LAUTOKA CITY COUNCIL DISASTER WASTE MANAGEMENT CONTINGENCY PLAN

Ever Green, Ever Clean,
Lautoka City




June, 2024

Kyoto University
Graduate School of Global Environmental Studies

ASIA-PACIFIC NETWORK FOR
GLOBAL CHANGE RESEARCH

IDMR
Sichuan University – Hong Kong Polytechnic University
Institute for Disaster Management and Reconstruction

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Participants of DWM Contingency Plan Stakeholder Consultation held on 23/3/22 at Tanoa Waterfront Hotel

Foreword

Fiji like other Pacific Island countries frequently face natural disasters especially cyclones and flooding. It has been envisaged that we are going to face evolving global risks associated with climate change. Most significantly, disasters will become more frequent and severe.

Natural disasters often result in generation of high quantities of waste during a short span of time. This usually puts extreme pressure on government, waste agencies and municipalities with limited resources and capacities.

It has been always the case that current landfill sites become very difficult to rehabilitate with limited resources especially after sudden influx (disposal) of unexpected large quantities of disaster waste. It affects the existing infrastructure like access, drainage, embankments and its life span. Disaster waste also pose risks to public health and safety, impact environment and also affect livelihood of citizens.

It has been also learnt from past experiences that issues related to waste management is usually not given the needed priority in terms of funding within the context of disaster response. Disaster response is usually centered around other urgent areas requiring immediate attention (humanitarian assistance in form of shelter, food, safe water supply, access, infrastructure restoration, facility repairs etc). This has been a challenge in addressing post disaster waste management situations.

This Disaster Waste Management (DWM) Contingency Plan which is a first for any municipality in Fiji will guide Lautoka City in implementing the appropriate pre-disaster preparedness measures as well as timely post-disaster responses after disasters strikes. These recommended measures will make Lautoka city more resilient to generated disaster waste from future natural disasters and also assist people in recovering quicker and restoring their livelihoods.

The formulation of DWM Contingency Plan will complement the existing Disaster Management Plan and strengthen council's efforts in terms of allocation of appropriate resources and well-structured approach in handling disaster waste. The Plan also promotes resource recovery efforts to recycle or reuse disaster waste.

Lautoka city Council whole heartedly thank everyone for their support in formulation of this Plan. I am positive that in partnership and with our united effort, we can improve the overall coordination and mobilization of resources for a more effective, efficient and timely disaster waste response.

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ACTING CHAIR OF SPECIAL ADMINISTRATORS
LAUTOKA CITY COUNCIL

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Commissioner West Mr Mesake Ledua, Chief Guest at the DWM Contingency Plan Stakeholder Consultation held on 23/3/22 at Tanoa Waterfront Hotel

Part A: Background of Disaster Waste Management Contingency Plan for Lautoka City

1. Introduction

1.1 Purpose of the contingency plan

This Disaster Waste Management Contingency Plan provides a roadmap for Lautoka City Council and is a tool to use effectively at time of disaster. This plan will also ensure that waste is properly managed during the post disaster recovery phase. The Plan describes the existing solid waste management capacities of the Council and proposes practices to be followed before a disaster strike (preparedness phase), during and post disaster (recovery phase) to address disaster waste issues.

It is envisaged that the plan can effectively:

- Reduce adverse impacts of disaster waste.
- Protect the environment and public health.
- Save money and resources.
- Promote resource recovery.
- Promote livelihood.
- Help build back faster and better.
- Improve administrative efficiency during disaster to respond better to disaster related emergencies.
- Promote communication and coordination amongst stakeholders.

1.2 Definition of Disaster Waste

Disaster waste refers to all types of solid wastes that is usually generated as a result of a natural calamity in this case cyclones and flooding. Disasters wastes are generated as a result of damages or impact of disasters on vegetation, buildings, goods, infrastructures and properties. It also includes dead animals and damaged food items.

Natural disasters generate high quantities of waste during a short span of time. This usually puts extreme pressure on government, waste agencies and municipalities with limited resources and capacities. Mostly, the local agencies are unprepared to handle huge amounts of disaster waste let alone other urgent areas requiring immediate attention (humanitarian assistance in the form of shelter, food, safe water supply, access, infrastructure restoration, facility repairs).

It has been always the case that current landfill sites become very difficult to rehabilitate with limited resources especially after sudden influx (disposal) of unexpected large quantities of disaster waste. It affects the existing infrastructure like access, drainage, embankments and its life span.

