and market operations severely disrupted on each occasion.

Nadi River is 375m from the market at the closest point, but the market site is located within a broader meander of the river, so rising flood waters approach the market from at least two directions. The river rises in the Naloto Range to the east and flows westward through the Nausori highlands, and down the Nadi Valley (Paquette and Lowry, 2012). Despite being the largest catchment in western Viti Levu, the catchment size is quite small at 490 km², and with a small and steep watercourse inland, when combined with heavy rain, downstream rapid rising water levels result (McGree et al., 2010). Nadi has been identified as a high-risk location for flooding (Gravelle and Mimura, 2008), and virtually the entire population (99.5%) of Nadi is exposed to

the risk (Nunn et al., 1994). During a cyclone event, the situation is further compounded by increased river discharge at the mouth of the Nadi River (Gravelle and Mimura, 2008).

The underlying rocks of the Nadi area, comprising of unconsolidated silts, clays, sand and gravels (Geological Survey Department, Suva, 1965), similarly reflect the historical riverine geography of the area. Nadi is in a low risk earthquake zone (Hamburger et al., 1986).

Physical structure and produce sold

Nadi Market is made up of four produce halls, representing different phases in the development of the market, plus 20 lock-up kiosks selling spices and dry groceries. The oldest section of the market, in the middle of the site, dates from the 1960s, and, in addition to four rows of fruit-and-vegetable stalls, the building also houses the only restaurant, Leed's Restaurant. Owing to its age, the original building has a low ceiling and vendors say, gets very hot in the warmer months. There are a couple of shallow steps up into this section of the market on all sides, and only one small ramp.

The Nayate Wing, 20-30 years old, is situated between the oldest section and the dry-goods hall; the irregular-shaped area has 10 rows of fruit-and-vegetable stalls and the *kai* section, where vendors, who come mostly from the Naitasiri area, sell fresh-water mussels from floor level. The inside of the roof in this part of the market has foil covering that in many places is frayed and worn. The floor in this section slopes from both sides towards the middle of the stalls, there are no fans, and, similar to the oldest section of the market, the canopy facing the new tarpaulin tents is very tattered, and offers limited protection from the elements.

Three rows of wooden tables fill the space between the oldest part of the market, and the next produce hall, the Khatri Wing, opened in

1999. The hall represents the next phase in the market development. There are a couple of rows of wooden tables, and 10 rows of metal-sided, wooden-topped tables from which fruit and vegetables are sold. The roof has an apex, and is foil covered. Approximately 15 casual vendors sell produce from two rows of new, put-up tables, located closest to the tarpaulin tents; they occupy the space from Mondays to Thursdays. However, on Fridays and Saturdays, the vendors say that two farmers sell from these tables and the casual vendors are displaced to the floor, selling beneath the newly-acquired tents (Nadi Town Council, 2016). Vendors complain that the glare from the white tent, especially, is very distracting when it is hit by direct sun.

At the eastern end of the market, the Mudaliar Wing, opened in 2006, has one fruit-and-vegetable stall, but the majority of the area is for kava sales (both root/powdered and mixed), sold from the 11 rows of concrete stalls dedicated to dry sales. Small wooden benches accompany the stalls, but many of them are in poor repair, and vendors use their own seating. The wing also contains the fish market, plus an adjacent coconut stall, and the two-storey market master's offices. The high roof is made of flat irons, and has an external zigzag profile, which vendors compare with that of a bus station. The internal guttering crisscrosses the hall six times because of the roof design.

The newest, high-ceilinged development, in the south-west section of the market, was opened in 2014 and can accommodate up to 300 fruit-and-vegetable vendors in 15 rows of metal - sided tables - previously, the vendors sold from the floor under tarpaulin (Fiji Sun, 2014a). Not all the tables were occupied at the time of the assessment. The area benefits from 6 ceiling lights and 5 rows of fans - there is no foil lining to the inside roof. A women vendors' accommodation centre is incorporated into the extension.

In the night-market area - a separate space within the new section - vendors sell pre-cooked seafood parcels, mostly for the lunchtime trade. Juice vendors and sellers of pre-cooked roti and sweets sell along Main Street to the north of the market. They sell from wooden tables supplied by the council, but use their own canopies, tarpaulin and umbrellas.

To the south, within the market boundary, is the open area where casual vendors sell unprotected from the floor. During the week the relatively few casual vendors in this area come from Vagadra Village; towards the end of the week, the casual vendors come to sell here from the wider area. Vendors say that the floor - based produce can be damaged by the strong sun; cassava, for instance, they say, turns black if not shaded.

Vendors

Nadi Market has, on average, 500 vendors on any given week day, and on Fridays and Saturdays, the figure rises to 700 vendors (market master, pers. comm.). Of the 422 vendors at the market at the end of the first quarter of 2016, 54% were permanent, and women and men were represented almost evenly across the two categories of permanent and casual vendors (51% are women).

Vendor Security

Nadi Market is open from 7.00am to 5.00pm Mondays to Wednesdays, and then closes an extra 30 minutes later on Thursday (7.00am - 5.30pm), and then again on Fridays (7.00am - 6.00pm). On Saturdays the market opens at 6am and closes at 4.00pm. Each evening, vendors have the choice to continue to sell after hours in the area around Main Street. They are charged an additional \$1.30 to sell in the evening. Vendors of cooked food are charged \$2.25 a day for a table.

Women casual vendors are able to stay at the recently opened (2014), secure Women Vendors' Accommodation Centre. It is on the first floor of the new market development, and has beds, toilets and washing facilities. Charging \$2 per woman per night, the centre can house up to 30 women (Fiji Sun, 2014). Children are not allowed to stay at the centre.

The market is mostly surrounded by barbed-wire fencing; in places - above the gate on Market Road, for instance - the wire has clearly been climbed. A section of the perimeter in the new market development has no barbed wire at the top of the fencing. Vendors say that the fence is not high enough to dissuade trespassers, and that theft is a problem at the market. There is only one night-time security guard, and they are employed to look after the council premises, not the property of the vendors. There are no security cameras at the market. Even in the daytime, theft can be an issue. For instance, many vendors left their stalls to watch Fiji play in the final of the 2016 Olympics Rugby Sevens, only to return to find that some of their produce was missing.

There are two sets of public toilets at Nadi Market. The male and female toilets attached to the Mudaliar Wing are accessed from outside the building, and there are also toilets as part of the new development. Entrance fee: 20 cents.

A fire hose is located at either side of the Mudaliar Wing, and there is another fire hose adjacent to the restaurant that also services the new extension.

Services

Water Security

The water supply is generally good, and the market is well provided for in terms of taps and sinks. Six tiled basins and taps are evenly distributed around the Mudaliar Wing, another tap is located next to the restaurant, and another

single tap outside near the juice sellers. The new extension has six more taps. At the time of the assessment, several taps had been left running into overflowing buckets. There is no alternative rainwater tank.

Energy Security

Lighting levels vary around the market; the newest development has both good natural daylight and good ventilation. There are high ceiling fans, although only one or two were working at the time of the assessment. There are also six high-level ceiling lights. Vendors say that most fans had stopped working within two months of the opening of the new extension. The Mudaliar Wing has strip lights, and ceiling fans, although the fans were not operational at the time of the visit. When the fans in the Mudaliar Wing are operational, vendors say that dust is sent over tables and goods. There are five rows of Perspex sheeting in the roof, to allow natural daylight in, although limited light was able to penetrate because of the general cleanliness of the sheets. Vendors in the oldest section of the market request fans to circulate the air in this section. The market has no back-up generator.

Drainage

The internal guttering in the Mudaliar Wing leaks in many places. Vendors say that the roofing tin has been replaced, but not the guttering, which is just patched: "This is a leakage market". The internal downpipe and drain nearest the *kai* section of the market, also overflows, and because of the slope to the floor at this point, water collects in the central walkway between stalls.

The plumbing system is also poor in the restaurant, as water was pouring through the wooden slats of the restaurant wall, and vendors say that the excess seepage had been happening for some time. The water in the receiving, open drain was yellow and smelling.

The covered drain running across the market between the old section and the three rows of wooden stalls apparently overflows, and vendors say that when it does they are left sitting in water.

Waste Management

Vendors collect their own rubbish and deposit it in wheelie bins located around the market. The content of the wheelie bins is then unloaded into a fixed, concrete-sided rubbish area, located near the toilets at the eastern end of the market. The waste is mixed, and there does not appear to be any waste segregation.

Five cleaners service the market on a daily basis, by removing waste and undertaking general sweeping. The whole market receives a general clean once a month, although vendors say that only the floors are cleaned, not the walls nor roof areas, and the market is very dusty, especially at roof height.

Accessibility and Transport

The bus station is less than 100m away from the market, and vendors either carry produce from there or hire a wheel barrow from other vendors. The adjacent car park, the vendors say, is of a

limited capacity, although it can accommodate upwards of 50 vehicles. Many vendors park elsewhere, for example, at St. Michael's Catholic Church or along the police station road, as parking at the market car park costs about \$5 a day. The carrier unloading area is near the fish market.

Currently, one vendor in the new extension uses a wheelchair. She says, however, that despite arriving at 7.00am and leaving at 5.00pm every day, she has only used the washroom twice in the last year - she normally does not move from her stall. The new facilities include a disabled-accessible toilet.

Governance

Committee members of the Vendors Association say that there is a good relationship between the vendors and the acting Market Master, Solomoni Raura. The committee is well organised, with an active president, secretary and treasurer.

Namaka Market

- No evidence of flooding at the market since it opened 2005
- Plans to extend market with addition of two-storey extension
- Gap between roof of original market and roof of 2010 extension traps debris, dislodged in wind and heavy rain onto produce below, plus minor leakage in roof
- Temporary dusty conditions from road upgrade
- Fish market poor ventilation - hot
- Small, dusty, gravel car park
- Bare soil slope behind back drain of market, clogs drain requiring dredging
- No waste segregation scheme



Location, history and development

Namaka Market was built in 2005, and abuts onto the main road through Namaka, Nadi; it is just over one km away from Nadi International Airport. The airport runway is between the market and the coast, with the shoreline some 1.5km away. The market, therefore, receives a considerable influx of tourists during the day, with several bus loads visiting during the assessment. There have been no reports of flooding at the market since it opened.

The track of tropical cyclones often transverses western Viti Levu, therefore Namaka Market has experienced the passage of cyclones in the past. The underlying geology, like Nadi Town, is made up of sedimentary rocks (Rodda, 1967).

The market was extended away from the road in 2010. The newer roof of the extension overlaps with the original roof, but there is a gap the entire length of the market between the two roofs, and when there is strong wind, the leaves and other debris that have accumulated there over time fall on the vendors and their produce below. The vendors have requested a meshing to prevent this, however, once fitted this would need ongoing maintenance.

There is a further proposal to extend the site into the adjacent Fiji Land Authority slot, with the construction of an additional building that will contain more stalls - especially targeted at the flower vendors - and to offer the option of overnight accommodation to casual vendors.

Physical structure and produce sold

The main building comprises of an open-sided, high-ceilinged structure, supported by six rows of central, metal supports, and with a curved, corrugated roof. The open-sided nature of the market means that vendors on the periphery are exposed to sunshine during at least part of the day, and rain, when it rains heavily.

The primary structure of Namaka Market was mostly unaffected by Cyclone Winston. However, the secondary, end panelling on both sides (gable ends) received considerable damage and needed to be replaced in part. There are small holes in the roof that result in minor leakages in rain. Recently the council has inserted four ceiling air-flow vents (ventilation outlets with integral fans). The vendors are very pleased with the vents and have requested more as they allow air, and a certain amount of light, into the market hall.

The stalls are metal and permanently fixed to the concrete floor. Most of the stalls sell fruit and vegetables, although there are four stalls that sell kava in the hall. The last two rows of tables have been reserved for the use of farmers and casual vendors (28 vendors/tables). If the tables remain unoccupied, then permanent vendors may use them. There is also a restaurant and fish market integral to the complex, in addition to the market master's office. For the last two years, the flower vendors have been accommodated under two UN Women open-sided tarpaulin canopies at the rear of the market. Behind them is the open drainage ditch for the market. Previously, for four years the flower vendors were based in the car park with no shade nor shelter; however, they say that they had more customers there.

There is a slight gradient to the market floor, and when there is heavy rain, vendors say that rain water flows from the western corner across the floor, and floor-based produce in the middle of the market get wet.

Vendors

Namaka Market is small, with only 82 vendors at the end of the first quarter 2016. And while women and men are evenly represented among the two-thirds of vendors who are permanent, only 4 men are casual vendors - the remainder of casual vendors are women (n = 25). Many of the casual vendors are flower vendors who live

some distance away from the market in Naitasiri, Tailevu and Suva; or are farmers, who mostly come from two villages: Nagado Village and Nadele Village; both villages are reasonably local, on the other side of the airport towards Lautoka.

Permanent vendors pay \$2.35 per table and casual vendors \$2.55 per table. After Cyclone Winston, the vendors had their fees waived for one to two weeks, and there was also a reduction in stall fees - currently, they do not pay VAT on the cost of the tables (a 9% reduction).

Vendor Security

The market operates 12 hours a day (7.00am-7.00pm) Monday to Saturday, and is unusual in that it is also open on Sundays and Public Holidays from 7.00am-2.00am, with vendors choosing to come on those days if they wish. The fish market is particularly busy on a Sunday.

There are segregated toilets, each with shielded entrances, located near the restaurant: the women's toilet has two cubicles; the men's toilet, however, only has one cubicle and a urinal, and the male vendors comment that when there is a queue for the cubicle, they have to resort to accessing the toilet facilities at Rajendra's supermarket across the road. There are currently no disabled toilet facilities, and there is one regular customer who requires assistance. There are plans to extend the toilet block as part of the new expansion proposal. Currently there are no bathing facilities at the market, and when children require a bath, they are bathed under one of the open taps, with no privacy.

There is no accommodation at the market so the flower vendors, who generally come a considerable distance, stay with relatives in the wider area e.g. Lautoka. They say that that arrangement can be difficult, and makes for very long working days for them. Since about 2010-11, the council provides one security guard

(6.00pm-7.00am), and no-one is allowed on-site after 7.00pm. Vendors comment that they can't even return if they leave a mobile phone behind.

Two cleaners are employed by the council, one for the morning and one in the afternoon, and the market hall is mopped every day. Vendors say that the market should have a 'full clean' on the last Saturday of each month, although it has been at least two-three months since the last clean, and vendors say that there is plenty of dust. Despite that, the market, including the toilet area, is very clean, and it is noticeable that the roof rafters are generally free of dust and cobwebs - commendable considering the extensive and dusty road works adjacent to the market.

In the event of a fire, there is a fire hose near the market master's office, and the market has a PA system for announcements. There is no CCTV system at the market, and the vendors say that there have been thefts. A 30-40cm step is located along the entire market side that fronts the main road, and because of the road upgrade, on the grounds of safety, the council has erected a temporary fence to the front of the market. Vendors say that, with limited access directly from the road, business has been affected. The council, once the road works are complete, plans to put steps to enable access.

The site is open, and the vendors comment that they would like some sort of fencing, for peace of mind, when they leave their produce at night.

During Winston, the market closed between 2.00-3.00pm at the instruction of the market master. The flower vendors went earlier as they had further to travel to reach home. Owing to the frequency that the Nadi area experiences cyclones, the vendors were well prepared: taking produce home, and securing their properties - securing screens, windows and roofs; putting shutters up; locating torches and lanterns, and ensuring that the family is gathered together.

Services

Water Security

The market is serviced by two external taps, one near the rubbish collection point (wheelie bins) and one by the toilets. There are also two hand-basins near the men's toilets. The water supply is good, although it might fail two to three times a year. There is an alternative rainwater tank near the tap and wheelie bins in the car park. It is unsuitable for use as drinking water.

Energy Security

The site is serviced by mains electricity, although the main lights were not switched on during the assessment visit, and the market was still open and light (it was a sunny day); however, during dull weather the lights would be on. There is no back-up generator at the site. Other than lever windows, the fish market has no ventilation nor cooling system.

Drainage

Guttering on the road side of the market drains rainwater from the roof to downpipes on the two-section lean-to at the front of the market. At the rear of the main building, the extension roof drains to five downpipes that flow into the purpose-built, cement ditch at the back of the market - the water in the ditch flows in the direction of the car park. The ditch is a soak-away, as once run-off rainwater leaves the market site, via a grid, it soaks away into the adjacent, open field. Although the method concerns vendors, as long as there are no blockages to the drainage system, the system reportedly works well. The ditch does tend to get blocked with debris from

the bare slope above, and there was evidence that the ditch had been cleaned the day before, as, in several places, recently dredged soil-based material was drying in the sun on the market side of the ditch.

Waste Management

Vendors are responsible for taking their own rubbish to the green wheelie bins located in the car park. Many of the wheelie bins have no lids, and are difficult to move as they are missing tyres. There used to be a waste segregation project at the market, but that was stopped some four years ago, and now the waste is mixed. Vendors say that the area can smell in hot weather. It is also adjacent to the external tap. Vendors comment that there is need for more awareness and education in regard to sustainable-waste management.

Accessibility and Transport

The unfinished and non-demarcated gravel car park is compact, and generally too small for the number of customer visits, especially now that the opportunity to park alongside the market has been removed with the dual-carriageway upgrade. In dry weather the car park is very dusty, and the vendors note that it is not hosed down during dry periods.

Governance

Currently, there is a vendors' interim committee, and the vendors comment that the committee needs to be registered formally. The market master has been in post for 12 years, and has firm ideas for the market. He is assisted by a market attendant, and other general workers

Nausori Market

- New substantial market (largest in Fiji) on new site - opened 2015
 - no damage from Cyclone Winston
- No leakages from roof, and no use of internal taps within market hall, makes floor surface dry
- Good aisle width between permanent stalls, and good signage throughout, including emergency exit signs
- Casual vendors selling outside exposed to elements
- Overflow car park un-surfaced and very muddy in wet weather
- Ditch containing stream to rear of market prone to water-level rise - though not flooded to date.
- Dry goods section of market located closest to ditch - bulky goods stored on floor
- Pedestrian crossing - lights not adhered to by pedestrians and perilous crossing practices



Location, history and development

The original Nausori Market opened in January 1940 (Baxter, 1980); however, in September 2015, a new, purpose-built market was opened, 400m to the north of the old site, and close to Nausori golf course. The development cost \$3 million (Bola-Bari, 2015).

The frontage of the market is along the high-speed and high-volume Verrier Road, that is part of the main, circular King's Road. The market is north of the main town, and approximately 250m away from the Rewa River, with its largest river catchment in Fiji (2,920 km²) (McGree et al., 2010). The old market, only 100m from the river, had to close every time the river rose. The new site, before it was developed, would also flood, but since construction, there has been no flooding at the market site to date. Nausori Town regularly floods, as it is built on the flat, alluvial deposits of the Rewa River (Rodda, 1967), and it last flooded during Cyclone Winston. The coast is some 10km away from the town to the east.

Physical structure and produce sold

The large, 5590 sq m building (MMF Consultants Ltd., 2016), with its rectangular shape and high ceilings, inside resembles a warehouse. It has a permanent roof that is supported by sturdy, internal steel pylons. The solid market construction was undamaged by Cyclone Winston, and, as a result, was open as usual on the Monday following the cyclone.

Within the market building, there are designated areas for fresh produce, dry produce (kava and groceries) and a small section for handicrafts, and at the rear there are sections for fish and *kai* sales. Two restaurants and a café (all with attached kitchens) service the market, and there are a number of inside kiosks selling sandwiches, DVDs, electronics etc. The hall has a mix of fixed (reserved) stalls in the interior section of the produce hall, for permanent vendors, and

portable tables and wooden stalls at either end of the hall, available to the casual/daily vendors. The market roof is well insulated and there are no leaks, and with no interior water taps, the market floor is dry throughout.

Beyond the market perimeter, the adjacent land to the north is used to create additional customer parking, though, as it is unpaved, the area readily turns to mud in rain; during wet weather only four-by-four vehicles, mostly belonging to wholesalers, use the site. The heavy axle-weight of the carriers aggravates the muddy conditions.

Vendors

Nausori Market has just over a thousand market vendors (n = 1042), 55% of whom are permanent vendors, with men and women equally represented among the permanent vendors.

In terms of vendor capacity, Nausori Market is currently the largest municipal market in Fiji, and can accommodate more than 1300 full-time and daily fruit-and-vegetable vendors (MMF Consultants Ltd.). At the time of the assessment, six months post-Winston, many of the reserved stalls, especially in Section B, normally used by permanent vendors, were unoccupied, as vendors had yet to return after the cyclone. All vendors (permanent or casual, inside or out) are charged the same rate per stall: \$1.25.

The smallholder farmers and casual vendors mostly sell at the market on Thursday to Saturdays, and come from the three provinces of Tailevu, Rewa and Naitasiri, with a few coming from as far away as Ra. Produce also come from other areas, namely Lautoka, Ba, Tavua, and even Sigatoka valley (MMF Consultants Ltd.). Women make up some 58% of the farmers/casual vendors. Nausori Market is the only market that has considerable numbers of vendors from three provinces; other markets generally only have vendors from one province.

Vendor Security

The market operates between 7.00am and 6.00pm Mondays to Fridays; on Saturdays it opens an hour earlier, at 6.00am. The market has fencing around part of its perimeter (and plants and shrubs planted in borders), although the site is largely open, as there is no lockable barrier nor gates. Two council staff are employed at night, and there is a separate, small security office at the corner of the market, near entrance six. Casual vendors, most of whom are women, have no choice other than to sleep with their produce, as, currently, there is no accommodation for vendors in the vicinity.

There are two sets of male and female toilets (three cubicles in each toilet block, plus a shower), and the opening hours of the public convenience reflect the needs of the vendors. Most days the toilets close at 10.00pm, but on Fridays they operate 24 hours. Two dedicated male attendants maintain the male conveniences, and two female attendants, the female conveniences. The facilities are kept to a high standard. Vendors use the facilities for free, although there is a 20 cents charge for the general public (and 40 cents to use the shower).

Previously, it has been noted that few vendors were accompanied by children (UN Women, 2011), however, several children were present at the time of both the Friday and Saturday visits.

Announcements are made over the PA system, and there are fire alarms, strategically positioned around the hall. The fire alarm sounds quite regularly (two to three times already this year), and the fire service responds each time. Most are false alarms, but there has been one, out-of-hours fire earlier this year, when one of the appliances in an electrical kiosk overheated. The market hall was smoke-filled, and vendors were denied entry for a couple of hours. Vendors say that, if the fire had started during the day, the

extent of damage would not have been so great, as it would have been dealt with immediately. Exit signs from within the market hall are clearly visible above each entrance, and in the far corner of the hall, beyond entrance 8, there is a concealed side door - a (small) emergency sign indicates its use as an exit point.

On the Saturday of Cyclone Winston, the market closed early, at around midday, and vendors were asked to go home. The market master made the announcement, having been instructed by the Nausori Town Council to close the market. The town council, in turn, had been notified by the Local Government, and the Central Commissioner had initiated the action.

With the market closed, some vendors tried to continue selling produce outside, but the police arrived to move people on. There was no structural damage to the market as a result of Cyclone Winston, and the market reopened as usual on the Monday.

There is a form in the market master's office for complaints or the reporting of an incident.

The casual vendors who sell produce from the demarcated spaces between entrance 4 and 5 have no shelter. The selling spots are open to the elements, and vendors bring their own protection, ranging from individual umbrellas to quite elaborate tarpaulin booths. In high wind each would offer varying wind resistance, and the gentle, open slope, from which the vendors sell, faces the prevailing south-easterly winds.

Services

Water Security

The water supply to the market is reliable and of good quality, with the hall being serviced by two sets of eight sinks, located along the exterior wall, between entrance 6 and 8. Vendors must wash any fruit and vegetables outside before

bringing the produce to the stall - thus ensuring dry surfaces and clean, appealing produce displays. There are also single taps at each of the entrances running the length of the market, although as the taps are not aligned directly over a drain, the area around each tap is constantly wet.

Within the market hall, an internal tap was located near entrance two, but it has been capped (sealed), as, like the external taps, the area was found to be constantly wet. The external single tap, near entrance 3, has also been capped as it is sited at the crowded, road-crossing corner of the market. Such modifications indicate a high level of awareness to health and safety, with the management prepared to adjust the availability of facilities when circumstances require.

Four fire hoses are located outside along the length of the market. There are no fire extinguishers.

Energy Security

The market is well lit, and there is a back-up generator should the main power supply fail - the generator was relied on post-Cyclone Winston, for instance. The old market would have struggled to have operated without mains power - the new produce hall is very light and airy in comparison. And air circulation and available light are unimpeded, as stall displays in the produce hall can attain a maximum height of 45 cm (18 inches) only.

Outside, the lamp posts that illuminate the site are solar-powered and therefore, independent of the mains power.

Drainage

The drainage downpipes, at regular intervals along the exterior guttering, carry rainwater from the roof to the grid-covered drains - three of the downpipes lead to the three rainwater storage tanks - two located at the rear of the market, near the fish and *kai* sections, and the third, next to the security office. The tanks are not suitable for drinking water.

Rain water from the downpipes flows into a ditch containing a stream to the north of the market, that runs parallel to the length of the market. The stream feeds into the Rewa River. Vendors say that, in heavy rain, the water does rise in the ditch, although, as yet, only to an intermediate level (where cassava was planted as the time of the assessment). One vendor, however, pointed out that the land above the overspill car park is currently being cleared for development - they had heard for the construction of a hospital and supermarket - and they voiced concern that with more hard surfaces and excess-runoff, there may be the potential for flooding.

It was also noted that the ditch runs along the side of the market where the dried foods and groceries are located, and if there was a flood, the merchandise would be badly damaged, as much of it is stored only a few inches off the ground on pallets.

Waste Management

The market operates a waste-segregation scheme. Vendors separate green waste and paper from bottles and cans. Green waste is placed into green wheelie bins located around the market hall. These in turn are emptied into two skips, positioned near the ditch (two external water taps are also located there). The content of the skips is collected by local pig farmers once or twice during the week, and two to three times on Saturday, as need dictates. Separated bottles and cans are collected by Coca Cola.

Not all vendors use the scheme, so there will be a push to encourage use next month. The women's association sectional representatives will drive the initiative within their sections (there are current 16 sections to the market).

Accessibility and Transport

Directly opposite the market is the new bus terminal that allows ease of access to public transport for farmers, vendors and customers. The closest bus terminal, on the market side of the dual carriageway, is a market-transit (drop-off) bay, exclusively for the vendors arriving by public transport; it allows direct access to the market without the need for vendors to cross the busy Verrier Road.

The market has external areas for wholesales (weekdays only) and dedicated attendant-controlled, car-parking spaces (\$2 per car). A taxi rank, with space for four taxis, is located at entrance 8, and a loading/unloading bay between entrance 8 and 6, for the use of other vehicles. Loading time is limited to 30 minutes.

Within the market there are clearly marked walkways for pedestrians, that are sufficiently wide enough to allow wheelchair access. There is also a toilet designed for wheelchair use - although currently the hand basin is missing. Until recently, one of the vendors was wheelchair-bound, although they passed away on July 2016, and currently none of the vendors is living with a mobility-impaired disability.

There is good, clear signage throughout the market hall. Beyond the market perimeter, there is a lights-controlled crossing at the south side of the market, with a protected central reserve. However, it was observed that people generally cross at the crossing when a gap in the traffic allows, rather than waiting for the pedestrian-priority lights. Verrier Road is a high-speed dual carriageway and neither pedestrians nor drivers seemed to allow for the other road user. It was also noted that the road surface at the crossing was already patched and pitted with minor potholes, that were filled with rainwater at the time of the Saturday visit. People crossing therefore, were forced to divert their path to avoid the puddles; and many of the adults were accompanied by small children and/or carrying

shopping bags. Any hesitation or collision of opposing pedestrians could be costly, if not crossing 'on the lights'.

A vendor mentioned that the biggest contention at the market at the moment was the positioning of the crossing. Customers were complaining that currently they have a considerable distance to carry purchases. One of the vendor associations wants the crossing to be moved opposite the middle entrance (Gate 2). Currently, the distance from the market to the bus terminal is approximately 180m - the same distance as the old market was from the then-bus station. With a direct crossing, the distance saving would be about 120m. However, the pedestrian approach at the bus terminal would need to be redesigned.

Governance

The market is owned and operated by Nausori Town Council, under Ministry of Local Government, and on-site, there is an office belonging to the council, where the market master is based (the market master has been in position for the last five years). Four or five other staff work in the office, and there are various council attendants around the market site.

Two vendor associations operate in the market. The long-established Rewa Farmers Association has been in existence for about 40 years, and has 300+ members, with membership comprising roughly 50:50 men and women. The other association is the Nausori Women Vendors Club, established about 4 years ago. The women's club currently has 360 members, although the president says that there will be a meeting and recruitment drive after the first anniversary of the new market opening (mid-September). Women complain that their voices are not heard, so each month the club has a *talanoa* (informal meeting) to voice the women's concerns; the *talanoa* session is followed by representatives meeting with the market master.

Rakiraki Market (also known as Vaileka Market)

- Very frequent, severe flooding - proximity of tributary of Penang River, and development in town and flood plain
- Extensive damage from Cyclone Winston, resulting in plans for new market
- Casual vendors displaced from new shed to again open, floor-based selling because of cyclone
- Rakiraki constantly windy and produce in new shed wind - damaged on tables; kava section produce blown off tables in strong wind
- Tattered tarpaulin protection from afternoon sun along tents section
- Extensive tarpaulin sheeting erected daily by council to protect 'wing' containing dry goods
- No running water (tap) in fish market and no ventilation fan
- Dusty gravel car park and no shade because of loss of trees in market square



Location, history and development

Rakiraki Market is located in Rakiraki Town, the only urban settlement in the Penang River catchment (Brown et al., 2016). The market was founded during the 1950s (Baxter, 1980), and prior to Cyclone Winston consisted of a covered, main produce hall (built in two phases: 1979 and 1982) and an additional high-ceilinged extension. The new extension (open shed) opened in 2014, at a cost of \$250,000, and was specifically built to accommodate the casual vendors who used to sell produce out in the open (Fiji Sun, 2014b).

The current market facilities, which had been in place for about four decades, were severely damaged during Cyclone Winston - the central produce hall used by the permanent vegetables vendors, the 13 'Digicel' kiosks near the bus stand (2010), and the newly-built (2012) women's accommodation centre were all destroyed - consequently, a new complex is planned to replace the entire market (Devi, 2016). The proposed development, to be built on the current site, will cost \$7 million FJD (newswire.com.fj, 2016), and is scheduled for completion by the end of 2017.

Rakiraki Town is more used to the flooding hazard than cyclones, however, with 73% of those in a recent survey who live in the Penang River catchment, stating that they have been adversely affected by flooding (Brown et al., 2016). The Penang River is approximately 0.75 km away from the market, and its tributary, Waimari, runs to the east (back) of the market, less than 15m away from the main buildings. The Waimari joins two other tributaries just a short distance downstream of the market, near Rakiraki Sugar Mill, and when heavy rain falls, especially in the mountains, the market and town are vulnerable to flooding. Market vendor, Faranises Maisomoa, estimates that vendors lose two-weeks' business each year because of flooding (Maisomoa, per. comm.), and she says the problem is getting worse. In 2015, for

instance, there were four floods. The northern Viti Levu coast is approximately 2.5km away, across the flood plain, and Rakiraki Market has been evacuated previously because of the tsunami risk. Sugar cane farms, scattered along the river catchments of the River Penang and the River Nakauvadra, have caused deforestation and erosion of the area around Rakiraki, resulting in the risk of flooding. Additionally, recent developments in and around the town are believed to have contributed to the increased incidence of flooding. New construction is evident in the Naiqoro Flats, the sugar cane-filled floodplain that surrounds the town; and within the town, on the other side of the Waimari stream, a raised complex of new buildings, the Shiu Prasad Complex, now presents a solid barrier to flood waters, so that rather than allowing spill over of flood waters into the adjacent fields, vendors believe that the substantial development now deflects flood waters back into the market and town. Previously, floods used to rise and fall over a few hours; now they take one or two days to recede.

Out of town, two culverts take streams from the hills across the fields and under the main Rakiraki road; these culverts indicate the likelihood of a flood risk in the town, as they flood first. Maisomoa said that she had been told by the aged landowner of Naiqoro Flats, that the original course of the river was one of the streams, but the owners of the sugar mill diverted to river to cool the mill many years ago. Therefore, in heavy rain the water still seeks out its original course. In town, the market is one of the first places to flood as the tributary immediately behind and a drain within the town both flood and the flood waters converge at the market. Significant flooding and forced evacuations of the town in recent years have prompted the Rakiraki provincial administrator to call for proposals to divert the river and/or to relocate Rakiraki Town (Brown et al., 2016). The igneous rocks around Rakiraki are mostly hard, basaltic (Rodda, 1967), and Rakiraki is in a low risk area for earthquakes (Fiji Government, 2004).

Physical structure and produce sold

Currently, the market consists of an L-shaped, open structure (the original market on the current site), the new shed and a series of tarpaulin tents.

The L-shaped structure, since Cyclone Winston, is open sided, but has 10 lockable, wooden kiosks (five along each outer wall), plus a council storage room for tools. The roof in this part is generally in good repair, with a foil lining, and clear (blackened) Perspex panelling interspersed along its length. On the opposite side to the kiosks, the market is open-sided and unsecure - it used to be integral to the larger produce hall that was lockable. Among the kiosks nearest the new extension, one kiosk is a barber's, although the sign above the door clearly advertises the room as the Vendors' Learning Centre. There are two rows of high, metal tables in the central open area from which vendors sell kava. The restaurant in the middle, The Chicken Master, was formerly the market master's office, which is now located in the other 'wing', close to the fish market.

In the other wing there are five more kiosks, a kava-mixing room with tap-and-sink arrangement (which currently houses nine vendors), another locked room, the market master's office, and the fish market. The fish market has two chiller cabinets to store fish, and raised, tiled selling surfaces, that were empty and devoid of running water at the time of the assessment.

Part of the open area has kava and dry-grocery stalls, although the area closest to the fish market appeared to be used as an untidy storage area for council materials. The external roof was damaged during Cyclone Winston and the end tin sheeting still shows the destructive force of the winds. In the afternoon, the impacts of strong sun are felt on the stalls nearest the restaurant, and the council assembles a huge tarpaulin sheet daily to hang from the roof as protection.

Outside, the foundations of the former vegetable market are visible. Casual vendors now sell produce in this area from under makeshift tarpaulin. There is also a green tent housing a fruit-and-vegetable vendor. The new extension is constructed from solid, metal girders with a tiled roof, some of which are blackened Perspex sheets and a level, concrete floor. High ceilings and open sides make the new extension very light and airy, but, on occasion, vendors say that it can be too windy. Green vegetables especially wilt in the wind. The building, too, sustained damage during Cyclone Winston, and while the primary structure remained unaffected, there was damage to the roof, the secondary structure. Some sheeting still has perforations, and there is one part that has a gaping hole, patched only with ill-fitting tarpaulin.

The extension now accommodates the displaced permanent fruit-and-vegetable vendors. The vendors sell produce from a mix of solid wooden tables (recycled, old Nausori Market tables that arrived after Cyclone Winston, to replace lost stalls) and plastic tables given by the UN Women. Vendors are responsible for the provision of seating. The area used to be used by casual vendors; and now, the casual vendors are displaced to the floor around the market buildings and in the gravelled car park (closed to traffic on Saturdays).

Four tarpaulin tents sit alongside the new extension - they have been added since Cyclone Winston, to accommodate additional fruit-and-vegetable vendors. The UN Women has also supplied additional tables and chairs that are mostly used in this area. In 2010, thirteen 'Digicel' kiosks were built along the roadside adjacent to the bus stand, but they were badly damaged by the land-mark tree in the corner of the plot, toppled during Cyclone Winston; the kiosks were bulldozed and the remnants of the tree removed. Previously, the tree offered shade to the casual vendors that sold around its base. Now three sweet stalls occupy some of the space where the kiosks once stood.

Across from the bus stand, only the foundations of the newly-built women's accommodation centre remain. Another mature tree fell on the accommodation block during Cyclone Winston, resulting in irreparable damage to the building. Two juice vendors now use the levelled space.

Vendors

There were 245 vendors at Rakiraki Market at the end of the first quarter of 2016, 60% of whom were permanent vendors, and most of these are wholesalers. Women account for almost 70% of the permanent vendors and the majority of casual vendors (55%); 94% of ground-space vendors, pre-cyclone Winston were women. A notice on the notice board of the market master outlined the following pre-Winston permanent vendors by category: inside kava 10 (9 male: 1 female); fruit and vegetables 42 (17 male: 25 female); mixed kava 8 (6 male: 2 female); Digicel 12 (4 males: 8 females); groceries 10 (5 males: 5 females); ground space (4 males: 61 females).

Permanent vendors pay 85 cents per stall per day, casual vendors 60 cents per stall and the fish vendor 28 cents per kilo. Monthly rents are as follows: mixed-kava vendors \$90 per month, and a fish vendor, who rents the small room next to the fish market, \$60.

Permanent vendors say that the number of farmers attending the market has declined as they are waiting for the new market.

Vendor Security

As the market is open-sided, there are no opening and closing times, and vendors can come and go as they please. However, vendors say that they have lost market items to theft because of the ease of access. This was especially true post-Winston, when flood-surviving produce, scales and display items (plates and bowls) all disappeared. There is one night-time security

staff employed by the council (6.00pm - 6.00am). There were also incidences of looting through Rakiraki Town post-Winston.

The original, ageing toilet block is currently the only public convenience at the market. There are three cubicles on the women's side, and one of the men's. The washroom in the women's has had the showerhead removed. There is a 20 cents charge (free to vendors). Vendors complain that the toilet block smells and can be very unpleasant with the wind in a certain direction, as was the case at the time of the assessment. In the past, vendors have asked the market master for the toilets to be cleaned because of the smell, and he has attended to their request.

The upgraded 'Digicel' toilet block, completed in 2013 (Fiji Sun, 2013) with contribution from UN Women, and located near the taxi stand, was locked at the time of the assessment, and vendors say that it is only open when the older toilet block required council maintenance.

A fire hose is located at the back of the Chicken Master Restaurant, and a fire extinguisher outside the kava-mixing room. There has not been the incidence of a fire at the market. There is a PA system for announcements.

Services

Water Security

Cyclone Winston resulted in the loss of some water pipe works that supplied water to the market. The internal tap in the fruit-and-vegetable produce hall was destroyed along with the building, and the fish market has been operational without direct access to an inside tap. The blocked off tap (and presumably broken pipe work) is in the corner of the fish market, and the fish vendor says that he now has to bring buckets of water from outside.

There is one outside tap and sink at the corner of the new extension nearest the drain (a second tap has been capped), and three taps and two sinks in the kava-mixing room. There is no alternative water tank for the market should the water supply fail.

Energy Security

The market is serviced by mains electricity; strip lighting is used in the L-shaped hall, although several bulbs are missing in the ceiling lights in this area, and the new shed has two sets of high-level spotlights that were not switched on at the time of the assessment - there is plenty of natural daylight in the shed. There is no back-up generator.

Drainage

At the back of the new extension a deep drainage ditch was constructed to accompany the extension. It has a storm drain to prevent water coming up from the Waimari tributary, however, vendors say that, during heavy rain, waters come up from a subterranean drain in the town and the storm drain prevents that water flowing into the tributary.

There is an uncovered drain between the new extension and the rest of the market, that flows around the extension and into the tributary.

The down pipes at the back of the extension are damaged, and the guttering missing over the L-shaped structure, wrenched from its fixings by the strength of the wind during Cyclone Winston.

Waste Management

Waste segregation is clearly advertised at the market, although less well adhered to. Yellow wheelie bins are located around the market and green waste is sometimes separated from other waste types. There is a mulching area behind the toilets for biodegradable waste. The wheelie bins are said to be emptied hourly or so, and waste removed from the site in the afternoon.

The Rakiraki rubbish dump is located very close to Naria Primary School, and the Department of Environment was looking to move the site earlier this year (Nasiko, 2016).

Accessibility and Transport

The bus stand is next to the market, and a taxi stand is in the parking area immediately outside. Cars can park in the gravel area surrounding the market during weekdays - they are banned on Saturdays when the space is giving over to casual vendors.

Within the market, the floors are generally in a good condition, level and smooth, allowing ease of access within the buildings. However, access up into the market space is problematic. Uneven steps mark the entrance to the new extension from the shops side, and a drain divides the new extension from the rest of the market, with only a narrow ramp bridging the ditch. Another area of restriction is the fish market. Here, the fish vendor says that the area gets very busy with customers on Saturdays, and movement inside the room is impeded by its design and the number of people trying to access the area. The raised outline of both the accommodation centre and the produce hall could catch out the unwary.

Governance

Previously, there was a women's club and a market vendors' association, though now the two associations have merged into the interim association. They have a good relationship with the Market Master, Ilaisa Vakaloloma. Vakaloloma is a practicing SDA, so was not at the market when Cyclone Winston struck (Saturday); however, he was warning the vendors of the imminent arrival of the cyclone on the Friday - his last working day for that week. The market master also writes letters of support for vendors when they apply for loans or hire-purchase. Vakaloloma is supported by an assistant market master; there is also a council labourer and a security guard on site.

Savusavu Market

- No past flooding - no riverine source close by - Vunikoka Creek to one side of market
- Plans to develop partial two-storey extension
- Proximity of the coast, and risk of storm surge and tsunami
- All casual vendors sell from tables, not from the floor
- Older, low-ceilinged section of market poor ventilation and hot in hot season
- Fish sales from new extension, stored in vendor-owned chiller cabinets - no back-up generator
- Flower vendors on Saturdays, and unprotected from elements
- Separate food parcels shed open-sided and unsecure



Location, history and development

Savusavu Market was established in 1973, and is located in the middle of Savusavu Town, a popular tourist destination in southern Vanua Levu. It has a coastal location, with the shoreline less than 50m away, and like much of the town, the back of the market has an attractive, northerly aspect overlooking Nawi Island, and Savusavu Bay beyond. The main entrance to the market fronts onto the main road, Lesiaceva Road, that runs through the town. A taxi stand and the bus station are adjacent to the market, and the office of Savusavu Town Council is incorporated into the eastern frontage of the market building.

The entire area is low-lying, and the Nasekawa River, that flows into the northern part of Savusavu Bay, is the main river in the area (Roy, 1988) - there are no major river systems in the immediate vicinity of the town. The small Vunikoka Creek lies to the east of the market - although vendors cannot recall flooding at the market, and the bay is generally sheltered from open-ocean storm waves, as the south-easterly winds generate local waves that mostly affect the northern shore away from the town (Roy, 1988).

Cyclones, however, generally introduce strong westerly winds that attack the head of the bay (Roy, 1988). Cyclone Winston, for instance, tracked to the south of Vanua Levu, introducing hurricane - force winds that caused destruction in the town - Savusavu jetty was forced to close temporarily because of damage (Gopal, 2016a), and a bus was reportedly thrown inland by a wave (FBC, 2016).

The Market Master, Wame Nabete, said that because the cyclone was forecast to come early afternoon (2.00pm) on that Saturday, but arrived earlier, at about 11.00am, 190 people (vendors, customers and visitors to the town) were forced to shelter in the market during the storm, before

being transferred to the church and community hall in Yaroi Village, at about 7.30pm that night. Market opening hours were as usual the following week, although there was some minor damage to the roof.