1.3 Typical Disaster Waste Management Issues

- Disaster wastes in the case of Fiji usually include bulky wastes from buildings (concrete rubble, corrugated iron, timber, steel, furniture), house hold furniture and belongings damaged during disaster, power and telephone grids (poles, cables, transformers, wires, electronic equipment), water and sewerage distribution systems (broken pipes and lids), chemical wastes (workshops and industries), relief operations from evacuation centers and hospitals (food, packaging, healthcare wastes, normal garbage generated by evacuees) and natural debris (trees, branches, bushes, palm fronds, mud and silt).
- Uncollected building rubble and fallen trees and power poles has strong possibility to impede access and constrain rehabilitation and recovery efforts.
- Disaster waste including healthcare and other hazardous wastes may be disposed of in uncontrolled dumpsites or dumped in inappropriate areas posed health risks.
- There are potential exposure risks to asbestos containing materials from damaged buildings.
- Regular solid waste services may collapse due to a number of reasons, such as generated waste is beyond service capacity, damaged equipment and facilities, damaged transportation infrastructure, and inadequate available resources.
- Sharp items can pose risk of physical injury to people.
- Piles of refuse if not collected on timely manner can become breeding ground of vectors like mosquitoes and rats and pose risk of mosquito borne diseases and leptospirosis.
- Animal carcasses if not collected will cause foul odor, fly nuisance and pose health risks.
- Damaged food items from shops need to be identified at the earliest and condemned for destruction to avoid businesses salvaging and selling to consumers which may pose health risks.
- Piles of disaster waste if not collected on time will result in people resorting to burning the wastes and creating environmental health problems.
- Waste chemicals, oil, damaged sewerage reticulation systems etc need to be identified and managed properly to avoid leakages to environment.

1.4 Background of Disaster Waste Issues in Fiji and Lautoka City

Disasters cause associated adverse environmental, health, economic and social impacts to ordinary people. Disasters even claim innocent lives, damage properties, take away years of hard work within span of few hours and totally disturb the living condition for many people at least for few years. We are now facing the emerging global risks associated with climate change. It has been revealed, that due to climate change, we are going to face natural disasters not only more frequently but more severe ones.

It has been also learnt from past experiences that issues related to waste management is usually not given the needed priority in terms of funding within the context of disaster response. This has been a challenge in addressing post disaster waste management situations for Fiji. Despite the existence of a Disaster Waste Management guideline for the Pacific, there has not been a strategy written up for specific towns and cities.

On the 20th and 21st of February 2016, Category 5 Tropical Cyclone (TC) Winston cut a path of destruction across Fiji. The cyclone was estimated to be one of the most severe storms ever to ever hit the South Pacific and the World. With a wind speed of 280 km/h, 44 people were confirmed dead leaving thousands homeless without food, safe water, supplies etc. Around 424 evacuation centers were established with 35,000 evacuees. 97 schools were damaged and 100 per cent of crops destroyed in affected areas. A 30-day State of Natural Disaster was declared. Severe TC Winston caused huge destruction of public facilities and infrastructure (access, sewage, water reticulation, electricity, communications, health, etc).

Lautoka City Council looks after xx communities and there is one landfill that is utilized for waste filling in everyday waste collection. However, this space is not enough when cyclones as strong as TC Winston affects Fiji, there is a large amount of waste generated and this placed constraint on existing resources. To address this issue and ensure that the council cope with the immediate need to manage wastes properly, there is a need for a contingency plan in place. The amount of waste generated during few hours after TC Winston was equivalent to approximately 20% (5955 tons) or one fifth of whole years waste (28,641.02 tons – average of 2010/2015/2018/2021) being disposed at landfill. Poor management of disaster waste can create a high likelihood of various disease outbreaks like leptospirosis, dengue, Zika, typhoid.

Disaster pictures from Lautoka city

1.5 Cyclone Season in Fiji (Lautoka)

Natural disasters have affected approximately 45,000 people globally each year, this results in about 0.1% of the global population (UNOPS, 2020). Despite the Pacific adding the least number to this percentage, the effects are strongly felt because of their vulnerability. The islands in the Pacific, are highly vulnerable due to their remoteness, geographical spread, limited island markets, and resources available. They are also vulnerable because of the exposure to a wide range of natural disasters, 76% of which are tropical cyclones, affecting 2.5 million people and causing1400 fatalities (World Bank, 2016). Fiji is affected by with approximately 2 – 3 cyclones per year. Tropical cyclones are projected to increase in intensity this century, even if the frequency decreases, this is due to Global Warming. The cyclone season in Fiji runs from November to April and some cyclones occur outside the season. Lautoka, as one of the two (2) cities in Fiji, have been affected by around 44 cyclones in the past 50 years. For every cyclone that affects Lautoka, most people are affected either in terms of damages to houses, public infrastructure and amenities, loss of businesses, agriculture, tourism, livestock's etc.