Prior to Cyclone Winston, the relatively protected Savusavu Bay had recorded only one major storm surge, during a hurricane in 1886 (McGree et al., 2010), when many boats were wrecked, houses blown down and plantations destroyed (Blong et al., 1994).

Sedimentary rocks, mostly sandstone and marls, make up the geology of the area around Savusavu (Geological Survey Department, Suva, 1965), and Savusavu is in a high-risk earthquake zone (Hamburger et al., 1986).

Physical structure and produce sold

The original market fronts onto Lesiaceva Road; vendors sell fruit and vegetables, spices and general groceries from wooden tables. Stalls are generally well spaced and there is a wide central aisle. The low roof is supported by solid wooden columns. The area is quite dark, and vendors say that it can get warm in the hot season. There is no interior foil-coating to the roof. There are three kiosks incorporated into the side of the original market, closest to the taxi stand - they are accessed from the outside walkway. The area in front of the market foyer is scheduled to receive a new pavement area.

The market building has been extended at least twice towards the shoreline (rear of the market) over the last 40 years. The first extension in effect doubled the size of the original market, and now contains more fruit and vegetable stalls, and the heavily glass-windowed market master's office. A handicraft centre is located along the side of the market directly behind the council offices. Five vendors sell their handiwork from there. The room has two ceiling fans, although

vendors say there are no power points; they also complain that the area is dusty. There are airflow ventilation outlets in the roof of the main market, although again vendors say that the area is hot in hot weather.

In 2014, because of population growth in the Savusavu area with the resultant increased demand for food, the market was extended again, at a cost of \$150,000 (Government funding under the PSIP programme). The new high-ceilinged extension is light and airy and accommodates 27 fish vendors, each of whom stores fish in their own individual chiller cabinet. Each cabinet is powered separately from the nearest power socket - there are several rows of electrical sockets for that purpose. The area can house 40 vendors (Taleitaki, 2014). The whole fish for sale were caught locally; when no fish is available locally, vendors sell sliced fish from Suva.

The new extension also means that the market is now segregated by produce type; for instance, all the kava vendors have been grouped together in one area nearest the taxi stand (between the old market and the new extension), although many of the tables were unoccupied at the time of the assessment. To the sides and rear of the new extension, tables are set up for casual vendors. Users of the tables at the rear of the market benefit from the recent addition of tarpaulin covers, and all tables have some sort of shade, although when the market is most crowded (Saturdays) some vendors do have only limited protection from the elements.

A food-parcel selling area was also completed in 2014, at a cost of \$50,000FJD. It is located near the bus waiting area and comprises of 36 tables in three rows of 12. The roof is made of roofing tin, and vendors say that they get wet when it rains. The area is not fenced, and dogs can easily enter the area, causing a nuisance.

Vendors

There are approximately 290 vendors at Savusavu Market (www.savusavu.info), and that figure includes: 90 vegetable vendors; 27 fish vendors; 28 kava vendors; 5 handicraft vendors; 17 parcel vendors; 3 pastries/juice vendors, and approximately, 50-60 casual vendors (market master, per. comm.). Most of the vendors are women, and all vendors sell produce from tables - the only municipal market where no casual vendors sell from floor height (one casual vendor was preparing cooked food on the floor, to sale from the table, and as a result, they 'stood out' among the other vendors).

Vendors comment that flower vendors only come on a Saturday and are offered little protection, and they suggest that more flower vendors would come to the market if there was more shade on offer. Stall fees are \$2.10 a day.

Vendor Security

The market is open between 7.00am to 5.00pm Monday to Fridays, and 7.00am to 3.00pm on Saturdays. The main market has either a lower, stone wall and wiring (at the front) or chain-link fencing at the rear and is lockable throughout. The cooked-food parcel area is open sided, however, and vendors say that they carry heavy items daily that could be locked in cabinets if the area was locked. One night-time security staff is employed by the council for the site (6.00pm - 6.00am), and there are no security cameras nor a PA system at the market.

The segregated, free public toilets are at the rear of the market - there are no disabled facilities. One of the handicraft vendors uses a wheelchair, though she was not at her stall during the duration of the visit. The toilets do not have a dedicated toilet attendant, and are cleaned once a day in the morning. Vendors complain that the facilities can smell badly, and cleanliness deteriorates over the course of the day.

There is a fire hose in the main market building and also a wall-mounted fire extinguisher near the fish section.

Services

Water Security

The market has a reliable mains water supply, although there is no alternative rainwater tank for use by vendors should the mains supply fail. There are two alternative rain water tanks for the toilets (the raised tanks were toppled during the height of Cyclone Winston).

There are no internal taps in the main market; two taps, however, are located outside, near to where the casual vendors are located, and the overflow feeds into the bay via a short, unsealed drainage ditch. An additional tap is located near the taxi stand, and it feeds directly into a deep, concrete drainage ditch.

The cooked food-parcel area has an additional tap, although there is no external tap at the side of the market nearest the toilets, and vendors say that they have to use the toilet taps. There used to be an interior tap in the main market, but it was removed when the new extension was added.

Energy Security

Strip lighting lights the main market, although it is still quite dark in the central areas. Vendors say that the electricity supply is seldom interrupted, although there is no back-up generator at the site should the mains power fail, particularly notable, because of the number of fish vendors and the use of individual mains-powered chiller cabinets.

Drainage

Water is carried from the market roof in a series of downpipes, and at the front of the market, flows into an open drain, set against the base of the market wall. The drain runs the length of the market frontage, although it stops at the council offices. A metal grid forms a walkway over the drain at the kiosk corner.

Another deep, open drain takes water from the exterior tap and the middle section of the market roof - the drain runs the length of the kiosks between the market and the bus stand, and is crossed by a series of crossing points, positioned outside each kiosk entrance.

Inside the market, the overhead drainage pipes between the original market and the extension show signs of being previously sealed around the joints.

Waste Management

The rubbish bins are emptied every day, and several green wheelie bins were located around the inside of the market. Currently, there is no green-waste separation scheme. The vendors say that the main market gets very dusty, and that general cleaning happens only once in a few months.

Accessibility and Transport

The bus station and taxi stand are adjacent to the market, and there is a small car park at the rear of the building: "free, if there is space". Five-minute loading and unloading is permitted at the taxi stand. Most vendors arrive at the market by bus from the surrounding villages, and carry the produce to the market - there are only a few wheelbarrows.

The market has a broad entrance and easy, level access, with generally smooth flooring throughout. One vendor in the handicraft area uses a wheelchair, although she was not present at the market during the assessment.

Governance

Savusavu Market is under the authority of Savusavu Town Council, and the market manager is accompanied by three attendants (one female and two males). There appears to be a good relationship between the interim vendors' association and the market governance.

Sigatoka Market

- Sigatoka area important supplier of produce - the 'salad bowl of Fiji'
- Plans for relocation of market, bus stand and council offices to Lawaqa Road, Sigatoka
- Market and town situated in a high-risk earthquake zone
- Women account for 89% of casual vendors, who sell unprotected from floor
- Overhead guttering between old and new extension leaks throughout; and roof leakage elsewhere
- Market is lockable, with extensive security - camera coverage - no night - time security staff
- Toilets use local borehole for water supply - stored in water tanks aloft
- Fish and *kai* section mixed in with fruit and vegetables - odour and water nuisance



Location, history and development

Sigatoka Market is located in Sigatoka Town in southern Viti Levu; a demarcated, open area was established in the town in 1939 to replace the Saturday selling of produce along the Sigatoka River (Baxter, 1980), and although it only functioned on Saturdays, it quickly proved popular (Baxter, 1980). The market at its current site was not established until 1970 (UN Women, 2011).

To the south of the market is the bus station, and to the north, Market Square. The current market infrastructure was built in 2005, and a new wing has been added since.

Sigatoka River is 100m directly east of the market, and Sigatoka Town is approximately 3.5km from the mouth of river. At 1450km², this is the second largest river catchment in Fiji (McGree et al., 2010), and consequently, makes the surrounding land very fertile. Much for the fresh produce sold in the market, and, indeed, in other markets in Fiji, is grown along the 15km Sigatoka Valley Road - Sigatoka is known as the 'salad bowl of Fiji'. The underlying geology of the area is predominantly sedimentary, and comprised of mostly sandstone and mudstone (Rodda, 1967). Sigatoka is situated in an area capable of producing an earthquake of high intensity (Hamburger et al., 1986).

The Market Master, Ilesa Ravouvou, briefly outlined plans for the relocation of the market, bus station and council offices to Lawaqa Road, Sigatoka. The project is currently awaiting landowner approval.

Physical structure and produce sold

There are approximately 600 stalls and three geographical divisions to the market - in the form of three produce halls. The green wing is the newest development, and is located on the eastern side of the market. It was originally a high

ceilinged, open-ended structure (UN Women, 2009), however, the end panelling was added to prevent birds entering, and more recently, the roof has in part been lowered to enable a women vendors' accommodation centre to be added above (Fiji Sun, 2015). At ground level, there are eight rows of concrete tables and three rows of lower, wooden tables located towards the north end of the hall. In total, there are 73 registered fruit-and-vegetable vendors in this section. The sides of the hall have solid lower walls and chain link above. Strong sunshine in the mornings means that vendors avoid selling along the tables closest to the eastern side and in the north-eastern corner of the hall. Casual vendors selling in the eastern walkway adjacent to the green wing also seek shade at this time of day.

The middle section, the yellow wing, has four vents in the roof for ventilation and six rows of high concrete tables (with abutments) from which a mix of fruit and vegetables and dry goods (including kava) are sold. Again, hot sun affects the northern stalls of this section. Conversely, a small section of tiled floor in this wing - remnants of the former shellfish stalls - makes the flooring cold, and the vendors say they have to wear socks because of the cold. This section also has a pizza restaurant and bakery, accessed from the road side to the north. The market master's office is on the opposite side of this section, along with a small inside kiosk and outside canteen that services bus customers.

The orange wing forms the western section of the market, and consists of a small produce hall and extension. The hall has three ceiling vents for air circulation, and six rows of concrete blocks each containing four stalls. The extension has 70 stalls in two rows of wooden tables, and there is also side panelling at height to block out the sun. Casual vendors occupy this extension area. The access nearest the bus station end has recently been closed, because of safety concerns about the two water tanks raised aloft.

The private fish market is also located in the orange wing and a *kai* section, although at the time of the assessment, *kai* sales were also mixed in with the other fruit-and-vegetable stalls. On Saturdays, the southern end of the extension is given over to fresh fish.

The roof area is clean throughout the market.

Vendors

Of the 468 vendors at Sigatoka Market at the end of the first quarter of 2016, 41% were permanent, with the remaining 275 vendors (59%), farmers. There is a general gender balance among permanent vendors, with women slightly outnumbering the men, making up 55% of the group.

The market master provided a further breakdown of registered vendors: vegetable and grocery vendors make up the majority of vendors (84%), and of these 52% are women. However, women make up at least 60% of the handicraft, juice and sweets vendors. Within the market, there is also a geographical division between the genders. Men make up 56% of vendors in the orange and yellow wings, while women predominate (70% of vendors) in the green wing.

Women also account for the vast majority of farmers (89%) who sell at the market from Wednesdays to Saturdays. The majority of these women sell produce from the floor and are unprotected from the elements.

Each vendor pays \$1.10 per stall per day, and an additional \$1.10 after 5pm.

Vendor Security

Sigatoka Market is opening from 7.00am to 5.00pm daily, except Sundays. The 30-bed Women's Accommodation Centre was opened in 2015 at a cost of \$400,000 (Nasiko, 2015).

There is no after-hours security, as the produce halls are firmly locked at night, and according to one vendor, theft does not seem to be a problem - she remembers as a child that the fencing would be cut at night, and kava would disappear. Now, the kava stalls are located more centrally, well away from the perimeter of the produce hall. There is also a PA system for announcements, and security cameras constantly monitor the market - screens were active in the market master's office.

There was a recent fire in the outside canteen across the corridor from the toilets; a fire hose is located near the bus stand.

Services

Water Security

The water supply to the market is satisfactory, although vendors say that there are some interruptions on occasion. There are two hand basins and two wall taps in the yellow wing, one outside tap near the bus stand and another outside tap to the north of the market. The toilets shared by market vendors, the general public and long-distance bus users, have two newly-installed water tanks that store water from a local bore hole for use in the conveniences. Vendors explained that the water supply would be cheaper from the bore hole. The women's accommodation centre also has an alternative water tank aloft.

Energy Security

In the lowered ceiling section, there are two rows of five LED ceiling lights. Elsewhere, conventional strip lights are in use.

Drainage

The women's accommodation had to be closed recently because the toilets were leaking. Sewage seeped into the produce hall below, and put several stalls out of use. Vendors say that the Ministry of Health visited and said not to use the

area. The overhead guttering between the new development and the older produce hall leaks throughout.

Waste Management

Wheelie bins are located at the front and rear of the market, and the general-waste refuse truck collects the rubbish from the front of the market, near the bus station. Signs clearly advertise waste segregation, although, at the time of the assessment, not all green bins contained green waste.

The market has one member of staff to clean inside the market and one staff for the outside area. There is also an attendant for the toilets. Then once or twice a year the market receives a general clean, when vendors are asked to take their produce and property away.

Accessibility and Transport

There is no official loading and unloading area for the market, and recently, the Market Square area has been used for the purpose - vehicles are

allowed 15 minutes free: "trucks just unload and go". On a Saturday, however, the road is vehicle-free, and during the week, there is always a safety issue. Apparently, one female vendor was almost crushed between two vehicles.

The main intra-island bus stand is immediately outside the market, and vendors benefit from the short, compulsory stop that long-distance bus users undertake.

There is a disabled toilet available as a separate facility within the toilet block.

Governance

The market is under the authority of the Sigatoka Town Council, and has a Market Master, Ilesa Ravouvou, who has been in post since 2007. He has two assistants (one male and one female).

Suva Market

- Market sited on reclaimed land and within a high - risk earthquake zone
- Tsunami risk because of proximity of coast
- Plans for major new market within area of current market and bus stand
- Casual vendors (75% of whom are women) travel considerable distance in community carriers to sell outdoors at market
- High customer footfall on Saturdays in confined space
- Constant wet floor in main produce hall because of internal taps, and risk of flooding from internal drainage system - legacy of original market drainage
- High-level tarpaulin tents have rain - generated stretch 'bubbles', requiring regular replacement
- Only vendors' toilets, upstairs, inadequate in number, and in poor sanitary condition



Location, history and development

The first formal market was built in Suva in 1892, although the market at its present site was not established until 1950 (Baxter, 1980). Suva Market is located very near to the coast in central Suva - the wharf and Nubukalou Creek (adjacent to the fish market) are <50m away; and like much of the Suva foreshore, the market is built on reclaimed land (artificial-fill land), underlain by considerable thickness of soft muds (Shorten et al., 2001). All of Suva is located in a zone that is susceptible to earthquakes, with low-lying areas of the city especially vulnerable (Hamburger et al., 1986). The underlying geology of Suva Market is expected to amplify shaking associated with earthquakes, and liquefaction may occur (Shorten et al., 2001).

The market has a confined site, surrounded on all sides by commercial land: Suva Port and Princes Wharf are to the west, and Kings Wharf to the northwest (Harris Road); the fish market to the southwest (Usher Street), the bus station to the north and commercial buildings to the east (Rodwell Street).

Suva Harbour developed, in part, because it was well protected from the prevailing southeast and east winds, thus, the adjacent Suva Market has a relatively-sheltered location (Nunn et al., 1994).

Physical structure and produce sold

The rectangular, single-storey section of the produce hall is the original building, containing fruit and vegetable stalls, and a small craft section at the rear (Harris Road end). The structure is of solid build, with concrete floors, walls and corrugated roof. The more recent extension (nearest Rodwell Street), opened in 1991, and is two-storey: fruit and vegetables on the ground floor and kava and dry goods sales in the upper hexagonal. There are two access points to the upper floor - stairs near entrance 10 and, opposite, to the left of entrance 1, a ramped (doubled-back) walkway.

The produce hall was refurbished in 2009, when most of the asbestos roof was replaced (UN Women, 2009); vendors noted that one part of the roof had not been replaced, and that section currently leaks in wet weather. Elsewhere, holes in the roof and ill-fitting joints to guttering also cause leaks, and, at the time of the assessment, several buckets were being used around the hall to collect the raindrops. The inside walkways when wet from the leaks become slippery. Recently, a middle-aged customer had slipped on a wet surface, badly injuring themselves. The ceiling of the ground-floor extension is also quite low, although the central hexagonal-void has a sky light, and, according to vendors, ventilation is adequate, even at the height of summer. One woman vendor in the main produce hall did collapse, however, during a period of very hot weather, and required hospital treatment.

Outside, the open-air area between the produce hall and the bus station has nine high-quality, high-level tarpaulin 'tents' that offer protection from the elements. However, six 'bubbles', where the tarpaulin had stretched because of rainwater collection, were leaking and bulging dangerously in the heavy rain. Also, in several places it was observed that water dripped excessively from the eyelets used to thread rope to secure the canvas to the scaffolding. In voluminous rainfall, all the guttering above the downpipes, nearest to the toilet block, overflow badly. Association members stated that they would have preferred a corrugated-roof construction; they say, however, that they were not consulted in the choice of roofing material.

Similar, smaller tarpaulin sections offer protection at the rear of the market, and between entrance 1 and the corner of the market - five stretched bubbles were observed in that one section alone. The vendors say that the tarpaulin had been replaced twice over the three to four years since assemblage.

The outside flower market, situated on the corner of Rodwell Street and Usher Street, also has a relatively-new roof extension to offer protection to the flower vendors. The produce-hall roof extends over all the walkways immediately encircling the market ensuring a certain amount of protection to the outdoor vendors. The vendors positioned under the lean-to, on the Usher Street side of the market, say that they get wet when it rains, and the afternoon sun hits them directly.

Vendors

Over one thousand vendors sell produce at Suva market (n = 1054), although only a third of them do so on a permanent basis. Geographical clusters of vendors within the market site are by type of vendor and/or the geographical area that they come from. Only permanent vendors (n = 354) sell in the produce hall, 56% of whom are women.

Casual, daily vendors, mostly women (75%), are allowed to sell outside only, and they swell the numbers of vendors on Thursdays to Saturdays, when the demarcated outdoor area between the market and the bus station is opened up for selling. On the Usher Street and Harris Street side of the market, casual vendors are allowed to sell on Fridays and Saturdays only; on these two days, vendor numbers treble in comparison with earlier in the week. Suva City Council (SCC) erects temporary tarpaulin canopies along the Usher Street and Harris Street areas of the market, and most vendors are provided with some form of shelter from the elements, although the canopies often sag, hindering walkways, and in windy weather they can collapse or get torn.

The high percentage of women casual vendors means that overall, almost 70% of vendors at Suva Market are women, and most of them sell irregularly and/or for the latter part of the week only. Any awareness raising in disaster management, and the actioning of action plans

must take account of the temporary nature of many of the vendors, and the busyness of customer footfall on weekends. All vendors need to be aware of any disaster management plan and what to do in a disaster-related emergency.

Equally, casual vendors can travel up to 168kms to get to Suva Market, the furthest of all markets (UN Women, 2011), and take up to four hours to undertake the journey. Any market closure must take into account distance that vendors have to travel to reach home safely.

Vendor Security

The market operates between the hours of 6am and 6pm, although from 5pm the interior produce hall is closed, and some vendors continue to sell outside. Within the produce hall, security cameras are operational - vendors say that they still experience theft of produce - and a public-announcements (PA) system is regularly used to make announcements during the day. The PA is the means that would be used to inform vendors and customers of an imminent, sudden-onset disaster. The PA system can be heard by the outside vendors.

At night, one security guard is employed by SCC to oversee the security of the market master's office. The Rural Women Vendors' Accommodation Centre, added in 2013, is open from Wednesday evenings through to Saturday morning, and can house up to 200 women. The vendors who sell on the Usher-Street roadside of the market on Fridays and Saturdays are reluctant to use the accommodation centre for fear that during the night their produce will be stolen - the roadside is open to the public.

The women who do overnight at the centre have to use the public convenience outside the market boundary and ask for it to be unlocked each time. During the day, market vendors based at ground level also use the public convenience,

as there are no toilet facilities in the lower floor of the market, and only three female cubicles upsides (potentially shared between upwards of 700 women on the weekends). Women report delaying using the public facilities at night because of the shame of having to walk passed men; and there is also hesitation in using the upstairs toilets during the day because of the perceived distance and time away from the stall. In the event that large numbers of people would be required to stay at the market during or post an unexpected disaster, the current facilities would only offer very basic provisions - there are no bathing facilities on site, nor at the nearby public conveniences.

Services

Water Security

The water supply to the market is generally reliable, although there are occasional stoppages. The lower produce hall has six internal taps, and one outside tap. There are also two roof-fed storage tanks, one raised at the extension end of the market, and the other at the Harris Street end. The water collected is not suitable for drinking. There are fire hoses installed near taps. There are no fire extinguishers in the market hall, only in the accommodation centre.

Energy Security

Previously, the market suffered from sporadic interruptions to the electricity supply, problematic, especially as the Fiji Electricity Authority requires that when supplies have been cut for more than three hours then a market must close. Since the beginning of 2016 Suva Market has had a generator, however, so energy reliability has been resolved, as long as the generator battery remains charged. The vendors are very pleased with the development.

Lighting levels are satisfactory throughout the market, and the upper floor is especially well-lit with natural light from the sky light. The council is in the process of replacing the conventional strip

lighting with LED bulbs, and while the ambience of the hall is altered somewhat with the new bulbs, the vendors do not mind the changes, and the emissions footprint of the market will be reduced. In the old part of the produce hall, the strip lighting uses the energy-thirsty and difficult-to-replace 6ft tubes.

Drainage

Externally, the market hall is raised with a slight step to the building; all the 10 entrances to the main produce hall have a ramp (with integral drainage), allowing ease of access. Water is drained from the roof of the produce hall through downpipes located on the inside of the market hall to a system of covered drainage ditches on the floor of the hall. In places, the cast-iron drainage covers are rusty, ill-fitting and raised, causing a potential safety hazard for pedestrians. Beneath the covers, many of the drains contain stagnant water, and vendors complain that the drains are rat and mosquito-infested. The design of the system is probably a legacy from drainage for the original, smaller market .

There is also the risk of a blockage to the internal drains, and plastic bags and vegetable matter were evident in several of the drains when the covers were removed. In 2006, high tide coincided with a blockage to the inside-drainage system, and the hall was flooded to a depth of at least 60cm (2ft). Vendors remember spending the day sitting on their stalls because of the water levels. Previously, Blong et al., (1994) makes reference to localised flooding in the area of the market in June 1990 and July 1991.

Waste Management

For the last three years Suva Market has been operating the sustainable Waste Separation Project. Compostable waste vegetable-matter and paper are separated from plastic bottle and bags, and deposited in green wheelie-bins by the vendors. The bins, in turn, are regularly collected and emptied throughout the day by council workers who deposit the contents in four

skips located along Harris Street. The skips are emptied daily and the waste taken to a depot in Samabula, Suva to be converted into compost. The scheme appears to be running smoothly, with vendors willingly engaged; and, as a result, little discarded organic rubbish is evident in the produce hall. The vendors, however, do not benefit directly from the scheme.

The entire market is closed on Easter Saturday each year so that the council can give the market a once-yearly clean (Good Friday, Saturday, Easter Sunday and Easter Monday); and vendors say that they, therefore, lose sales on a very busy bank-holiday Saturday. Some ten years ago, the market was cleaned every Sunday. Vendors say that the annual clean is too infrequent, as dust builds up in the hall causing problems for those vendors who suffer from respiratory conditions.

Accessibility and transport

From Mondays to Wednesday mornings vehicles can be parked at the market for the delivery of produce. On Wednesday afternoons the SCC closes the area for the setting-up of outside stalls. The nearest car park, from Thursday onwards, is the MPI car park, and wheelbarrows are used to transfer produce, at \$3a trip. Similarly, the public parking spaces along Usher Street are closed to traffic on Fridays and Saturdays, when casual vendors use the area for the sale of produce. That leaves the market without car parking on the busiest two days of the week. The internal, clearly-marked clearways are kept free of traffic

on Mondays to Wednesdays. The walkways are not quite so clear on Fridays and Saturdays, as vendors tend to encroach a little on keep-clear corridors.

There are no exit signs, nor evacuation plans displayed. The upper dry foods area, with its hexagonal design, is particularly confusing spatially, and vendors say that visitors often are not sure where the exits are, nor how to leave the level. The upper-floor layout is disorienting and could cause addition confusion in an emergency.

Governance

The market has an assistant market master, four supervisors, and various attendants (apparently, the position of market master is vacant) - all are employed by the Suva City Council.

There are three vendors' associations: The Suva United Market Vendors Association, has a long, 45-year history, and a good working relationship with the market management; and the Assistant Secretary, Ms Shobhna Verma, liaises with and report concerns to the management. Currently, the association has 270 paid members. The other two, newer associations are the City General Vendors and Farmers' Association, and the Women's Association. A good working relationship between vendors and management is essential for the implementation of disaster management plans.

Tavua Market

- No previous flooding event at the market nor within Tavua Town
- Plans for new, two-storey development to replace current market, on adjacent land
- Original produce hall poor ventilation - very hot - restaurant cooking adds to heat generation in area
- Extension area low ceiling and dark - poor ventilation - hot
- Drainage needs attention in several areas of the market
- Step down into original produce hall - poor access
- New tarpaulin, side canopies too short, especially for afternoon sun
- Casual vendors in open, western section of market, sell unprotected



Location, history and development

Tavua Market is located in the coastal town of Tavua, in the north of Viti Levu. The Tavua Creek runs to the east of the market (about 175m away), and the heavily mangrove-covered coastline is approximately 3.4km away to the north west.

The market was established in 1945, although the current building dates from 1998 (UN Women, 2011). A further extension, encompassing the original building, was added in 2004. In a survey of nine markets, Tavua Market was the only one that reported that flooding was not a problem (UN Women, 2011), and during the courtesy visit, the new CEO of Tavua Town Council, Binesh Naidu, agreed, saying that, not just the market, but Tavua Town has also not been flooded.

The current market has a confined site between commercial building to the east, and 'Home and Living' store to the west. Vendors say that the delivery vehicles to the store often threaten to knock the market fence while making the tight delivery manoeuvres. To the south of the market is open land that is currently used as a car park. The CEO of Tavua Town Council says that there are plans to relocate the market to near that area, and the land owners, Tavualevu Village, have given approval for the land to be used. The two-storey development, however, will take several years to complete.

While the underlying geology of the market and surrounds is igneous basalt (Geological Survey Department, Suva, 1965), the top soil is poor in the area around Tavua, so while the vendors tend to be local, no vegetables grow in the area, so the market produce is not (CEO, Tavua Town Council, per. comm.).

Physical structure and produce sold

Tavua Market occupies one location on the main King's Road, immediately opposite Tavualevu Village and adjacent to the bus stands for west-

bound buses. It is quite a compact market, with 326 stalls currently available, although not all were in use.

The original market houses the market master's office, the fish market, three restaurants and a shop, as well as being the area for the sale of dry goods and groceries. It has one dedicated, restricted access to the rear, between the shop and one of the restaurants, otherwise it is accessed through the surrounding market. Therefore, despite having quite a high ceiling, the area has poor ventilation and is very hot, especially with restaurant food preparation being undertaken on the premises. Vendors say that in the hot months (December through to February), it can be very uncomfortable to work in the area.

The main fruit-and-vegetable section of the market is contained in the newer extension on three sides (not to the rear) of the original market, and produce are sold from permanent, concrete tables. The extension has a very low ceiling, poor height clearance and very poor ventilation. It is also quite dark, especially for the vegetable stalls nearest the dry-goods section. Several stalls have items hanging above the tables, inhibiting the circulation of air, and limiting light. There are no fans nor ventilation ducts to this area. One vegetable stall, with a private electricity supply (power line), has installed a ceiling fan, but the vendor is unable to use the fan because, it is very low, and also, ironically, when powering the appliance, the air in the immediate vicinity of the stall is warmed by the heat from the strip light being dispersed by the fan.

The fish market has a drain running through it, a probable remnant from the extension of the original building; the room also has a ceiling fan (that was not in use at the time of the assessment). Two tarpaulin-covered freezers had recently been delivered and were sitting outside the market master's office. The intention of the council is to sell ice (at a nominal charge); fish will be able to be kept cool as a result.

The roofed area to the east side of the market is dedicated to the sale of mixed kava. Three UNWOMEN tarpaulin tents are also erected near the eastern entrance that offer protection from the elements for the casual vendors.

As a result of the high winds associated with Cyclone Winston, 15 roofing tins needed to be replaced on the market; fallen branches also damaged the fence on the western side of the market during the storm.

Vendors say that, in heavy rain, the roof leaks in several places, and the tarpaulin hanging from the end of the roofing tiles of the main market had to be replaced. The vendors say that the new tarpaulin canopy is too short, and in some places, there is nowhere to secure it to fencing, so it constantly blows around in windy weather; a longer length to the tarpaulin would have offered more protection.

Vendors

At the end of March 2016, only permanent vendors were selling at Tavua Market (n = 97), with almost 53% of them, women. The vendors are local to the area, having travelled 15km or less to get to the market (UN Women, 2011). As a result, no one stays overnight at the market. The market master now says that there are five or six casual vendors attending the market, and only towards the end of the week. They are mostly from the villages of Navai, Savatu, Nadrau, Nadala, Lewa, Koro and Nai Yala. At the time of the assessment, one women vendor was from Rakiraki, and travelling daily.

Vendor Security

The market operates between the hours of 7.00am to 5.00pm, Monday to Fridays, and 6.30am to 5.00pm on Saturdays. Between 5.00-7.00pm, the eastern-side extension area opens, and people can move to this area to continue selling. However, vendors in this area, who leave

at 5.00pm, say that produce goes missing during the two-hour sales extension. No after-hours security staff are employed by the council to look after Tavua Market when the site is closed. The site does have a barbed-wire fence running around the entire market; however, in several places, the fencing is broken and the barbed-wire, at the top, has been displaced, probably by someone climbing over it. Vendors say that theft is a problem at the site.

There is a PA system for public announcements, however, vendors claim that, because of the ceiling height, announcements are deafening for the vendors closest to the megaphones; two megaphones are located next to each other at a particularly low-ceiling point.

The only toilet block is for the use of the general public - there are no facilities dedicated to vendors - and vendors say that the public toilets can be dirty. The conveniences do have a shower cubicle. Vendors do not sleep in or near Tavua Market, and the market is the only one, where vendors do not bring their children with them (UN Women, 2011).

Services

Water Security

There are two sets of external taps at the market, close to the perimeter fence, and one internal tap. Each flows into the open drainage system that encircles the market. There was evidence of rubbish and organic matter in the drain at several points around the site, and vendors say that sometimes the drains smell, a particular problem for those vendors closest to them.

The water supply is generally good to the market, although there is no backup supply should the main water supply fail. The public-conveniences block has a water storage tank, aloft, that enables the use of the facilities during regular water-supply disruptions. The market, however, does not have access to the alternative supply.

Energy Security

The supply of mains electricity to Tavua Market is satisfactory; again, there is no back-up generator should be mains electricity fail. Conventional, strip-lighting lights the covered market, but because of the low ceilings, especially in the extension area, the market is quite dark. Equally, the bulbs become hot, and combined with the poor circulation of air in the market, all interior areas of the market are hot, and, according to some vendors, unbearable in the hot months. There are no council-run fans anywhere in the market, nor air vents to encourage circulation.

Drainage

The internal guttering, carrying water off the original market roof, leaks in several places, causing the vendors closest to the dry-goods section to have dripping water on their backs. In some places, the pipes have been attempted to be patched with adhesive tape. Similarly, there are several examples around the market of broken pipes and missing guttering; in one location, the guttering is not connected to a downpipe and just ends at roof height, emptying rainwater directly onto the area where casual vendors sit.

Waste Management

The market is cleaned at the times of major festivals such as Eid, Diwali and Christmas, or, on average, once every three months. The drains are reportedly cleaned every day.

Accessibility and Transport

Buses stop immediately outside the market, on the main east-west King's Road, and bus drivers, as a rule, have the engines idling while stationary at the stands. Vendors with stalls closest to the bus stands say, however, that fumes are not a problem from the vehicles. Customers and vendors from the road side access the market via steps. Otherwise, they can walk around to the main entrance, at the corner with 'Home and Living'.

There is a small car park at the market for deliveries and limited customer parking. Vehicles park very close to where the casual vendors are seated - two breeze blocks, one on top of the other, prevent vehicles encroaching too closely, though the safety feature offers little in the way of protection should an incident with either the brakes or gears of a vehicle occur. Wheelbarrow trips, to carry produce from vehicles to stalls and vice versa, cost \$1 a trip.

There is also a step down into this area from the surrounding market on two sides. The step is not well lit, and as it is particularly deep on the bus-stand side, it causes difficulty for elderly customers and also catches out the unwary. Access is virtually impossible for those with mobility issues.

Governance

Tavua Market has a vendors' interim committee, with non-elected committee members.



4. Discussions

Exposure

Table 1 summarises the exposure of markets to disasters and climate change: all markets are at risk of a tropical cyclone, although only Ba, Labasa, Nadi, Nausori, Rakiraki and Sigatoka are impacted by riverine flooding. Coastal markets are potentially threatened by storm surges and at the risk of tsunamis. Nausori and Suva are located in a particularly high-risk zone for earthquakes, and strong earthquakes could occur in Labasa, Levuka, Savusavu and Sigatoka. All market could experience flash flooding from torrential rain and blocked drains.

When each component of the vulnerability assessment is given a ranking (4 indicating very high risk through to 1 low risk) for each market and then tallied to give overall totals for exposure, sensitivity and adaptive capacity (Table 2), the results reveal that Labasa, Nadi and Rakiraki markets have the highest rankings for exposure to risks, while Labasa, Levuka and Nadi markets have the highest sensitivity. Levuka and Savusavu markets have the joint highest rankings for poor adaptive capacity.

Table 1: Exposure of markets to disasters and climate change

Market	Tropical cyclone	Floods	Earthquakes	Tsunami	Landslide	Drought	Sea-level rise (storm surge)
Ba	x	xx				xx	
Labasa	x	x	x			x	
Lautoka	x			x		xx	x
Levuka	x		x	x			x
Namaka	x			x		x	
Nadi	x	xx		x		xx	
Nausori	x	x	xx				
Rakiraki	x	xx		x		x	
Savusavu	x		x	x			x
Sigatoka	x	x	x				
Suva	x		xx	x			x
Tavua	x			x		x	

		Ba	Labasa	Lautoka	Levuka	Nadi	Namaka	Nausori	Rakiraki	Savusavu	Sigatoka	Suva	Tavua
EXPOSURE	Coastal location	1	2	3	3	4	2	2	2	3	3	3	2
	Coastal protection	1	2	2	2	3	2	2	3	3	3	1	3
	Waterway proximity	4	4	1	1	4	1	3	4	2	2	2	2
	Waterway protection	4	3	1	1	4	1	3	4	1	2	1	3
	Flood plain	4	3	3	1	4	2	3	3	1	2	2	2
	Ground/soil type	3	3	3	1	3	1	3	2	3	3	4	1
	Wind risk	2	2	2	2	1	2	2	3	2	1	1	2
	Tsunami zone	1	1	3	3	3	2	1	3	3	1	4	1
	Earthquake zone	1	3	1	2	1	1	2	1	3	3	4	1
	<i>Total</i>	21	23	19	16	27	13	21	25	21	20	22	17
SENSITIVITY	Security	2	1	2	1	2	2	2	2	1	1	2	3
	Natural resources	3	2	2	3	3	2	2	3	3	3	2	3
	Energy source	3	3	2	3	3	2	1	2	3	3	1	2
	Water source	2	3	2	3	2	1	1	3	3	2	1	2
	Vendor literacy	1	1	1	3	1	1	1	1	1	1	1	1
	Market population density	1	3	3	1	2	1	3	1	1	2	3	1
	<i>Total</i>	12	13	12	14	13	9	10	12	12	12	10	12
ADAPTIVE CAPACITY	Infrastructure & technology	2	2	2	3	2	2	1	2	2	1	2	2
	Financial resources	3	3	3	3	3	2	2	3	3	2	1	3
	Governance	2	2	1	3	1	2	1	1	3	2	2	2
	<i>Total</i>	7	7	6	9	6	6	4	6	8	5	5	7
OVERALL	40	43	37	39	47	28	35	43	41	38	37	36	

Tropical Cyclones

The intensity of cyclones has increased in recent years, with more category four and five cyclones being recorded in the Pacific (SPREP, undated). Fiji has had two recent catastrophic events: Tropical Cyclone Evan (December 2012), and Severe Tropical Cyclone Winston (February 2016).

Cyclone Winston, in February 2016, was the first category five cyclone to hit Fiji directly, and the headline figures make for alarming reading: \$1.4 billion of damage (Fiji Government, 2016a),

40% of the population of Fiji severely affected (defined as those living within a 50km radius of the eye of the cyclone) (UNICEF, 2016), and 90% of livelihoods impacted in worst-hit areas (Fiji Government, 2016b). The livelihoods of market vendors were adversely impacted as produce was either badly damaged or destroyed. Vendors in several markets report spending weeks either staying at home, or turning up at the market, just to look at each other across empty tables. The impact on market trading is particularly well illustrated in the monthly market fees (Table 3), expressed as a percentage of January's fees for Rakiraki Market (January - June 2016).

Month	Fees expressed as percentage of the fees for January
January	100%
February	68.9%
March	2.7%
April	13.5%
May	58.1%
June	59.0%

Source: Based on actual fees data, Rakiraki Market

Both the timing of cyclones in the agricultural cycle and also the interval between events (insufficient recovery time) can be critical, especially in terms of damage to crops (Benson, 1997). For instance, just two months separated

the arrivals of Cyclone Gavin (March 1997) and Cyclone June (May 1997) to Fiji, giving little recovery time (Terry and Raj, 1999). Equally, the extent of damage to crops depends on the distance away from the centre of the cyclone (Table 4).

Island	Distance from Nayau Km	Selected root crops				Tree crops			
		Cassava	Sweet Potato	Taro	Yam	Pandanus	Banana	Coconut	Bread fruit
Nayau	0	100	100	100	80	97	100	100	100
Cicia	30	100	80	96	54	59	100	91	100
Lakeba	30	94	87	55	48	20	82	75	50
Vanuavatu	45	75	75	-	-	-	75	60	50
Oneata	67	60	10	-	10	-	50	40	40
Komo	86	60	10	-	-	20	40	30	40
Moce	88	50	10	-	10	20	50	40	40
Namuka	99	50	20	-	-	-	50	15	30
Kabara	99	60	10	-	10	10	50	40	-
Fulaga	129	50	5	-	-	-	40	10	40
Ogea	142	50	10	-	-	4	40	10	40

Source: reproduced in Campbell (1984), from damage reports of the then-Fiji Hurricane Relief Committee

All markets, other than Labasa (Quoilevu, 2016), in the last quarter of 2016, were still reporting high prices for produce and a shortage of supply of certain fruit and vegetables as a result of Cyclone Winston (Table 5). One Rakiraki vendor

summarised 2016 as: "worse, worse and worse". Most vendors anticipate a return to normality only in 2017.

Table 5: Impact of Cyclone Winston on prices of selected produce			
Produce	Price before Cyclone Winston	Price post-Cyclone Winston	Percentage change
Cassava 50kg bag ¹	\$30	\$50	66%
Cassava bag ²	\$35	\$100	285%
Cassava bag ³	\$30-40-50	\$70-80	88%
Chillies per heap ¹	\$2	\$4	100%
Eggplants per bag ⁴	\$20-25	\$50	100%
Eggplants per heap ⁵	\$1-2	\$5	300%
Long beans ⁶	\$1.50	\$3	100%
Tomatoes per drum ⁷		\$30-40	-
Mangoes per bag ⁸	\$50	\$70	40%
Coconuts per dozen ⁹	\$3-4	\$10	250%

Source: ¹Singh (2016); ²Saqacala (Nadi interview, 2016); ³Namoce (Ba interview, 2016) ⁴Wati (Rakiraki interview, 2016) ⁵Loanakadavu (2016); ⁶Koroi (2016); ⁷Nayala (Ba interview); ⁸Rokoua (Suva interview, 2016); ⁹Miriama (Nadi interview, 2016)

Previously, only Cyclone Bebe, October 1972, had caused wide-spread damage in areas that supply most of the market produce. Following Bebe, prices for all root crops rose dramatically, and the very high prices continued until mid-1973 (Campbell, 1984).

While historical records indicate that each town in Fiji can expect to be hit directly by a category four cyclone once every 50 years, and a category five cyclone every few hundred years (Blong et al. 1994), climate change will render historical records inaccurate, and the recent destruction caused by Severe Tropical Cyclones of Pam in Vanuatu and Winston in Fiji clearly indicates that cyclone preparation and response is an essential component of any disaster management plan.

Floods

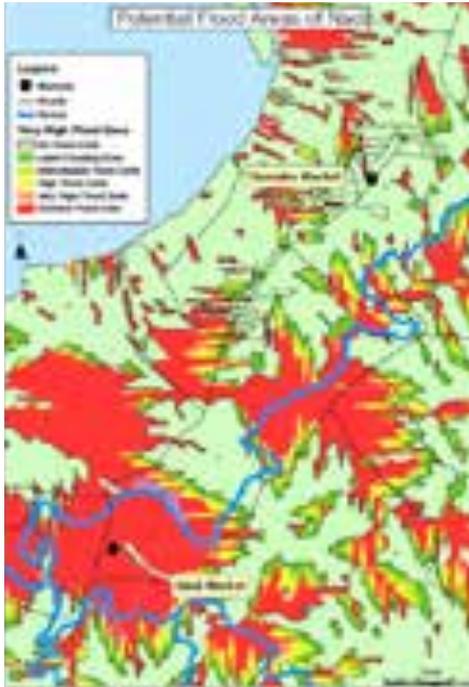
Flooding is the most common hazard to impact markets in Fiji. Of all the markets, only Tavua Market has a long flood-free history (UN Women, 2011); Namaka and Nausori markets, likewise, have not reported flooding, although both have been open at their current sites for only a relatively short time - 2005 and 2015 respectively, and, in the case of Nausori, the Rewa River is only 250m

away from the new site. Past data suggested that flood-producing damage within Nausori Town occurred once in 10 years (Blong et al., 1994).

Sigatoka Town has flooded in the past, although Cyclone Kina, December 1992 - January 1993, when Sigatoka Bridge was partially washed away, was the last time flooding affected the area of the market (Fiji Government, 1993). Similarly, Lautoka experiences local flooding associated with the passage of tropical cyclones. Cyclone Bebe, 1972, appears to have produced significant flooding (one metre) in the main commercial streets. A return period of perhaps once in 50 years was predicted for such an incident (Blong et al., 1994), although climate change may make the occurrence of flooding more frequent.

Lately, the Fiji Government has dredged approximately 500,000 cubic metres of silt from the Qawa and Labasa rivers, with the result that Labasa Town has not been affected by floods in recent years (Fiji Government, 2012). Dredging to deepen water channels and to alleviate flooding, however, should be viewed only as a temporary measure, as it would prove a costly longer-term solution.