1.6 Disasters (Cyclones) Historically – Fiji

From 1972 to 2021 there has been around 44 cyclones that made landfall in Fiji. Out of the 44, 4 have been category 5 cyclones (TC Pam, TC Winston, TC Yasa and TC Ana), these have affected Fiji in the last six (6) years. Historically cyclone intensity has increased over the years' and is predicted to continue to increase. Thus, amplifying the need to make proper strategies and plans to help address cyclone impacts.

Table 1: History of Disasters that Impacted Fiji since 1972

Category	Wind speed	Pressure	Speed	Affected Areas	Damages ($)	Deaths	
Bebe	October 19 – 28, 1972	Category 3 severe tropical cyclone	155 km/h (100 mph)	Fiji, Tuvalu	$20 million	24	
Lottie	December 5 – 12, 1973	Category 3 severe tropical cyclone	130 km/h (80 mph)	Fiji, Tonga	Moderate	80	
Tina	April 24 – 28, 1974	Category 2 tropical cyclone	100 km/h (65 mph)	Fiji, Tonga	Minor	None	
Bob	January 31 –	Category 3 severe tropical cyclone	155 km/h (100 mph)	Fiji, New Caledonia	Moderate	1	
Fay	December 27 – 31, 1978	Category 2 tropical cyclone	100 km/h (65 mph)	Fiji	Moderate	None	
Meli	March 24 – 31, 1979	Category 3 severe tropical cyclone	155 km/h (100 mph)	Fiji	Severe	53	
Wally	April 2 – 7, 1980	Category 1 tropical cyclone	75 km/h (45 mph)	Fiji	$2.26 million	18	
Mark	January 21 – 1-Feb-83	Category 3 severe tropical cyclone	150 km/h (90 mph)	Fiji	Unknown	None	
Oscar	February 26 – 6-Mar-83	Category 4 severe tropical cyclone	185 km/h (115 mph)	Fiji	$130 million	9	

Eric	January 12 – 20, 1985	Category 3 severe tropical cyclone	150 km/h (90 mph)	Fiji, Vanuatu	$40 million	9	
Raja	December 21, 1986 –	Category 3 severe tropical cyclone	150 km/h (90 mph)	Fiji, Tonga, Tuvalu	$14 million	2	
Bola	February 24 – 4-Mar-88	Category 4 severe tropical cyclone	175 km/h (110 mph)	Fiji, New Zealand, Vanuatu	$87 million	3	
Sina	November 20 – 4-Dec-90	Category 3 severe tropical cyclone	140 km/h (85 mph)	Fiji, Niue, Cook Islands, Tonga	$18.5 million	None	
Fran	March 4 – 17, 1992	Category 5 severe tropical cyclone	205 km/h (125 mph)	Fiji, New Caledonia, Queensland	$1 million	None	
Joni	December 3 – 13, 1992	Category 4 severe tropical cyclone	165 km/h (105 mph)	Fiji, Tuvalu	$1.6 million	1	
Kina	26-Dec-92 – January 6, 1993	Category 3 severe tropical cyclone	150 km/h (90 mph)	Fiji, Tonga	$110 million	26	
Gavin	March 3 – 12, 1997	Category 4 severe tropical cyclone	185 km/h (115 mph)	Fiji, Tuvalu, Wallis and Futuna	$18.3 million	18	
Hina	March 13 – 18, 1997	Category 3 severe tropical cyclone	120 km/h (75 mph)	Fiji, Tonga, Tuvalu	$15.2 million	None	
Susan	December 20, 1997 – 9-Jan-98	Category 5 severe tropical cyclone	230 km/h (145 mph)	Fiji, Solomon Islands, Vanuatu	Minor	1	
Dani	January 15 – 22, 1999	Category 4 severe tropical cyclone	185 km/h (115 mph)	Fiji, New Caledonia, Vanuatu	$2 million	14	
Paula	February 26 – 4-Mar-01	Category 4 severe tropical cyclone	175 km/h (110 mph)	Fiji, Tonga, Vanuatu	$1.39 million	2	
Ami	January 9 – 15, 2003	Category 3 severe tropical cyclone	150 km/h (90 mph)	Fiji, Tonga, Tuvalu	$65 million	14	
Cliff	April 1 – 6, 2007	Category 2 tropical cyclone	100 km/h (65 mph)	Fiji, Tonga	$4 million	1	
Daman	December 2 – 10, 2007	Category 4 severe tropical cyclone	185 km/h (115 mph)	Fiji, Tonga	$330,000	None	
Gene	January 25 – 9-Feb-08	Category 3 severe tropical cyclone	155 km/h (100 mph)	Fiji	$35 million	8	
Mick	December 3 – 15, 2009	Category 2 tropical cyclone	110 km/h (70 mph)	Fiji	$33 million	3	
Wilma	January 19 – 28, 2011	Category 4 severe tropical cyclone	185 km/h (115 mph)	American Samoa, Fiji, Samoa	$22 million	3	
Yasi	January 26 –	Category 5 severe tropical cyclone	205 km/h (125 mph)	Australia, Fiji, Papua New Guinea	$2.5 billion	1	
Evan	December 9 – 19, 2012	Category 4 severe tropical cyclone	185 km/h (115 mph)	Fiji, Samoa, American Samoa	$161 million	4	
Ian	January 2 – 15, 2014	Category 5 severe tropical cyclone	205 km/h (125 mph)	Fiji, Tonga	$4.3 million	1	
Lusi	March 7 –14, 2014	Category 3 severe tropical cyclone	150 km/h (90 mph)	Fiji, New Caledonia	$3 million	10	
Pam	March 6 – 15, 2015	Category 5 severe tropical cyclone	250 km/h (155 mph)	Fiji, Kiribati, New Caledonia	$360 million	16	
Ula	December 26, 2015 –	Category 4 severe tropical cyclone	185 km/h (115 mph)	American Samoa, Fiji	Unknown	1	