Figure 4: Potential flood areas of Nadi



Source: GIS-generated, by Amrita Lal

Ba, Labasa, Nadi and Rakiraki markets, however, all remain flood prone. Nadi, on average, experiences flooding once every two years; the highest recorded flood at Ba market was earlier this year, 2016, when the water level reached the top of the market master's office door, and other notable flood marks on the market master's door post included the years of 2009 and 2012. In Rakiraki, vendors lose about two weeks of business each year because of flooding. Figure 4 illustrates the relative exposure of Nadi Market compared with Namaka Market. Both markets are located quite close to Nadi River; however, while Nadi Town frequently floods, indications are that Namaka Market is flood-free.

Earthquakes

Earthquakes can be measured either according to magnitude (energy released) - the momentum measure scale, (Mw or M) - which is measured from 1-10, or by the observed effects, measured on the Modified Mercalli Intensity Scale (MMI), from 1-12.

Recurrence intervals for large earthquakes near Fiji - earthquakes of a magnitude 7 or greater - are expected every 15-21 years, while magnitude 6.5 or greater (for example the Suva 1953 earthquake) are expected every 2.5-6 years (Hamburger et al., 1986).

An examination of the main urban centres in Fiji reveals that a once in fifty-year earthquake would produce a strong earthquake (MMI of 6) in Nadi, Lautoka, Ba, and Labasa, very strong earthquake (MMI 7) in Sigatoka, and very strong to destructive earthquake (MMI 7-8) in Suva and Nausori. And every two to three hundred years, a probable maximum loss (PML) event would occur. Earthquake intensities would then range from very strong to destructive (MMI 7-8) for Nadi, Lautoka and Ba, through destructive (MMI 8) for Labasa and Sigatoka, to destructive to ruinous (MMI 8-9) for Suva and Nausori (Blong et al., 1994).

Geographical location aside, rock type also affects impact. The softness of the ground and the thickness of the soil above the hard rock play an important part in determining the level of ground shaking during an earthquake, and thus the amount of building damage. Generally, very hard (unweathered, intrusive igneous) rock offers the most resistance, followed by volcanic (Mesozoic) rock, very hard soil and soft rock (sandstone, muds and gravels), stiff soils and finally soil (artificial fill) vulnerable to collapse (Building Seismic Safety Council of the National Institute of Building Sciences, 2003). In urban areas, physical features predisposing buildings to damage, include un-reinforced masonry, steel-frame structures, poor maintenance and old structures; these factors add to the threat of building collapse, structural damage, content loss and the risk of fire (South Pacific Disaster Reduction Programme, 2002).

Labasa and Suva markets are built on reclaimed artificial land, the most susceptible soil type. For instance, the Suva Harbour area recorded some

of the worst damage from the impact of the 1953 earthquake (South Pacific Disaster Reduction Programme, 2002). Ground rupture, ground failure, amplification, liquefaction and flooding all pose a considerable risk to these markets in the event of a strong earthquake. Similarly, Nausori Market is built on alluvial deposits, and Ba, Lautoka, Nadi, Namaka, Savusavu and Sigatoka markets, soft sedimentary rocks. Only Levuka, Rakiraki and Tavua markets have an underlying geology of hard igneous rocks, although in the case of Rakiraki, the bedrock is covered by alluvial deposits.

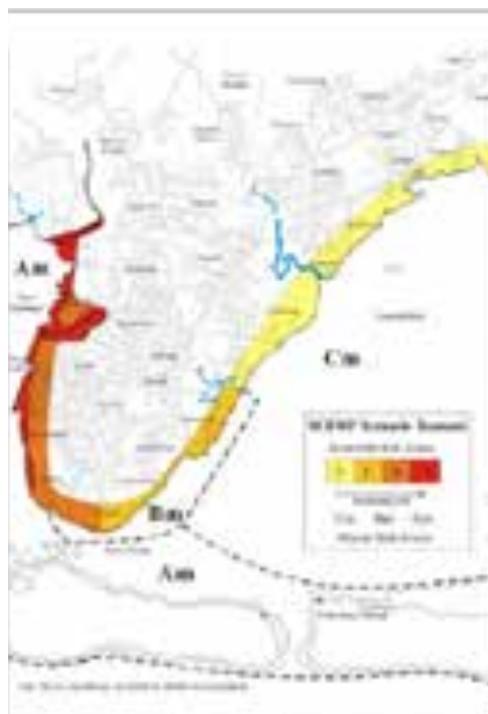
In the event of an earthquake, there is a high possibility of water-supply disruptions because ground shake can rupture pipes. Fires caused by gas leaks and electricity are also a consequence of earthquakes, and with potentially no water supply, there would be no ready means of extinguishing a fire in most markets that do not have extinguishers.

Tsunamis

An immediate coastal location and low site elevation make coastal markets in Fiji particularly vulnerable to the impacts of tsunamis. For instance, the 1953 tsunami adversely affected the port of Suva, with the wharf and seawall particularly badly damaged (Benson, 1987).

Therefore, the foreshore area of Suva, including Suva Market, is particularly at risk, especially, as it has been forecast for some time that there is a very real danger of an earthquake larger than the 1953 Suva quake occurring very close to the capital city (Hamburger et al., 1986). At high tide, the wave height in Suva could reach 2.8m (Blong et al., 1994), or up to 3.5m, as suggested by Rahiman (2006), resulting in considerable inundation (Figure 5).

Figure 5: Tsunami risk map for Suva



Source: South Pacific Disaster Reduction Programme (2002); SERMP - Suva Earthquake Risk Management Scenario

Similarly, while barrier reefs break the buildup of waves, and potentially reduce wave magnitude and velocity by up to 80% (Rahiman, 2006), a 2m high tsunami is still possible once every 50-100 years along the entire Fiji coast that is protected by reefs, and where no protective reef is present, perhaps higher tsunamis, of up to five metres, are possible (Blong et al. 1994).

Therefore, Lautoka, Levuka, Nadi, Namaka, Rakiraki, Savusavu, Suva, and to a certain extent, Tavua markets are all exposed to the threat of a tsunami, and most of these markets have been evacuated in the past because of tsunami warnings. Such action indicates a high level of awareness and response among market management and vendors alike, awareness and response that must be maintained.

Table 6: Tsunami warnings possible for the Suva region				
Tsunami category	Distance (km)	Source location	Travel time	Tsunami warning possible
Local	5-25	Suva, Navua	Few minutes	None
	50-300	Kadavu, Taveuni	10-30 minutes	Minimal
Regional	Up to 1500	Vanuatu, Tonga, Samoa	Up to 3 hours	Limited
Distant	>1500	Pacific Basin	3 to 13 hours	Ample

Source: South Pacific Disaster Reduction Programme (2002)

Table 6 lists the tsunami warning times for Suva in the event of an earthquake, a good indication for other coastal locations of the amount of time before the arrival of a tsunami, and therefore, the response time available. Immediate action is required should a strong earthquake be felt onshore, as the response window is approximately 10 minutes - sufficient time for most people to run to higher ground or seek an elevated site, although not sufficient time to deviate from that course of action or to take to vehicles and gridlock the local road network.

Only Ba, Nausori, Sigatoka and Labasa towns are not subject to tsunami risk (Blong et al. 1994).

Landslides

None of the market sites surveyed are at direct risk of landslides, although indirectly, flooding or earthquake can cause landslides that damage crops and access roads from farms to urban centres.

Drought

Drought has considerable impact on agriculture production and, therefore, market livelihoods; the Pacific region also experiences extensive El Niño-induced droughts, most recently during 2015-16 (UNOCHA, 2016a), when it was reported that crops in the north-west parts of Viti Levu had started to dry up because of the lack of rainfall (UNOCHA, 2015b).

Drought is of greatest concern in western Viti Levu. In the future, with a worst case climate-change scenario of decreasing rainfall and moderate population growth, water demand would exceed supply in the Nadi-Lautoka area by 38% by 2100 (World Bank, undated). Water conservation practices would need to be introduced at markets in the west, especially.

Climate change and sea-level rise

Low-lying coastal areas are susceptible to slow-onset sea-level rise; and given low elevations and proximity to the coast, the physical infrastructure and operations of many municipal markets in Fiji are potentially at risk from the impacts of sea-level rise. Water tables are expected to rise and adversely impact coastal groundwater systems, heightening the risk of flooding. Threats will be exacerbated still further when sea-level rise combines with storm surges or cyclones.

Suva is highly vulnerable to possible flooding - the main wharves of Suva Port would be overtopped with a 1m rise in sea levels, combined with a 50-year interval cyclone (Nunn et al., 1994) - although the capital is probably the most well-protected urban area in terms of adaptation measures, such as seawalls (Gravelle and Mimura, 2008). With the exception of the second city, Lautoka, other coastal areas are less well protected; much of the coastline around Nadi is especially vulnerable to sea level rise-related flooding (Figure 6).

Figure 6: Flooding detail for Nadi, 0.48m sea-level rise with 10-year storm surge



In time, more intense, El Niño-induced droughts, increased cyclone severity, higher temperatures, more unpredictable rainfall patterns, and rising sea levels will threaten the vitality and viability of market supply chains, market structures, and vendor interactions and livelihoods.

Sensitivity

Market hinterlands

Important vegetable production areas in Fiji include the Sigatoka Valley, Rewa Valley, Nadarivatu highlands and the hinterlands of Suva, Lautoka, Nadi, Ba, Nausori and Labasa urban areas (Chandra, 1978), and larger markets, Suva and Lautoka, have extensive hinterlands of produce (Figure 7).

Figure 7: Supply hinterlands of produce



Interview: Casual coconut vendor, Nadi Market, Cyclone Winston – produce supplies

The casual vendor has been selling coconuts at Nadi Market for the past five years. The stall is located next to the fish market, as people often buy coconuts at the same time as fish for the accompanying lovo. When the fish market is closed, as it was during the assessment, coconut sales also suffer.

Before Cyclone Winston, Akata would get her supplies from three sources: the islands of Taveuni, the Yasawa Group and Koro; but all three island groups lost their entire supplies during the cyclone. Immediately following, the market was closed for two weeks; then, Akata rang around her contacts but there were no coconuts. Finally, she had the name of a supplier from Lau, and he brought down one load of surplus supplies from Suva Market. Since then the coconuts have been supplied from as far away as Rotuma, but all supplies were sporadic until mid-September, when Akata managed to get 20 bags of coconuts from the Lau Group, at a cost of \$50 per bag (the equivalent of \$10 per dozen). She now sells them on to customers at \$5 per heap (5 coconuts).

The hinterlands of market vendors have expanded over the last 40 years (Table 7); vendors are generally travelling further to reach markets, aided in part by better infrastructure and transport, but also by the draw of being able to sell at well-established, regulated markets, with the accompanying trade volumes (customers). Casual vendors, especially, may chose to travel further to access a busier market.

Vendors use a variety of means by which to travel to market. Some walk or use their own transport, but the majority of vendors take public transport. Many casual vendors and farmers travel to the market by community carrier, enabling shared costs and direct transport. Others travel by bus, or, in the case of Levuka and Lautoka markets, by boat, from Moturiki Island and the Yasawa Group respectively. The larger markets (>400 vendors) have vendors and produce travelling the furthest distances (>100km), e.g. Labasa, Lautoka, Nadi, Nausori, Sigatoka, and Suva. Smaller markets have vendors travelling from the local surrounds, e.g. Ba, Levuka, Rakiraki, Savusavu and Tavua. The exception is Namaka Market where flower vendors travel considerable distances to sell flowers at the market (Table 22).

Table 7: Distances travelled to market by producer vendors (kms) and total number of market vendors

Market	1970s ¹	2010s ²	Total no. of vendors ⁴
Ba	14	50	365
Labasa	19	150	1015
Lautoka	30	100	755
Levuka	16	153	50 ²
Nadi	10	100	422
Namaka	-	100	82
Nausori	15	100	104 ²
Rakiraki	25	28	245
Savusavu	-	25 ³	290 ⁵
Sigatoka	18	128	468
Suva	25	168	1054
Tavua	20	15	97

Source: ¹Baxter (1980); ²UN Women (2011); ³ current fieldwork assessment estimates; ⁴UN Women data - 1st Quarter 2016; ⁵www.savusavu.info.

The more local the catchment for producers and vendors, the more vulnerable the market to a direct hit from a natural hazard, as vendors are reliant on the availability of local produce. Conversely, the greater the distance that vendors travel to reach market, the longer it takes to return home, and awareness of travel times is essential in the event of a sudden-onset disaster. This is especially true for markets such as Suva and Nausori, where casual vendors often travel in community carriers, and vendors can only leave a market when the last member of the community is ready, thereby delaying departures for many.

Interview case study: Full-time farmer/producer vendor, Suva Market, Cyclone Winston

Farmer, Savenaca, sells only on a Saturday. On the day of Cyclone Winston, he was selling at Suva Market as usual, and recalls running to the carrier at 3pm with the rest of the community, having left most of the produce behind. Everyone at the market was talking about the warning before, and at 2pm the PA announcement said to get ready to go home. It took them another hour to gather everyone (about 20 people in total). Four miles away from the village in Navunimono, the driver of the carrier came across a fallen tree that had blocked the road. In the height of the cyclone, the vendors had no choice other than to stay in the carrier for the night. The carrier was shaking from side to side, and back and forth in the wind, and people were really scared.

Very early the next day, when the winds had died down, the villagers started to walk to the village. The four-mile walk took them half a day, because they had to negotiate the debris. Savenaca's wife, three children (aged 6 years, 3 years and 18 months) and his father were all safe at home, but obviously very worried for his safety, as he had not arrived back on the Saturday. They were all overjoyed at the reunion.

Interview case study: Full-time non-producer vendor, Rakiraki Market, Cyclone Bebe

Vendor, Sunila, compares her experiences in Cyclone Winston to those of Cyclone Bebe (1972-3), when she was a nine-year old. Her father got the entire family to spend the night in a big truck during Bebe - a move that she will always remember, and always be thankful for because their home was completely destroyed.

On the Saturday of Winston, Sunila was selling at the market as usual. The vendors heard that the cyclone was coming, and so started to sell produce fast ('fire sale'). She left the market at 3.00pm, by which time the road was already flooded. When she reached home, her husband said that it was best to cook early. Sunila was in the kitchen and lifting a pot of cooked rice from the stove when the kitchen roof came off. The roof over the next room also went, and she and her husband spent the rest of the night under the bed. She lost everything.

Another important consideration is that while women form the majority of permanent vendors across most markets (55%), they form an even larger proportion of casual vendors (67%) and farmers (71%), vendors who travel further to reach market, and are often the only family member attending the market, and may only know other community members who also attend the market.

Market infrastructure

Plans for market development

Most municipal markets in Fiji have their origins in the immediate post-war period (Table 8), when a designated, regulated market became the recognised place from which to sell local produce. Since then, all markets have gone through a series of developments/extensions. And municipal markets in Fiji are currently going through another phase of development - major expansion, new build and relocation (Table 8).

Therefore, assuming the plans come to fruition, many of the market structures, that were assessed as part of the vulnerability

assessment, will either be modified considerably, or abandoned in favour of a complete new build in-situ or elsewhere over the next few years. Therefore, there is understanding that there may be reluctance on the part of councils to carry out extensive maintenance, especially at the markets earmarked for relocation: Labasa, Rakiraki, Sigatoka, Suva, and Tavua, and to some extent, at the markets awaiting building modification: Levuka, Namaka and Savusavu. Only four markets have no immediate plans for redevelopment: Nadi and Lautoka markets, that have benefited from recent extensions, Ba Market and the new, and recently-relocated Nausori Market.

Table 8: Key dates and developments for municipal markets in Fiji

Market	Dates re-established or founded ¹	Dates at current site or major extension work ²	Women's accommodation centre opened	Current relocation proposals or re-future development plans
Sigatoka	1948	1970	2014	Seeking landowners' permission for relocation ³
Labasa	1948	1957	2016	Announced relocation – 2018? ⁴
Nadi	1948	1966	2014	-
Nausori	1949	-	-	Relocated to new site in 2015 ⁵
Suva	1950	2009	2013	Relocation proposal before cabinet ⁶
Tavua	1952	1992	-	Landowners' given permission for relocation ⁷
Ba	1952	1983	2011	-
Lautoka	1952	2015	2014	-
Rakiraki	1950s	1987	2012*	New market development after Cyclone Winston ⁸
Levuka	1950s	-	-	Extension to old market, currently not in use
Savusavu	1973	2014	-	Partial two-storey extension planned, incorporating women's accommodation ⁹
Namaka	2005	-	-	Two-storey extension planned incorporating women's accommodation ¹⁰

Source: ¹Baxter (1980); ²UN Women (2011), plus Lautoka and Savusavu assessments; ³CEO Tavua Town Council; ⁴Market Master, Labasa Market; ⁵Bola-Bari (2015); ⁶CEO Suva City Council; ⁷CEO Tavua Town Council; ⁸newswire.com.fj; ⁹Market Master, Savusavu Town Council; ¹⁰Market Master, Namaka Market

* Rakiraki women's accommodation centre was destroyed during Cyclone Winston.

Nevertheless, important observations can be made to the climate-sensitivity of current market structures and set-ups, so that lessons can be applied to future market designs, and vendor resilience built upon and strengthened.

Previously, market management, in response to a survey, had noted the adverse impacts of weather on vendors (UN Women, 2011). Rain, flooding, harsh sunlight, lack of shelter, and weather-related destruction of produce were all listed as disproportionately impacting vendors, especially those who sell outdoors (UN Women, 2011); the above circumstances still impact vendors adversely.



Nausori Market: Sturdy, high building

Building design: lessons learned

Dimensions: Recent extensions at Labasa, Lautoka and Nadi markets, and the new build of Nausori, are all high-ceilinged and sturdy builds. Ventilation, therefore, is not the acute problem it is in the older markets with their low ceilings and lack of air circulation. Rakiraki and Nausori 'sheds' even withstood the winds of Cyclone Winston, with Rakiraki only losing a few roofing tiles, when so much destruction occurred elsewhere to the market.



Nadi Market: High, open-sided shed

The original market at Lautoka is also high-sided but, because of its octagonal design, sheer floor space, and low entrances, it is hot and lacking ventilation. The extension at Lautoka is also airy, although with too many glass panels at height (just below the ceiling), Lautoka City Council was in the process of retrospectively fitting

translucent greenhouse netting to defuse some of the light and resultant heat. Nausori Market has windows near the apex of the roof, but the external roof design has gable wings to aid in shielding the glass from direct sun, and therefore, the market does not suffer from being overly hot.



Lautoka Market: Too much glass at height, causes heat and glare



Nausori Market: Windows at height shaded by eaves of roof

Positives: New extensions - solid build, high ceilings, structures prove cyclone-proof

Windows shielded at height with winged roofs

Negatives: Most older markets - low ceilings and hot

Large glass panels produce too much light, at height, unless shaded

Roof and window designs: Roof designs are numerous across the markets, and most markets have a mix, reflecting different expansion stages to their development. The new Lautoka extension has an inverted-apex (winged) design; and, the Mudaliar Wing roof of Nadi Market has a zigzag external profile, which makes for an unusual internal guttering system. The upper windows of the new extension in Labasa Market have shutters above to provide both shade and storm protection.



Nadi Market: Zigzag design to roof of Mudaliar Wing creates internal leakage issues



Labasa Market: Shutters shade upper windows and act as storm shutters

Gable roofs that end abruptly at the edge of buildings or roofs that have unusual cut-outs as is the case in one particular part of Ba Market, expose vendors on the edges to hot sun, wind and rain. As a counter measure, the new extension in Nadi has winged extensions to shelter vendors /

passersby below. Aspect is also a consideration; however, while the south-facing sides of markets do not receive direct sunshine and therefore, the vendors positioned there would not be exposed to the hot afternoon sun, the prevailing wind direction (and rain) comes from that quarter - the south-east.



Labasa Market: Tarpaulin shades end stalls of extension



Rakiraki Market: Tarpaulin drapes and tents shade end vendors in new shed



Nadi Market: Eaves extend over walkway to shade users



Ba Market: Roof extension protects vendors

Interior lighting levels can also be a concern. To add light below, Perspex tiles are fitted in the roofs of several markets (Ba, Labasa, Nadi, Rakiraki) to enable daylight to penetrate to the area below. However, in almost all cases where Perspex is installed, the transparent panels have either been painted over in a darker colour or covered with temporary materials e.g. cardboard, as too

much light is allowed in when the tiles are left clear. Handicraft vendors in Labasa in particular complain because the strong sunlight through the Perspex tiles fades the handicrafts below. Skylights placed on the south-side of markets may be more tolerated by vendors, although only if the roof height is sufficient to give space between the rafters and the produce.



Nadi Market: Partly obscured, transparent roof lights (tiles)



Labasa Market: Roof tiles allow too much light and fade handicrafts

The presence of air vents in the ceilings of markets is quite common in an attempt to cool produce halls, and vents are a recent, welcome addition to Namaka Market. However, most

vendors either comment that vents do not solve circulation issues, or, indeed, that they add to the heat within, as the air on the outside of sun-baked roofs is hotter than that inside.



Namaka Market: New vents in roof result in improved ventilation



Labasa Market: Vendors claim vents in roof add to heat owing to high temperatures outside

The lining of the roof is an important aid in helping to keep a produce hall cool; unlined corrugated iron (tin) gets particularly hot. The addition of a



Labasa Market: Hot tin roof, with no lining nor ventilation

Some markets have ceiling fans (Lautoka, Nadi, Sigatoka), although maintenance is an issue - most were not working - and when they do work, they only benefit the few immediate vendors located nearby.

Positives: Foil lining to interior of roof to assist in keeping the roof cool - requires maintenance

Protective shutters useful when windows incorporated into building

Negatives: Roofs without wings (awnings) give vendors on the periphery limited

foil lining does help with heat reduction, although ongoing maintenance is required to ensure the longevity of the foil.



Tavua Market: Poor condition of foil lining to roof

protection. Clear Perspex tile too bright when in direct sunlight
Addition of air vents inconclusive

Guttering and drainage: Several markets have missing or poorly maintained external guttering and downpipes that can pour water onto vendors, customers or produce below, and many markets have areas of roofing that have no guttering and runoff is therefore not being directed to downpipes. Even when guttering appears substantial, rainfall intensity can render the infrastructure inadequate.



Tavua Market: Detached guttering



Labasa Market: Roof without guttering



Suva Market: Overflowing guttering in heavy rain

Internal guttering is a major leakage issue. Because markets have gone through various stages of development often two or more different aged buildings form one covered area. Where roofs meet, internal, overhead guttering is formed at ceiling height (Ba, Labasa, Savusavu, Sigatoka, Tavua). This guttering is often a source of leakage, and is very high maintenance. Internal guttering needs not just be the result of a merging of roofs, however; the Mudaliar Wing of Nadi Market has six rows of internal guttering because of the zigzag design of the roof, and all crisscrossing rows of guttering show evidence of leakage.

Conversely, in one part of Suva Market, the internal high-level guttering flows, via downpipes, into a metal-covered drainage system on the floor - a stagnant-water source, and potential flood risk - the floor-based drains were the means by which flood-water came into Suva market in 2006.

Fiji has already experienced major outbreaks of dengue, most recently in 2014, and vendors say that drains are a breeding ground for mosquitoes. All future internal guttering/drainage and areas of stagnant, standing water should be avoided wherever possible.



Savusavu Market: Overhead internal guttering between extensions



Nadi Market: Ample evidence of leakage from overhead, internal guttering

Positives: Prompt replacement of Winston-damaged guttering at Ba Market

Negatives: Basic maintenance/health check required for guttering/pipe work for all markets

Consider the installation of guttering where none present

Drainage is also a problem. Often it is an open, cement ditch that collects rubbish (and water when drainage is poor), smells and is a health and safety hazard. At Ba Market, the entire original market is surrounded by a deep ditch, the depth of which has seen vehicles fall into it, and, vendors say, have had to be lifted out. Similarly, at Savusavu Market, one casual vendor has positioned a table in the ditch, because of its depth.



Ba Market: Deep drainage ditch surrounds main market



Savusavu Market: Table sited in drainage ditch illustrating depth



Nadi Market: Contents of downpipes of restaurant seep through walls



Nadi Market: Poor drainage from restaurant results in foul smelling drain



Nausori Market: Sealed, regular downpipes from main roof



Nausori Market: Downpipe direct into drain with removable, protective grid

Within markets, often the *kai* section is found among the rest of the produce (Sigatoka), and owing to requiring a constant supply of water to

prevent them drying out, the *kai* area is usually wet (Ba), especially when there is no proper drainage outlet (Lautoka).



Lautoka Market: *Kai* section, tables drain into buckets



Ba Market: *Kai* section separate section of inside market



Nadi Market: *Kai* sales on floor near drain, and close to rubbish collection



Nausori Market: *Kai* market - purpose-built, separate annex (room)

Positives: New guttering and drainage at Nausori Market is exemplary - external, sealed units, with covered drains and feeder downpipes - and a separate kai section (room) with raised, easily drained surfaces

Negatives: Drainage - flood risk, health risk, safety risk

The number and positioning of water tapes also varies between markets, ranging from two taps in Namaka to 20 in Nausori, although at both Namaka and Nausori, taps are only located externally, and therefore, there are no water spillage issues inside either market. Ba, Labasa, Sigatoka and Suva each has more than 100 permanent vendors per main-supplied water tap (Table 9).

Table 9: Ratio of water taps to permanent vendors

Market	Total number of taps	Total number of vendors	Ratio permanent vendors to one tap
Ba	3	365	122
Labasa	8	1015	127
Lautoka	13	755	58
Levuka	1	50	50
Nadi	14	422	30
Namaka	2	82	41
Nausori	20	1042	52
Rakiraki	4	245	61
Savusavu	3	290	97
Sigatoka	4	468	117
Suva	7	1054	151
Tavua	5	97	19

Internal layout and produce displays: Tables are usually supplied by the relevant council or donated by organisations, and either they are fixed in position (Ba, Namaka), or free-standing and able to be rearranged or moved (Levuka). Sometimes, different buildings within each Market complex have different table types (Labasa, Lautoka, Nadi, Rakiraki, Savusavu, Sigatoka, Suva and Tavua). Some markets have a uniform pattern to the tables, while others have more of a haphazard

arrangement: Nausori Market has wide aisles and ease of access between the table rows; in Labasa Market, in contrast, the gaps between tables can be of less than a metre. At Nausori Market, displays of produce on table tops are only permitted to be 45cm high, ensuring both visibility and ventilation. At Tavua Market, produce (mats) hang at height, further restricting the already poor circulation.



Nausori Market: Wide displays and wide aisles for ease of access

Currently, Ba, Nadi and Rakiraki are the three markets most at risk of flooding, and previously, vendors at Ba Market describe lashing down tables, prior to a major flood, in a vain attempt to stop them being washed away - to no avail.



Labasa Market: Poor aisle width

Recently, Ba Market had rows of flood-resistant, fixed, metal tables installed, which it is hoped, will withstand a future flood. Nadi Market also has fixed tables in the new extension, but they already show signs of wear, and so far have not been exposed to flood water.



Ba Market: Fixed, flood-proof metal tables

Rakiraki vendors have inherited the old, wooden tables from Nausori Market, after Cyclone Winston destroyed their own tables, and vendors are happy with the replacements. However,



Nadi Market: New, wooden table tops showing signs of wear and tear

Lautoka vendors complain that their new tables in the new extension are too high, and many of the vendors use a variety of techniques to prop up their own seating.



Rakiraki Market: Tables from Nausori old market replaced those lost in Winston



Lautoka Market: Vendors' raised seating in new extension

Limitations to the sale of fish and seafood at the markets were observed. First the odour: when a fish market is incorporated into the main market, as in the case of Sigatoka and Savusavu, or nearby, Labasa, then vendors in close proximity complain that the smell can be nauseating, especially when exposed to it all day; second, casual vendors can sell fish and seafood from the floor, under the feet of passing customers (Lautoka and Nadi markets), creating health and safety issues. And third, conditions in fish markets are variable. Tavua fish market, for instance, has no internal tap nor ventilation, and similarly, Namaka fish market can be hot, as ventilation is poor.

Positives: Flood-resistant, fixed tables need to be sturdy (metal) and easily cleanable. Wide aisles and low display heights need to be adhered to.

Negatives: Vendors consultation on ideal height of new tables prior to purchase/fitting. Fish markets do not all have internal water taps, nor good ventilation.

Flooring: Uneven flooring can cause wobbly tables and trip the unsuspecting (Labasa, Sigatoka, Suva); equally, intentionally-polished concrete floors can be very slippery, especially when wet (Lautoka).



Sigatoka Market: Uneven floor



Lautoka Market: Polished floor, slippery when wet

Positives: Levelling gradients would alleviate localised flooding in markets

Negatives: Intentionally polished floors may be overly slippery, especially when wet

Shade and casual vendors: Casual outdoor vendors often sit unprotected in the sun, wind and

rain for all or part of the day (Ba, Labasa, Lautoka, Levuka, Nadi, Nausori, Rakiraki, Sigatoka, Suva, Tavua). Only in Savusavu, are all vendors offered some protection, and sell at a table rather than from the floor. Vendors use a variety of methods to shade themselves.



Rakiraki Market: Temporary tarpaulin caught in high winds



Suva Market: Casual vendors sell in the hot sun on Saturdays

In Nausori, casual vendors prefer to sit outside rather than at indoor tables, as they perceive that they sell more outside. Similarly, vendors in Levuka sell along Beach Street, rather than at the more marginal market to the north of the town.

Positives: Savusavu, all casual vendors sell from a table and under shade

Negatives: At many markets, casual vendors still sell unprotected from the floor (although need to examine why, if indoor tables are available)



Suva Market: Waste segregation in operation

Lautoka and Nadi vendors say there are too few wheelie bins/receptacles for rubbish, and vendors in Namaka, remark that the bins are sited inappropriately and are in a poor condition.



Labasa Market: Mixed rubbish in waste-collection bins

Positives: Several councils visibly promote waste segregation

Negatives: Waste segregation schemes in general are not well adhered to by vendors

Waste Management: Several markets promote the segregation of waste (Ba, Labasa, Lautoka, Nausori, Rakiraki, Sigatoka, Suva), although only in a couple of markets (Suva and Nausori) is the scheme strictly adhered to. At Suva market, the organic matter is turned into compost commercially (the vendors receive no financial reward); and in Nausori, it is collected by local farmers as feed for pigs.



Labasa Market: Signage promotes waste segregation in council offices

In Nadi and Tavua, the waste is left in open-sided collection areas, and in the latter case, the surrounding area is also strewn with rubbish.



Tavua Market: Rubbish strewn around rubbish collection site

Market cleaning: Vendors comment that regular, thorough cleaning of markets used to be standard practice. However, 'Spring cleaning' has become infrequent, and in the case of Suva Market, only once a year, over the Easter weekend. Across the markets vendors comment that ceilings



Ba Market: Internal roof demonstrates build up of dust

and walls are seldom cleaned, and dust levels build up, causing respiratory problems among vendors. Ba Market is particularly dusty at height (in the rafters). And markets with operational fans



Sigatoka Market: Local bore hole used as water source for toilets

All operational markets have at least one fire hose, although it may not necessarily be positioned near a tap, nor reach the full length of the market. If there is a disruption to the water supply, and in the event of a fire, most markets do not have access to fire extinguishers. Only Savusavu and Rakiraki markets have fire extinguishers in a public space.



Savusavu Market: Fire extinguisher located near new extension

only exacerbate the problem by redistributing the dust around the produce hall.

Services:

Water supply: Most markets do not have an alternative water source should the mains water supply fail. Water tanks are only available for use with the (public) toilets, and not suitable for drinking purposes. Only Sigatoka Market has shared toilet facilities (market and bus station) that rely on a local borehole for water. Ba, Levuka and Rakiraki have no alternative water source. No water conservation measures in practice, particularly important in drier northern and western drought-prone markets.



Labasa Market: Toilets with alternative water tanks

Positives: Some markets have fire extinguishers – possibly requiring training of use for vendors

Negatives: No alternative water supply for most markets should mains supply fail
No water conservation measures



Rakiraki Market: Fire extinguisher near mixed kava vendors' room



Tavua Market: Low ceiling height and conventional lighting makes area hot

Electricity: Only Suva and Nausori have back-up generators. Most markets use conventional strip lighting; Suva is in the process of changing its out-dated and difficult to replace tubes in

favour of LED lights - according to vendors, lighting levels are not affected. Some markets remain dark despite the presence of strip lights, especially in produce halls in Labasa, Sigatoka and Tavua.

Access: Few markets are truly wheelchair accessible; yet, Nadi and Savusavu, and until recently Nausori markets have vendors with impaired mobility and who use a wheel, and all markets need to be accessible to all customers, with clear aisles, good signage and disabled-friendly facilities as a minimum standard. Currently, customers using wheelchairs at the municipal markets are restricted in where they can access.



Lautoka Market: Wheelchair user interacting with traffic in side street



Suva Market: Wheelchair use in the main produce hall



Nadi Market: Gradients between buildings impair access for less mobile



Lautoka Market: Disabled toilets locked and blocked



Nausori Market: (Small) emergency signage indicates hidden exit



Suva Market: Keep clear signs indicate access, and generally adhered to

Positives: Nausori has good signage, ease of access, and separate disabled-friendly facilities

Negatives: Ramps, steps and uneven surfaces are present throughout most markets
Emergency signage too small, and generally signage poor

Transport: Most markets are located next to the bus and taxi stands for the respective towns - Nausori has its own bus market transit bay - and most vendors are dependent on public transport as their means of travel to and from the market. This dependency proved an issue during Cyclone Winston, when vendors who left their market departures until the very last minute, found that all transport had already left. Vendors ended up sleeping in Lautoka Bus Station overnight, and also stranded vendors, customers and passersby



Tavua Market: Market parking spaces very close to casual vendors

Positives: Road closures on weekends when casual vendors sell on the road side

Adaptive capacity

Disasters can be broken into by a series of emergency management phases: mitigation; preparedness; response, and recovery.

spent the day in Savusavu Market, at the height of the storm, unable to leave the premises before being evacuated in the early evening to a local village for the night.

Lautoka and Levuka markets have vendors who arrive by boat (fibre) and, in their cases, the timing of high tide is an additional consideration in the event of a natural hazard.

Safety concerns arising from the interaction between cars, vendors and customers at a few markets (Ba, Nausori, and Tavua). Some markets try to minimise risks by either closing key streets or the market car parks on Saturdays, to enable casual vendors to sell from the floor in a traffic-free environment (Nausori, Rakiraki, Sigatoka, Suva, and until recently Labasa).



Nausori Market: Dedicated market transit bay close to market

Negatives: Fibre-glass boats reliant on tide times for departures in emergencies
Community carriers wait until last person on board before leaving
Proximity of floor-based vendors and car parking spaces

Mitigation

Preventing future disasters and/or minimising their impact by dredging nearby rivers, building seawalls and climate-proofing market buildings, and by vendor awareness and training.

Preparedness

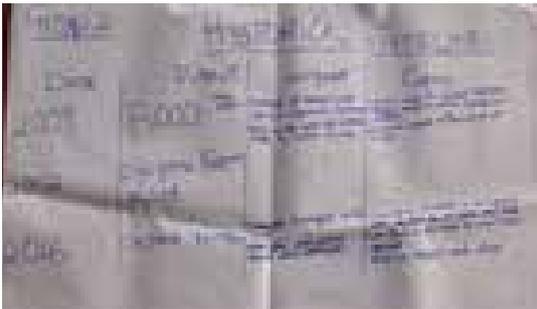
Communications: For market vendors, the radio is the main source of information about weather and natural hazards, although several comment that once they are at the market, they have no ready means of receiving updates.

Vendor awareness: The more frequent a natural phenomenon, the more aware and prepared vendors are to the hazard, but also the more the hazard dominates vendor psyche. For instance, during the Ba Market focus-group activities, one group listed only the recent flood and cyclone events that impacted the market - to the exclusion of all other timeline events. And the Suva vendors, having not experienced the effects of an earthquake, dismissed the likely impacts of any future earthquake on the market despite the market being sited on reclaimed land, and

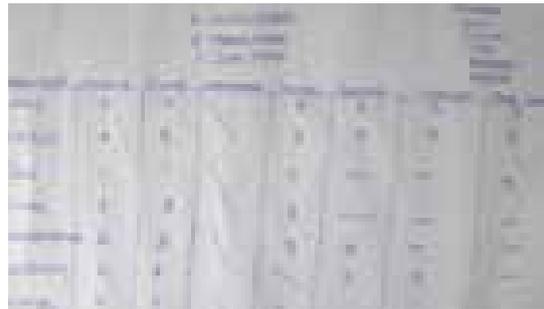
located in an earthquake high-risk zone. They were aware, however, of the effects of political unrest on livelihoods and market operations, more so than vendors at any other market.

Again, Cyclone Winston has brought to everyone's attention the devastating effects of a severe cyclone, and people are less likely to ignore cyclone warnings in future. However, the converse is true for tsunami warnings; the more often warnings are given and no tsunami materialises, the more reluctant vendors and the general public will be to heed future warnings and therefore lose income.

All focus groups, however, without exception, listed a cyclone as having the highest impact on the market and their livelihoods.



Ba Market: Flooding and cyclones dominates vendors recall of timeline



Suva Market: Vendors indicate no impact on market from earthquake

Seasonality - Vendors have sound knowledge of the effects of seasonality on produce (Table 10).

Drought - Vendors display knowledge of drought-resistant crops - tomatoes and round cabbage are both good in the dry season.

Floods - In the case of flooding, vendors are proactive. At Rakiraki Market vendors regularly send someone over to the tributary to check

on rising water levels to warn others. And at Ba Market, indoor vendors of dry goods start taking goods home after 1-2 days of rain, as inevitably flooding follows.

And at all flood-prone markets, vendors know to lift produce onto tables and to take valuables (equipment, monies etc.) home.

Table 10: Seasonal calendar of produce (as outlined by Suva Market vendors)

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Mango	x	x	x								x	x
Mandarin		x										
Wi			x						x	x	x	
Kavika	x	x	x								x	x
Duruka												
Water melon				x	x	x	x	x	x			
Avocado				x	x	x						
Pineapple	x	x	x	x	x	x					x	x
Tomatoes	x	x	x	x	x	x	x	x	x			
Dhania	x	x	x	x	x	x						
Bean	x	x	x	x	x							
Eggplant						x	x	x	x			
French bean						x	x	x	x			
Papaya									x	x	x	x
Orange												
Tarawau	x	x	x								x	x
Lemon				x	x	x						
Lettuce							x	x	x	x		
Cucumber							x	x	x	x		

Cyclone - Understandably, much attention during the focus-group activities and interviews focused on the impact of Cyclone Winston. Of the 30 vendors interviewed at random as part of this assessment, only 14 were at their respective markets on the day of Cyclone Winston; 11 stayed away because of the warnings, three were at other events; and two only started selling post Cyclone Winston.

One of the Suva vendors interviewed, who works alongside other staff at her stall, said that she left the stall and went to do emergency-supplies shopping the morning of Winston. But, another casual vendor at Suva market that day, said that her whole village was unprepared, as none of them had heard that the cyclone was coming (and only 4 out of 37 houses in her *mataqali* survived).

Tsunami - Lautoka, Rakiraki, and Suva market vendors all recall occasions when the market was closed because of a tsunami warning;

vendors in Rakiraki congregate on the tump in the central town square.

Preparedness of home and gardens:

Flood - One vendor commented that in times of flooding she knows to expect three other neighbouring families, from low-lying, flood-prone homes, to come to stay with her.

Cyclone - Several vendors said that they run to cut the cassava, although one interviewee from Rakiraki said of Cyclone Winston that despite cutting the cassava: "they were dug like they used a fork - nothing left". Another vendor commented that things outside were tied to a tree; and the tree went.

Interview, permanent vendor, Rakiraki Market, Cyclone Winston

Vara says that she knew Cyclone Winston would hit Rakiraki because: "cyclones look for deep water, and Bligh Waters is the deepest water in Fiji

[...] Bligh Waters is calling it". And she knew what damage a category five cyclone could do because she had watched the coverage of Cyclone Pam on YouTube. On the Friday night, her husband arrived back from Taveuni, got a torch and climbed onto the roof to remove the Sky dish. Vara had already bought biscuits, tuna, and candles, and instructed her children to empty their school bags of books, wrap the books in plastic bags, and put biscuits, tuna and two change of clothes in each bag. She also wrapped all appliances and other valuables in rubbish bags and put them in the deepfreeze, and then wrapped that in tarpaulin. During Winston, the deepfreeze was blown 10.00m but everything inside survive: "It's not a wind, it's a devil".

Market master action:

Market closure - All market masters make the announcements to close markets, guided by the advice from their respective town council and Ministry of Local Government. In the case of Winston, after the closure announcement, most vendors packed up, although some vendors moved outside and continued to try to sell produce. In several cases, the police arrived to move people on (Levuka, Nadi, Nausori, Suva). Vendors who heeded the warnings, exclaimed their surprise at the actions of a few: "But there is only one life... you go...finished".

In Savusavu, many vendors and customers were caught out as Cyclone Winston arrived earlier than expected at 2.00pm, and 190 people were forced to seek shelter at Savusavu Market, before being evacuated to neighbouring Yaroi Village.

The displaying of an evacuation plan needs to be highly visible and clearly understood to be effective. Lautoka Market was the only market to have a (small) evacuation plan evident, and it just showed exits for the new extension - no information for emergency route once out of the building and no other information. It was on a side wall, and could easily be missed.



Lautoka Market: evacuation plan for new extension

Response

Interview, casual vendor, Rakiraki Market, Cyclone Winston

Eta was selling at the market on that Saturday, as usual. She left at about 3.00pm and reached home at 4.00pm, and went to cut the cassava. Then she prepared an early dinner for her husband and her three children (11, 5 and 3 year olds). The wind picked up and they realised that they had to go to their neighbours, the boss's house. She recalls how thirteen people spent that night standing in the bathroom of her neighbours'. There was no room to sit down and they were there until 6am on the Sunday morning. Her eldest son, 11 years old, grabbed her shirt with his hand, and put his head there all night. The children didn't sleep properly for a month after, and even now when they are outside and there are strong winds, they run in and say: "Mummy, mummy, hurricane".

Recovery

In the immediate aftermath of a disaster, the focus is often on cleaning up the home. Many women vendors said that they spent the first two weeks after Winston just soaking and hand washing clothes and bedding, and in some cases taking it to the river each time, as there was no mains water supply. Other vendors report coming to the market to find that there was nothing to sell and going home again to plant.

Vendor action - Vendors at Ba and Rakiraki markets sought alternative venues to sell produce immediately after Winston; in Ba, vendors sold from the steps of Rajendra's Supermarket, and in Rakiraki, vendors took to the slopes of the hill leading into town from the King's Highway. All market vendors struggled with the immediate supply shortage after Cyclone Winston. Left-over windfall produce were sold for the first few days (eggplants, pawpaw mangoes and coconuts), before vendors turned their hand to other ideas.

Some vendors started to sell cooked food (*roti* parcels) prepared from some of the food rations (rice, tinned fish, flour); others started to sell seafood; while others sought alternative suppliers: a Suva vendor received supplies of *voivoi* from Kadavu; while other vendors physically went to other markets to look for vegetable produce. One Rakiraki vendor said that she went to Lautoka and brought back round cabbage and spinach, while another in Rakiraki hired a rental vehicle (\$250 per day) with four other vendors and each brought back 2-3 bags of produce from Nausori.

With high prices, vendors also looked to add value to produce, and therefore, increase profit margins. Cassava is \$100 a bag, but more money can be made when cooked and sold in small portions.



Nadi Market: Value-added cassava

External assistance – During the 2012 floods, the Government paid the stall fees of 370 vendors (\$100 to market vendors in Ba and Rakiraki and \$50 to vendors in Nadi, as payment of, on average, 19-55 days of stall fees (Fiji Government, 2012e). In Nadi, the UNDP employed 100 vendors for two weeks, to help clean up the town after the floods (cash for work programme) (Nadi focus group activities).