Winston	February 7 – 25, 2016	Category 5 severe tropical cyclone	280 km/h (175 mph)	Fiji, Niue, Tonga, Vanuatu	$1.4 billion	44	
Donna	May 1 – 10, 2017	Category 5 severe tropical cyclone	205 km/h (125 mph)	Solomon Islands, Vanuatu, Fiji	Significant	2	
Gita	February 3 – 19, 2018	Category 5 severe tropical cyclone	205 km/h (125 mph)	Fiji, Wallis and Futuna, Samoa	$225 million	2	
Josie	March 29 – April 2, 2018	Category 1 trop ical cyclone	75 km/h (45 mph)	Vanuatu, Fiji, Tonga	$5 million	6	
Keni	April 5 – 11, 2018	Category 3 severe tropical cyclone	140 km/h (85 mph)	Vanuatu, Fiji, Tonga	$5 million	None	
Pola	February 23 – March 2, 2019	Category 4 severe tropical cyclone	165 km/h (105 mph)	Wallis and Futuna, Fiji, Tonga			
Sarai	December 23, 2019 – 2-Jan-20	Category 2 tropical cyclone	110 km/h (70 mph)	Fiji, Tonga, Niue, Cook Islands	$2.3 million	2	
Tino	January 11 – 20, 2020	Category 3 severe tropical cyclone	120 km/h (75 mph)	Fiji, Niue, Solomon Islands	$5.83 million		
Harold	April 1-20, 2020	Category 5	145km/h	Fiji, Vanuatu, Solomons	$123.5 million	30	
Yasa	December 11 – 19, 2020	Category 5 severe tropical cyclone	230 km/h (145 mph)	Vanuatu, Fiji	$246.7 million	4	
Ana	January 26 – February 1, 2021	Category 3 severe tropical cyclone	120 km/h (75 mph)	Fiji	>$1 million	1	
Bina	Jan 30-Feb 1, 2021	Category 1	83 Km/h	Fiji	No major Impact		
Cody	Jan 8- 15, 2022	Category 1	93 Km/h	Fiji	$25 million		
Irene	Jan 18-19, 2023	Category 1	74 Km/h	Fiji	No major Impact		
Kevin	March 1-6, 2023	Category 4	248Km /h	Fiji	No major Impact		
Mal	November 13-16, 2023	Category 2	137 Km/h	Fiji	No Major Impact		

Source: https://en.wikipedia.org/wiki/List_of_retired_South_Pacific_cyclone_names

1.7 Intended Users

The DWM Contingency Plan is developed to be used by frontline management staff and workers responsible for coordination disaster waste management efforts in the council.