Again, stall fees were waived by the government post-Cyclone Winston (22 February - 31 March) to assist market vendors (Gopal, 2016b).

Several agencies supplied quick-growing seeds (eggplant, long bean etc.), although one vendor commented that now there was a surplus of those produce at the market.



5. Recommendations

With plans for the majority of municipal markets in Fiji to be either extended or rebuilt in the next few years, it seems appropriate to outline some generic recommendations from current market infrastructural designs, so that the build-back-better principle may be applied to new market builds. It is also important that market vendors be given the opportunity to participate fully in the consultation and planning process, so that they can influence future market infrastructure based on their vast current experience.

Generic recommendations:

Market infrastructure

- A single apex and gradual pitch to the roof of high sheds is capable of withstanding extreme winds (Rakiraki Market);
- Windows at roof height need to be shielded from direct sun either with temporary sheeting, or more ideally, at the design stage - with an extension of the roof above (Nausori Market);
- Eaves can be extended to the roof to shelter vendors below (Nadi Market new extension), rather than using tarpaulin;
- When tarpaulin is used along the edge of market buildings, the length needs to be adequate and tattered sections replaced regularly - the colour white, although cooler to sit under, reflects much light and can cause nuisance from reflection to vendors seated opposite and close by;
- Foil lining cools tin roofs, but requires ongoing maintenance;
- Ventilation (vents) in south-facing roofs - windward side and/or no direct sun;
- Translucent (non-clear) tiles for use only on south-facing roofs and only when roof height is adequate to prevent damage to produce below;
- Conventional lighting to be changed to LED or solar-powered where possible;
- Alternative water tanks and water conservation measures to be introduced;
- Adequate fresh water taps for external use only (Nausori Market) - no washing of produce in market buildings; cover area above outside taps, so that not open to elements;
- Avoid use of overhead, internal guttering, as prone to leakage and constant maintenance required;
- Fixed, metal stalls (tables) - optimum height, width, and spacing for ease of emergency evacuation, flood-damage prevention, ease of cleaning and better air ventilation;
- Level concrete (non-polished) flooring for ease of access within and between buildings;
- No hanging produce at height to aid circulation of air within produce halls;
- Segregated *kai* section, raised from floor to tables, with dedicated drainage outlets;
- Separate fish market, ideally with air conditioning, or as a minimum, fan-assisted cooling and window vents, plus access to internal water tap and drainage.
- Outdoor juice and cooked-food vendors require market-supplied tarpaulin for shade.

Market maintenance

- Introduce, or enforce, waste management/ segregation scheme, and ensure adherence, potentially via some sort of incentivised vendor scheme (payment or supply of compost);
- Regular 'major' spring clean of walls and rafters of market buildings to minimise build up of dust, and, as a minimum, cleaned thoroughly at least once a quarter;
- Ceiling fans, when used, require regular maintenance, and care with positioning, so as not to redistribute dust;
- Fire hose checks to be regularly undertaken, and fire extinguishers fitted as standard (with regular training in use given);
- Consider dual-alarm installation, to double as fire alarm and early-warning system e.g. in case of a tsunami warning.

Information and communications

- Warning dissemination - check positioning of PA systems for audibility throughout market, including by casual vendors outside, but ensure not positioned too close to nearby vendors;
- Provision of central notice boards that outline procedures in emergencies, emergency contact numbers, actions, persons responsible and displaying evacuation plans;
- Daily weather forecast to be posted on notice (white) board;
- Consider appointing section leaders to be responsible for ensure emergency practice drills undertaken;
- Consider external factors (time of day, day of the week, conditions of tide etc.) when making emergency decisions/ announcements, as latter part of week, especially, high attendance by casual vendors, many of whom are not familiar with the overall market operations and who know

only the location where they sit and the community members that accompany;

- Casual vendors frequently travel the furthest and often on a collective basis; and therefore need advanced notice when required to return home early;
- Clear signage to aid speedy evacuation in an emergency, including exit signs;
- Clear plans of evacuation routes and assembly points displayed in each building;
- Development of market disaster management action plan;
- Develop strategies for the dissemination of market disaster management action plan to all market users, including customers.

Governance

- Owing to the success of previous schemes, consider having a fixed government fee-waiver scheme post future disasters.

Site-specific recommendations

Table 11: Recommendations for Ba Market		
Ba Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Cover drain to ensure both rubbish free and safety issue resolved, especially for casual vendors who seat on the edge of the drain; - Introduce tables for casual vendor and provide shade along 'corridors'; - Ventilation in roof. 	<ul style="list-style-type: none"> - Move electrical box from within fruit and vegetable section; - Installation of back-up generator; - Introduce alternative supply of water (tank); - Upgrade toilet facilities to ensure access by people living with disabilities.
Market Governance	<ul style="list-style-type: none"> - Provide Council-paid, night-time security staff; - Commit to regular cleaning of roof and rafters as part of cleaning roster; - Enforce waste management scheme, and upgrade onsite composting facilities; - Routinely check fire hose for leakage. 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Ba Market, with the full participation of vendors, with a focus on cyclone, flood and drought. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	
Capacity Building	<ul style="list-style-type: none"> - Vendors are very alert to the risk of flooding, but less well aware for the impact of drought on the supply of produce. Awareness raising on impact of drought and alternative drought - resistant produce; - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 12: Recommendations for Labasa Market

Labasa Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Extend access ramps to produce halls; - Add tarpaulin drapes for end buildings to protect vendors throughout market; - Cover outside taps area near toilets; - Paint over Perspex tiles in upper floor of handicrafts centre to block some sunlight; - Reopen locked toilets at cooked-food stalls area, and segregate into male and female toilets; - Install guttering for cooked food stalls; - Investigate opening up end panels of main produce halls to allow more ventilation; - Tarmac car park near cooked food stalls to minimise dust. 	<ul style="list-style-type: none"> - Relocation of market to Subrail Park, Labasa; - Ensure adequate taps in new market development; - Ensure adequate ventilation; - Install back-up generator.
Market Governance	<ul style="list-style-type: none"> - Enforce waste management system; - Install alternative water tank. 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Labasa Market, with the full participation of vendors, and with a focus on cyclone, flood, earthquake and drought. 	<ul style="list-style-type: none"> - Review and update Disaster Risk Management Plan for new site.
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	
Capacity Building	<ul style="list-style-type: none"> - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 13: Recommendations for Lautoka Market

Lautoka Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Improve ventilation in main hall with more fans; - Provide juice sellers with tarpaulin cover in Namoli Green; - Provide tables for casual vendors selling seafood on floor in new extension; - Re-open disabled toilet facilities between market and mall; - Rearrange tables in mixed kava section to provide more space between vendors; - Repair security cameras; - Redraw evacuation plan to account for all the market buildings and show evacuation routes as well as exits; - Install fire extinguishers for use when a fire and disruption to mains water supply. 	<ul style="list-style-type: none"> - Install proper drainage for kai section; - Install solar lighting throughout market; - Consider reducing the height of tables in new extension, and fixing to floor; - Level floor in original market, and replace wooden assortment of tables with fixed, uniform tables; - Install water tank for alternative supply in event of mains water failure; - Back-up generator in event of mains electricity failure.
Market Governance	<ul style="list-style-type: none"> - Enforce waste management system; - Install alternative water tank. 	<ul style="list-style-type: none"> - Commitment to run an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Lautoka Market, with the full participation of vendors, with a focus on cyclone, flood, drought and sea-level rise. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	
Capacity Building	<ul style="list-style-type: none"> - Education awareness training on waste segregation; - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 14: Recommendations for Levuka Market

Levuka Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Supply tents for casual vendors along Beach Street to offer shade. 	<ul style="list-style-type: none"> - Ensure adequate drainage from market into Totogo Creek; - Fix holes in corrugated iron awning; - Install water tank for public toilets as alternative water supply; - Ensure all outdoor stalls have adequate cover.
Market Governance	<ul style="list-style-type: none"> - Introduce waste segregation scheme for organic waste; - Ensure the full participation of vendors in development of market building. 	<ul style="list-style-type: none"> - Appoint market master to oversee market; - Commitment to run an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Levuka Market, with the full participation of vendors, with a focus on cyclone, earthquake, flood and sea-level rise. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	
Capacity Building	<ul style="list-style-type: none"> - Awareness raising on benefits of market building for vendors and customers (hold training on mutual, non-trading day to ensure all vendors are able to attend); - Encourage establishment of vendor association; - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 15: Recommendations for Nadi Market

Nadi Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Consider moving casual vendors, at least temporarily, to new extension to occupy empty tables; - Improve ventilation with installation of fans in oldest section of market; - Construct ramps to aid access to oldest section of the market, especially; - Provide tables to raise kai off floor-level in Nayate Wing for hygiene purposes; - Provide tarpaulin shelter for casual vendors seated throughout the week near Leed's Restaurant; - Cover white tarpaulin surfaces with greenhouse netting to reduce glare; - Undertake regular maintenance checks on fans in new extension; - Provide juice and cooked-food vendors with tarpaulin shade; - Fix broken plumbing in Leed's Restaurant, and address stagnant restaurant drainage. 	<ul style="list-style-type: none"> - Replace entire internal guttering in Mudaliar Wing because of leakage; - Level flooring in Nayate Wing to ensure middle stalls are not flooded in heavy rain; - Replace foil lining of Nayate Wing roof to reduce heat; - Raise perimeter fencing to increase security; - Install alternative water tank; - Consider moving restaurant off-site.
Market Governance	<ul style="list-style-type: none"> - Introduce waste segregation scheme and educate vendors in its use; - Ensure walls, rafters and roofs are routinely cleaned as part of general market cleaning. 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Nadi Market, with the full participation of vendors, with a focus on cyclone, flood, tsunami and drought. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	
Capacity Building	<ul style="list-style-type: none"> - Awareness raising of water conservation measures and impact of drought conditions on livelihoods; - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 16: Recommendations for Namaka Market

Namaka Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Replace wheelie bins (to include bins dedicated to the recycling of organic matter); - Fill gap between the two overlapping roofs with netting to prevent debris falling on produce and vendors; - Plant soil-binding vegetation on the bare slope above drainage ditch to prevent soil falling into ditch; - Reinstate access (steps) from main road to the market to aid access; - Improve ventilation in fish market with vents in windows and installation of fans. 	<ul style="list-style-type: none"> - Plans to extend market to include two-storey development, with vendors' accommodation; - Upgrade, demarcate and tarmac car park; - Ensure toilets accessible for people living with disabilities, and washing facilities included in new extension; - Erect secure fencing around market site; - Install a back-up generator.
Market Governance	<ul style="list-style-type: none"> - Reintroduce waste segregation scheme and re-educate vendors in its use; - Ensure regular thorough cleaning of market to prevent build up of dust; - Consider distance that casual (flower) vendors travel when making decisions re. warnings about disasters. 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Namaka Market, with the full participation of vendors, with a focus on cyclone, flood and drought. 	<ul style="list-style-type: none"> - Review and update Disaster Risk Management Plan for extended site.
Disaster Preparedness Capacity Building	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice; - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 17: Recommendations for Nausori Market

Nausori Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Construct weekly tarpaulin cover for casual vendors sitting outside at south-eastern end of market; - Replace missing hand basin in disabled-accessible toilet; - Increase size of emergency exit sign at north-western end of market; - Install fire extinguishers. 	<ul style="list-style-type: none"> - Consider the installation of a perimeter fence for added secure at the site; - Construction of women vendors' accommodation centre; - Surfacing overspill car park (though care that runoff may add volume to stream).
Market Governance	<ul style="list-style-type: none"> - Monitor stream to the rear of market at times of heavy rain; - Careful supervision of car park in emergency evacuation as space is restrictive; - Consider distance that casual vendors travel when making decisions re. warnings about disasters. 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Nausori Market, with the full participation of vendors, with a focus on cyclone, flood and earthquake. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	
Capacity Building	<ul style="list-style-type: none"> - Education awareness training on waste segregation; - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan, including education/awareness training on importance of prompt evacuation. 	

Table 18: Recommendations for Rakiraki Market

Rakiraki Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Replace tattered tarpaulin on western end of new shed with more permanent drapes to shade vendors; - Restore water supply to fish market; - Fix hole in roof tiles caused by Cyclone Winston; - Connect downpipes, disconnected during Cyclone Winston; - Reinstate shower head to provide washing facilities, especially important in the absence of women vendors' accommodation centre; - Ensure 'digicel' toilet block is open as alternative to market toilet block; - Construct ramp into new shed from market square side of market (drain side) to enable ease of access. 	<ul style="list-style-type: none"> - Redevelopment (rebuild) of market; - Consider fixed (permanent) tables in new build; - Consider adequate space for mixed kava vendors; - Tarmac gravel car park to minimise dust; - Install alternative water tank; - Install back-up generator.
Market Governance	<ul style="list-style-type: none"> - Introduce waste segregation scheme and educate vendors in its use. 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Rakiraki Market, with the full participation of vendors, with a focus on cyclone, flood, tsunami and drought. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	<ul style="list-style-type: none"> - Review and update Disaster Risk Management Plan for new site.
Capacity Building	<ul style="list-style-type: none"> - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan; - Reinstate Vendors' Learning Centre to provide a venue for training; - Consider asking for a deposit when hiring out tables and chairs to cover loss/breakages. 	

Table 19: Recommendations for Savusavu Market

Savusavu Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Improve ventilation in oldest section with construction of foil lining to roof; - Extend roof eaves of the cooked-food shed; - Install PA system; - Install external tap on side of market nearest toilets; - Fix overhead internal guttering between the two older sections of the market. 	<ul style="list-style-type: none"> - Installation of back-up generator, especially important for chiller cabinets in fish market; - Construct fence around cooked-food parcels shed; - Install wash facilities and disabled-accessible facilities in public toilets; - Install alternative water tank; - Install back-up generator; - Cover market drainage ditch in front of shop stalls.
Market Governance	<ul style="list-style-type: none"> - Introduce waste segregation scheme. 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Savusavu Market, with the full participation of vendors, with a focus on cyclone, flood, tsunami and sea-level rise. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	<ul style="list-style-type: none"> - Review and update Disaster Risk Management Plan for extended site.
Capacity Building	<ul style="list-style-type: none"> - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 20: Recommendations for Sigatoka Market

Sigatoka Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Check and repair the overhead internal guttering between orange and yellow wings for leaks; - Segregate the <i>kai</i> and fish markets from the produce vendors; - Provide shade in the form of tarpaulin for the casual vendors who sell unprotected around Market Square; - Provide tarpaulin drapes along wall of green wing to protect from morning sun. 	<ul style="list-style-type: none"> - Relocation to Lawaqa Road, Sigatoka; - Ensure adequate water taps in new development; - Install back-up generator.
Market Governance	<ul style="list-style-type: none"> - Introduce waste segregation scheme. 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Sigatoka Market, with the full participation of vendors, with a focus on cyclone, flood and earthquake. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	
Capacity Building	<ul style="list-style-type: none"> - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 21: Recommendations for Suva Market

Suva Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Check and fix leaks to roof in old-market area of produce hall; - Consider installing splash screens around internal taps to minimise wet floors; - Installation of fire extinguishers; - Installation of exit signs on upper level of market. 	Redevelopment of market (new site).
Market Governance	<ul style="list-style-type: none"> - Incentivise waste management segregation; - Consider distance that casual vendors travel when making decisions re. warnings about disasters; - Increase frequency of thorough market cleaning to once a quarter, rather than once a year as at present; - Pay attention to cleanliness of vendors' toilets on upper level; 	<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Suva Market, with the full participation of vendors, with a focus on cyclone, earthquake, tsunami and sea-level rise. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	<ul style="list-style-type: none"> - Review and update Disaster Risk Management Plan for new site.
Capacity Building	<ul style="list-style-type: none"> - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

Table 22: Recommendations for Tavua Market

Tavua Market	Short-term	Medium-term
Market Infrastructure	<ul style="list-style-type: none"> - Poor ventilation Short new tarpaulin Open western section sell unprotected Original hall step down Hanging produce Back-up generator Low fencing Alternative water tank Broken piping guttering Foil roof. 	<ul style="list-style-type: none"> - Relocate market to adjacent land; - Ensure adequate washing facilities and accessible toilets for those living with disabilities.
Market Governance		<ul style="list-style-type: none"> - Commit to running an annual exercise, in conjunction with vendors, to test and review the Disaster Risk Management Plan.
Disaster Risk Reduction	<ul style="list-style-type: none"> - Draft and finalise Disaster Risk Management Plan for Tavua Market, with the full participation of vendors, with a focus on cyclone, tsunami and drought. 	
Disaster Preparedness	<ul style="list-style-type: none"> - Regular testing and review of Plan to ensure continued relevance and practice. 	
Capacity Building	<ul style="list-style-type: none"> - Ongoing awareness raising of actions for preparedness and response as part of Disaster Management Plan. 	

A photograph of a fish market stall. In the foreground, several large, silver fish with dark stripes are laid out on a wooden surface. To the right, a person's arm and hand are visible, reaching towards the fish. In the background, a person wearing a dark blue jacket is seen from the back, looking at the fish. The stall is filled with various types of fish, including some smaller, reddish ones. The overall scene is a busy fish market.

6. Market Disaster Management Action Plan

“There is a need to fast track development of Response Plans and Early Warning Systems for floods, earthquakes and tsunamis, at all levels in order to provide the people with reasonable safety measures to be able to deal with these events confidently and to facilitate a more responsive and timely Government intervention.” (Fiji Government, 2010a, p.21)

The suggestion to develop a disaster-management approach for markets and market vendors has been mooted recently. MMF Consultants, in a recent report, recommended the development of a market guide to aid greater efficiencies of market operations. They concluded by stating that one vital component of the guidance would be the market's compliance to national policies such as OHS, fire and disaster management (MMF Consultants, 2016, pp.34).

Every market is different, as will be the disaster that could strike; actions, therefore, need to be efficient, timely and responsive, and the input and guidance of market vendors is critical to give ownership and responsibility to any plan, and also to avoid market-specific difficulties and delays.

Aim

To enable markets and market vendors to understand and manage hazards in order to reduce and mitigate risks and create resilient and sustainable market communities.

Objectives

- To take a proactive approach to mainstream climate risk management into market development frameworks;
- To facilitate vendor-based disaster risk management for resilient markets, through vendor awareness and governance support, and with market vendors and other stakeholders input to formulate suitable actions to be taken;

- To develop detailed site-specific disaster risk management development plans in collaboration between different stakeholders;
- To prepare a timetable and conduct training exercises to test and validate the model; and,
- To regularly review the plan and run refresher sessions to maintenance the knowledge of how to prepare for and respond to disasters in the market.

Market Disaster Risk Committee should be established at the market level, with the purpose of managing early warning systems, introducing risk reduction measures, and responding to disasters.

Where possible, the Disaster Risk Management Plan and notices should be produced in appropriate, local vernaculars. This is especially important to ensure that all vendors have access to the information.

Calling for help

Address of market
Emergency number
Market Master's number
Fiji Water Authority
Fiji Electricity Authority
Hospital

Key actions

The following section outlines key messages and actions that vendors can undertake prior to, during and after a natural hazard. The information can be conveyed in a series of initial training and awareness campaigns with posters and noticeboard displays. Simulation exercises should be undertaken at least once a year, when different scenarios could be tested at a market-wide level, to ensure that all users, casual and permanent vendors, market management, the young, elderly, less mobile, and those living with a disability, understand and are catered for in any disaster risk management actions and evacuation plans. Evacuation routes and assembly points also need to be clearly identified.



Floods

What is a flood?

A flood is the buildup of large quantities of water that cannot be absorbed by the soil nor accommodated by the usual water channels. A flood can be a river flood, a creek flood, a storm surge or local flood (blocked drainage - flash flood), and can be associated with a tropical cyclone or the passage of a depression.

What to do before a flood

- Monitor the weather closely using radio, television, other reports and local knowledge
- Prepare to elevate produce off the floor and take produce home
- Never store important documents at floor level

What to do during a flood

Flooding imminent:

- Create water barriers at the entrances, if market has solid walls and entrances
- Turn off electricity at the mains switch and back-up generator, if applicable
- Announce evacuation procedure if the safety of vendors and customers is threatened
- Able-bodied members of the market to assist those in need where possible
- Seek higher ground
- Do not attempt to wade or drive across rivers or flowing streams
- If flood water rises before an evacuation of market, go to an upper level or roof

What to do after a flood

- Enter the market with caution
- Ensure the building is structurally safe, look for buckled walls or floors
- Check the electrical service before turning on power
- Provide general clean up, while maintaining health and safety
- Dispose of and destroy all left-over produce properly
- Discard all cleaning aids and food items that had contact with flood water



Strong winds

It is important for vendors to understand the nature of tropical cyclones, especially in terms of their severity (international classification) and associated impacts. Strong winds can also occur without the presence of a cyclone.

What is a tropical cyclone?

A tropical storm has winds that revolve around a centre of low pressure - the eye, in the middle, is a calm area of blue sky during the day (or stars at night). Very strong (clockwise) winds surround the eye, accompanied by torrential rain, and a destructive storm surge along the coast that can cause extensive flooding (25% of fatalities during Cyclone Winston were caused by coastal inundation). The cyclone season is from November to April.

What to do before the tropical cyclone/strong winds

- Monitor the weather closely using radio, television or other reports
- Remove or tie loose objects down outside, and cut back vegetation and dead branches overhanging the market.
- Review safe areas of the building with vendors and staff, close to walls and support columns at the centre or back of the market and away from windows and glass walls.

What to do during the tropical cyclone/strong winds

- Stay in the safe area of the building, close to walls and support columns at the centre or back of the market and away from windows and glass walls.
- If the eye (centre) of the cyclone passes over, there will be a calm period (drop in winds) for 2-30 minutes - make emergency repairs only, as necessary.
- Once the eye has passed over, the winds will return from the opposite direction, and can be stronger.

What to do after the tropical cyclone/ strong winds

- Enter the market with caution
- Ensure the building is structurally safe, look for buckled walls or floors
- Check the electrical service before turning on power
- Provide general clean up, while maintaining health and safety
- Dispose of and destroy all left-over produce properly



Earthquake

What is an earthquake?

An earthquake occurs when two blocks of the earth slip past each other, releasing energy at depth and causing a violent shaking of the ground above (the epicentre). A large earthquake always has aftershocks. Aftershocks can last for weeks, months or even years after the main quake. Earthquakes that occur under the ocean may cause a tsunami.

What to do before an earthquake

- An earthquake, itself, does not kill people, but the destruction of buildings, falling debris and unsecured items cause death and injury.
- Earthquakes cannot be predicted, but you need to have a plan.
- Where are the safest and most dangerous places in the market? What changes can be made to make the market safer during an earthquake?
- Fix loose items, avoid storing items at height.

What to do during an earthquake

- If you are inside the market, stay inside
- Avoid dangerous places (stairways, balconies, near windows, doorways)
- Drop, cover and hold on!
- Drop to the floor onto knees, cover head and neck, and crawl to cover (a table/stall) or internal wall

- Do not run outside; if outside stay outside in an open space and away from external walls

What to do after an earthquake

- Stay calm, do not panic
- Be prepared for aftershocks
- Check for structural damage to the market and other hazards
- Check for fire and check water and electricity supplies
- If near the coast, head for high ground inland

Secondary effects

Earthquakes can trigger tsunamis, landslides and floods



Tsunami

What is a tsunami?

A tsunami is a series of large waves that strike coastal areas, causing flooding and extensive damage to coastal communities. They are caused by submarine earthquakes, landslides and volcanic eruptions. It is important to realise that there is a series of waves, from minutes up to an hour apart, and the first wave may not be the largest.

What to do before a tsunami

- Owing to the potential sudden onset nature of a tsunami and shorter warning timeframe, the market must have a robust early warning system and associated vendor awareness campaigns. An evacuation plan must be in place, in advance, to take advantage of any tsunami early warning that may be received.
- If there is a large earthquake (more than 20 seconds), a potential tsunami may result.
- If the sea goes out unexpectedly beyond the low tide mark, then a tsunami may follow within minutes.
- Move to higher ground immediately.

What to do during a tsunami

- Do not go to watch a tsunami, you will be too close to escape.
- Remember, the tsunami may consist of multiple waves, each up to an hour apart.
- If you have chance, move to higher ground.
- If you are caught inside the market, move away from windows and to the landward side of the market.

After a tsunami

- After a tsunami hits, there may be flood waters. Treat with caution and do not wade through the water.
- Avoid debris in the water as it may be a health and safety risk.
- Check that the tsunami has not damaged the structure of the market and other buildings.
- If able, come out of the market, especially if flood waters surround the building, as the water may undermine the structure and cause walls to collapse.



Drought

What is a drought?

Drought, caused by a lack of rain, is a slow-onset hazard, that can develop over many months. Drought adversely affects crops, animals and ultimately people. Drought may be accompanied by high temperatures and people may be at risk of heat stroke.

What to do before a drought

- Introduce water conservation practices at the market
- Install an alternative tank for the collection of rain water
- Address leaking drainage and guttering at the market
- Consider placing a large, filled plastic bottle in each toilet cistern, to reduce water use with each flush
- Ensure adequate ventilation and regularly undertake maintenance checks on fans and air conditioners
- Consider planting drought-resistant crops and planting methods (use of mulch); intercropping etc.

What to do during a drought

- Avoid heat stroke by keeping cool: consider the clothing worn and the amount of fluids drunk
- In the case of heat stroke, move to a cool, breezy area, and cool the person with a damp cloth or get them to take a shower, if possible
- The probability of fires increases during a period of drought, caution to the risk of fire is necessary

What to do after a drought

- The length and severity of the drought have a great impact on drought recovery
- Initial rains after a drought may bring flooding and soil erosion
- Establish an organic composting system for the recycling of organic matter in the market to retain more moisture
- Develop a drought recovery plan



7. Conclusion

Municipal markets in Fiji are well organised and well run places of trade and transaction, and market vendors form resourceful and generally resilient communities; nevertheless, all market sites and vendors are vulnerable to the impacts of sudden onset disasters and climate change.

Given sufficient warning, market vendors generally know how to prepare for and recover from the effects of floods, cyclones and tsunamis; and the more frequently a hazard is experienced, the more likely vendors are aware of the risks and are to be able to cope with its effects. In the flood-prone markets of Ba, Nadi, and Rakiraki, for instance, vendors are alert to warning signs, and start preparing for flooding early on; they are also adaptable in terms of knowing where, near the market, will be flood-free and relocate temporarily to that location, so that they can continue to sell produce when the market is closed. Not all markets have experienced flooding however, although all need to be alert to the risk of flash floods, caused by torrential rain or blocked drains.

Similarly, vendors know the measures to undertake before and during cyclones to minimise impacts; however, many vendors said that they were unprepared for Cyclone Winston as they had not realised the severity of a category five cyclone. This highlights the need for training that includes the interpretation of meteorological or disaster information into easily understandable language and that clearly outlines likely impacts. And again, while several coastal markets have undertaken evacuations successfully following tsunami warnings (Lautoka, Rakiraki, Suva markets), emphasis needs to be placed on understanding the hazard - for instance, a tsunami is a series of waves, not just one wave; and a cyclone may be accompanied by excessive wave heights and storm surges in coastal areas. Such messaging must be reinforced in any disaster management plan and accompanying training, to ensure that everyone remains safe before and once evacuation has taken place.

Vendors are less aware of the likelihood that earthquakes could impact Fiji - Fiji has only had two strong earthquakes in recent times (Suva 1953 and Taveuni 1979) - and therefore, vendors have a tendency to be dismissive of the hazard. Preparing for, reaction during and response after earthquakes are all important components to be included in the disaster management plan, especially for those markets in high risk areas (Labasa, Nausori, Savusavu, Sigatoka and Suva).

Equally, it is essential that all sectors of the market, vendors and market governance, are included in devising, revising and implementing any disaster risk management action plan, so that all are aware of, and agree to the risks and actions to be undertaken. Casual vendors especially must be included, as they, as a group, are the least aware of market operations and the most vulnerable in terms of limited social networks within the market and often they have travelled the greatest distances to reach the market.

The method of notification and messaging are also important. Currently, PA systems are used to broadcast announcements in all the markets except Savusavu and Levuka, and are good for the dissemination of evacuation/closure information, but other methods are needed to detail how to prepare for sudden onset hazards, and the likely sequence of events should a disaster hit.

Vendor resilience must be accompanied by infrastructural resilience. Solid, metal tables and other market furnitures securely fixed to the floor would minimise flood damage, and reduce flying debris in cyclones and earthquakes; and while market infrastructure offers little in the way of resistance to flood waters, the lack of well-sealed buildings is generally positive for cyclone resistance, as winds would blow through the structures and prevent pressure differences. The new market builds of Nausori and Rakiraki proved particularly able to withstand very high winds during Cyclone Winston. However, the

older markets generally suffer from ageing construction, poor ventilation and, when low-ceilinged, are dark. Fans, air vents and Perspex tiles have been used, to varying degrees of success to ease ventilation issues.

Hot sun and heavy rain expose vendors on the edges of markets to heat exposure and cold, wet conditions. All vendors, including casual vendors, should have access to shelter from the elements. Care should be given to the type of shelter offered: bright-white tents reflect too much light onto nearby vendors; overhead canopies can collect rainwater in 'bulges' and side tarpaulin need to be of adequate length to protect vendors and produce.

Similarly, markets over the years, have been extended via the addition of various buildings. When two adjoining roofs meet, the resultant internal guttering at height is high maintenance and often leaks. Care is required for future developments to avoid such overhead drainage.

At ground-level, internal drainage again needs to be avoided, and external drainage needs to be covered, rather than open ditched, and cleaned regularly.

The assessments of the twelve municipal markets and interviews and activities with vendors at selected market sites, are snapshots of the current situation, immediately post-Cyclone Winston and pre-relocation and major development of many of the markets. Nevertheless, the project highlights current circumstances and offers some valuable insights into vendor awareness and infrastructural resilience to natural hazards and climate change, and as such, forms a baseline for future disaster risk management and climate change adaptation within markets.



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GATE 6



Kiosk
Food Stalls
Toilets



Vegetables
Fruits
Rootcrops
Produce
Kava / Yaqona

Kava
Market / Bus S

Ka
Fis



KELL
INVESTMENT
PLC LTD

8. Appendices

List of participants

SUVA MARKET

Initial Meeting: Tuesday, 23rd August 2016, Women Vendors Accommodation Centre

Rakesh Nand	General Secretary
Shobhna Verma	Assistant Secretary
Mahendra Kum	Committee Member
Krishan Klimar	Committee Member
Alomita Mavoava	Committee Member

Vulnerability Assessment: Tuesday, 23rd August, Suva Market

Rakesh Nand	General Secretary
Shobhna Verma	Assistant Secretary

Courtesy visit to Suva City Council: Wednesday, 24th August, Suva City Council CEO Bijay Chand

Courtesy visit to Assistant Market Master: Wednesday, 24th August, Suva Market Vikash Sharma

Focus group: Wednesday, 24th August 2016, Women Vendors Accommodation Centre

15 participants (13 women: 2 men)

Krishan Klimar
Shobhna Verma
Timaima Takavesi Dobui
Temalesi Seru
Asena Naidei
Sofia Talei
Mahendra K
Ved Prikesh
Emele Dituraga
Adi Bale
Alumita Mavoava
Akeneta Kamenio
Merooni Raikadroka
Kitty Salato
Akesa Lewamotu

Interviews: Thursday, 25th August, Suva Market

6 interviewees (5 women: 1 man)

Susana Lagakali
Matelita Rokoua
Lilly Caukilai
Laisa Vidovi
Akisi Bale
Savenasa Cokula

Interviews: Saturday, 27th August, Suva Market

Akisi Bale
Savenaca Cokula

NAUSORI MARKET

Vulnerability Assessment: Friday, 26th August, Nausori Market

Salote Delasau President,
Women Vendors Association
Narend Prasad Vice President, Rewa Farmers
Association

Courtesy visit to Market Master, Nausori Market: Friday, 26th August

Jitendra Singh

NAMAKA MARKET

Vulnerability Assessment: Tuesday, 6th September, Namaka Market

Mere Driu
Anil Kumar

Courtesy visit to Market Attendant, Namaka Market: Tuesday, 6th September

Ilami Lutumailagi

BA MARKET

Courtesy visit to CEO, Ba Town Council: Monday,
5th September
Dip Narayan

Courtesy visit to Market Master, Ba Market:

Monday, 5th September
Mohammed Shafiq

**Vulnerability Assessment: Monday,
5th September, Ba Market**

Lusiana Bulu
Lavenio Nabuli
Ateca Ligatuba
Milika Taufu

**Focus group: Wednesday, 7th September 2016,
Meeting Room, Bure Centre**

19 participants (17 women: 2 men)

Lavenia Nabuli
Nitesh Prasad
Penitale Naiagilevu
Siteri Lewase
Ateca Ligatabua
Mereani Salote
Koralaini Ratu
Atilaite Vakaloloma
Adilagi Sukanabou
Mereoni Neisua
Salianieta Ragato
Repeka Vilewai
Naomi Raqona
Milika Vetuga
Emali Vitilevu Nawalu
Premila Devi
Lusiana Bulu
Kasanita Bativu
Sainimili Haravavua

**Interviews: Monday, 5th , Wednesday, 7th and
Thursday, 8th September 2016, Ba Market**

6 interviewees (4 women: 2 men)

Naveen Patel
Bulikila
Masaliveu
Emali Tokauvalu
Mereseini Naola
Ita Rosa Nayala

TAVUA MARKET**Courtesy visit to CEO, Tavua Town Council:
Friday, 9th September**

Binesh Naidu

**Courtesy visit to Market Master, Tavua Market:
Friday, 9th September**

Robert Reuben

**Vulnerability Assessment: Friday, 9th
September, Tavua Market**

Miliakere Tavaga
Vasenai Ralulu
Abdul Azeem

LAUTOKA MARKET**Courtesy visit to Market Master, Lautoka
Market: Tuesday, 9th September**

Gordon Wong

**Vulnerability Assessment: Saturday, 10th
September, Lautoka Market**

Lako Ogotia
Semesa Doidoi

NADI MARKET**Courtesy visit to Market Master, Nadi Market:
Tuesday, 13th September 2016**

Solomoni Raura

**Vulnerability Assessment: Tuesday, 13th
September, Nadia Market**

Sainimere Vivuga
Kamta Prasad

**Focus group: Wednesday, 14th September
2016, Meeting Room, Open Bure Area**

20 participants (18 women: 2 men)

Miriama Cagi
Gangma Devina
Melea Mudu
Matia Loga
Vani Adi
Kamta Prasad
Sainimere Vivuga

Sainimili Mokia
Raijeli Davena
Enimai Kuvukuvucala
Lia Lawanimate
Elena Lauwai
Senitiki Radu
Vasiti Taliga
Elenoa Mataitoga
Veniana Lewarara
Episaki Viwaqa
Salome Waqa
Suliana Navuda
Sarafina Lewaninabula

**Interviews: Tuesday, Wednesday and Thursday,
13-15th September 2016, Nadi Market**

6 interviewees (5 women: 1 man)
Lia Saqacala
Daiana Rakuma
Shabnam Sameena
Akata Miriama
Bijma Wati
Maikeli Nagoda

SIGATOKA MARKET

**Courtesy visit to Market Master,
Sigatoka Market: Friday, 16th September**

Ilesa Ravouvou

**Vulnerability Assessment: Friday,
16th September, Sigatoka Market**

Kem Singh
Natasha Singh

LABASA MARKET

**Courtesy visit to CEO, Labasa Town Council:
Monday, 19th September**

Jitendra Prasad

**Courtesy visit to Market Master,
Labasa Market: Monday, 19th September**

**Vulnerability Assessment: Monday,
19th September, Labasa Market**

Miliana Sarasara
Sher Ali (Munna)

SAVUSAVU MARKET

**Courtesy visit to CEO, Savusavu Town Council:
Wednesday, 21st September**

Dhamendra Lal

**Courtesy visit to Market Master,
Savusavu Market: Wednesday, 21st September**

Wame Nabete

**Vulnerability Assessment: Wednesday,
1st September, Labasa Market**

Ana Vila
Saiasi Tamaideni

**Focus Group: Thursday, 22nd September,
Savusavu Market**

24 participants (24 women)
Alisi Ralaca
Nemai Nasara
Suruj Kumari
Ane Mape
Madhu Kumar
Tokasa Nadroka
Arieta Kunanewa
Taraivosa Divora
Anjila Devi
Sakuntala Devi
Indra Wati
Laisa Rabuka
Salaniela Teresia
Dharom Raji
Melania Khan
Vidisila Wati
Josifini Timola
Ivamere Diuwe
Roosalia Sui
Lisi Malolonga
Ana Vosayacoi
Esther Faewll
Merelesita Litia
Maria Vatamoto

**Interviews: Wednesday, Thursday and Friday,
21st -23rd September, Savusavu Market**

6 interviewees (4 women: 2 men)

Rosalia (Rosa) Sui
Sambhu Lal
Indra Wati
Olivia Vilimana
Litia Hola
Vilikesa Rairaqa II

LEVUKA MARKET

Meeting with CEO Levuka Town Council:

Saturday, 1st October

Josese Rakuita

Vulnerability Assessment: Saturday,

1st October, Beach Street, Levuka

Naini Rokotuinasigana
Niumai Adilele

RAKIRAKI MARKET

Courtesy visit to CEO, Rakiraki Town Council:

Tuesday, 4th October

Rakesh Chandra

Courtesy visit to Market Master,

Rakiraki Market: Tuesday, 4th October

Ilaisa Vakaloloma

Vulnerability Assessment: Tuesday,

4th October, Rakiraki Market

Kelera Waqatabu
Faranisese Maisamoa

**Focus Group: Wednesday, 5th October,
Rakiraki Market**

25 participants (21 women: 4 men)

Joeli Nailagovesi
Kinisimere Qoreqeratabua
Kingimere Ranadi
Filomena Roqorua
Ateoa Liku
Viva Bainivalu
Sunila Wati
Mereti Qio
Litiana Adivolasiga
Adi Menani
Lusila Finau
Susaisa Ravinilevu
Muniappa Maharaj
Mohini Ram
Sandip Lal
Asenaea Nainima
Nazmin Nisha
Savitri Devi
Seneseini Naiolo
Reapi Yavala
Kelera Waqatabu
Varanises Maisamoa
Gopal Naiker
Keresi A
Alesi Dokai

**Interviews: Tuesday, Wednesday and Thursday,
4th - 6th October, Rakiraki Market**

6 interviewees (5 women: 1 man)

Asenace Nainima
Sunila Wati
Varanises Maisamoa
Shishupal Naidu
Repeka Davui
Eta Ulu



9. Vulnerability Assessment Checklist

Environmental:

1.1 Map

2.1 Building:

Full description including type, age, materials and footing/foundation
(attach map and aerial/oblique photos)

Walls, floors and windows – central support; stairways and stairwells; building size/height Guttering

2.2 Associated buildings and facilities:

List all market buildings and facilities (attach map and aerial/oblique photographs);
Natural surveillance(trees/shrubs; fencing; boundaries/ borders/ adjacent landuse)

2.2a Main Produce sold

Fresh / dry / cooked food

2.2b Security

*Lighting / segregated toilets / sleeping / fire extinguishers / first aid - Evacuation plan
Reporting system for violence / opening hours / accident reporting*

2.3 Governance and finance mechanisms:

Describe current management structure / public announcements / telephone line
Associations – make-up; elected; key stakeholders and responsibilities

2.4: Waterways, coast and other natural features:

Add to map and comment on nature and quality

Services

3.1 Energy:

Comment on source, supply, reliability and costs / emergency power

3.2 Water:

Comment on supply, source, reliability, quality and quantity / alternative tanks (storage capacity)

Multiple entry points for water supply / internal – external taps

3.3 Accessibility and Transport:

How are goods transported and unloaded? How do vendors and purchasers access the market? Map access routes on map. Are there access blockage issues? Are there car parking areas for customers? Pedestrian traffic/ vehicle traffic interface. Evacuation signage? Emergency vehicle access/ Access for those living with disability

3.4 Drainage (engineered/natural):

(add to map, if evident) - stagnate / free flowing; covered / open/ ditches/terraces/hard-surfaces

3.5 Waste management:

How is waste managed, where, how and on what surface is it stored and how often is it removed?

Are health concerns evident?

3.6 DRR:

Are there any DRR policies? Early warning systems? Awareness training? Adaptations/ coping mechanisms? Prevention strategies?

Interview questionnaire

LOCATION	DATE and TIME
NAME	AGE
OCCUPATION	GENDER

1.1 How long have you been selling in the market?**1.2 Does anyone else in the family help you sell?****1.3 Are you a member of any vendor association / management committee at the market?**

Which? What is your role? The association's role?

1.4 What do you sell, and where does your produce come from?

Do you bring the produce to the market or buy from a wholesaler (at the market or elsewhere)?

1.5 How far do you travel to get to the market/to get produce, how, and how often?

What time do you arrive at the market? What is the last time that you can leave the market to get home?

**1.6 At the market, do you have a permanent location to sell from?
If not, where do you prefer to set up your produce that you are going to sell? Why?**

1.7 Which parts of the market are most affected by weather? How and why? Has anything been done to change these areas to make them less affected?

**1.8 Has the market been shut quickly in an emergency?
When, and what for? Any weather events that have closed the market?**

1.9 Where were you when the above weather events [NAME] / Winston struck?

1.10 Did you know that [NAME] / Winston was coming - how?

**1.11 What happened at the market on the day that [NAME] / Winston struck?
And at home? Did you prepare, and if so, how?**

1.12 Is there any advice about what to do at the market in a disaster?

Has anyone received any disaster awareness training?

1.13 Have you discussed disaster preparedness at the market since [NAME] / Winston?

What did you discuss, and who with?

1.14 Who do you think would be best at the market to give a warning of a disaster?

2.1 Who was most affected in the market / your home / your community by [NAME] / Winston? How and why?

2.2 What did you and your family do immediately after [NAME] / Winston to respond at home / the market?

2.3 What did you do later to respond?

2.4 Who helped, how and when?

2.5 How was the market building affected, and who cleared the debris at the market?

2.6 Did the market close / operate normally? Explain

**2.7 Did you have any reserves of food and agricultural produce?
What did you sell, and where did you get the produce from? How long for?**

2.8 In the case of Winston, is the market still affected or operating normally? How?

2.9 What other natural hazards affect the market? Non-climate hazards?

2.10 How are these changing?

2.11 Do you have secure shelter / safe area in the market / at home /in your community?

2.12 What livelihood assets do you have at the market / home, and were they affected?

2.13 How well informed are you about disasters (cyclones, floods, earthquakes, drought, tsunamis), and what would you do if there was a disaster and you were at the market / at home?

3.1 What happened to the price of produce at the market? Examples. How did the customers react? How much did you sell compared with normal times?

3.2 How was your income affected?

3.3 Were there any financial services available to help after [NAME] / Winston? (Market levy, loans, insurance).

3.4 Was there anything that prevented you assessing financial assistance?

3.5 Do you have other sources of income? All year - certain times? What are they?

3.6 Did you have any plans or saves that helped you ?

4.1 Who would you turn to at the market if you needed help? Financial / physically / advice / report something?

4.2 Do men and women work together to deal with problems at the market? Give examples

4.3 Do all vendors have equal access to information, decision-making at the market? Explain

4.4 What factors may make some people at the market more vulnerable than others?

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