2.0 Institutional Arrangements and Policies

2.1 National laws and regulations

The Plan recognizes the need to apply and work within the ambits of the following legislations related to waste management:

- ✓ Litter Act 2010
- ✓ Public Health Act Cap 111
- ✓ Environment Management Act 2005
- ✓ Local Government Act
- ✓ Environment Management Act 2005

- ✓ Environment Management (Waste Disposal and Recycling) Regulations 2007
- ✓ Lautoka (Garbage) Bylaw
- ✓ Lautoka (Open Fire) Bylaw

2.2 National and Regional DWM Guidelines/Policies

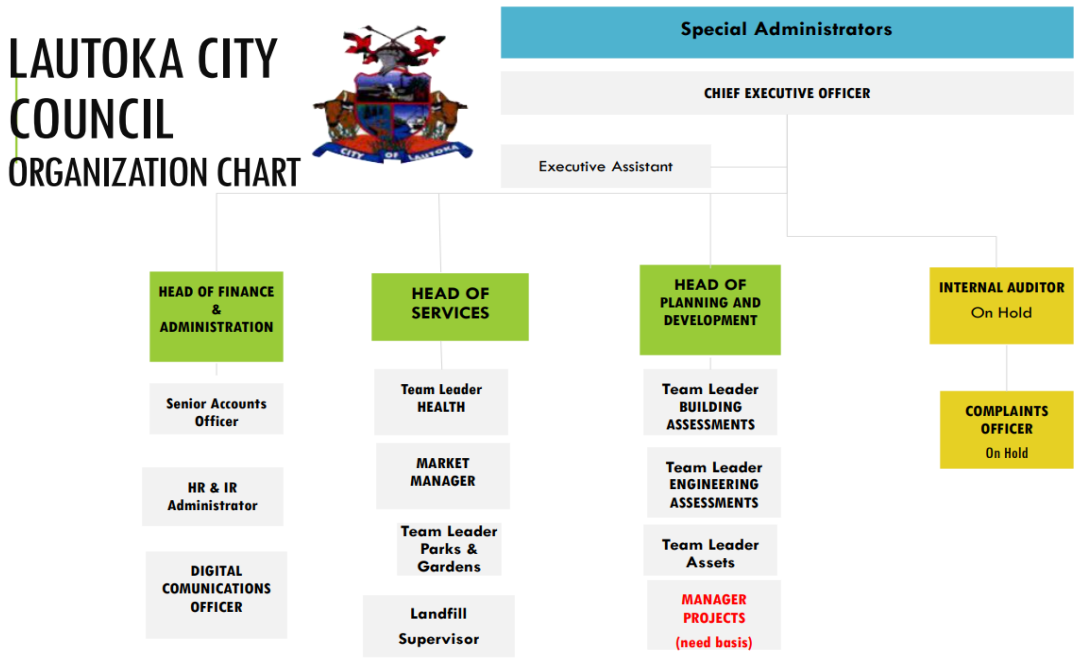
The Disaster Waste Management Contingency Plan (DWM C/P) of Lautoka City Council (LCC) is aligned with and compliments the following regional and national Guidelines/ strategies and Policies:

- ✓ Disaster Waste Management (DWM) Guideline for Asia and Pacific Islands
- ✓ Pacific Islands Regional Disaster Waste Management Guideline
- ✓ Cleaner Pacific 2025
- ✓ National Waste Management Strategy 2018-2028 (Department of Environment)
- ✓ Fiji's Green Growth Framework (Ministry of Strategic Planning, National Development and Statistics)
- ✓ National 7R Policy (Department of Environment)
- ✓ Lautoka City Council Standard Operational Procedure (SOP) for Disaster Management

In fact, some features of this DWM C/P has been adopted from the Pacific Islands DWM Guideline developed under JPRISM II Project to ensure consistency and avoid ambiguity.

2.3 LCC Organizational Structure

Figure 1: The organizational structure is reflected in the figure below.



2.4 Solid Waste Management (SWM) Plan

Lautoka City Council has an existing SWM Plan with the Vision of achieving "A Sustainable Lautoka City through the establishment of an Environmentally Sound Integrated SWM System". Disaster Waste Management is one of the Priority Action Areas in the SWM Plan. The plan was formulated in October, 2022 to address the need for an organized solid waste management system.

The Mission of the SWM Plan is "to implement Integrated Solid Waste Management System (ISWMS)" which strives for waste minimization and resource recovery efforts from waste? generation, discharge, collection, treatment and landfilling. The system also focuses on vigorous awareness and stringent enforcement initiatives for proper management of solid waste.

The establishment of such a system will:

- Maintain the urban environment and public health of the Lautoka City, which is the centre of economic and industrial activities of the western region in Fiji and, contribute to sustainable development.
- Motivate investment where economic development in the western region of Fiji can be promoted.

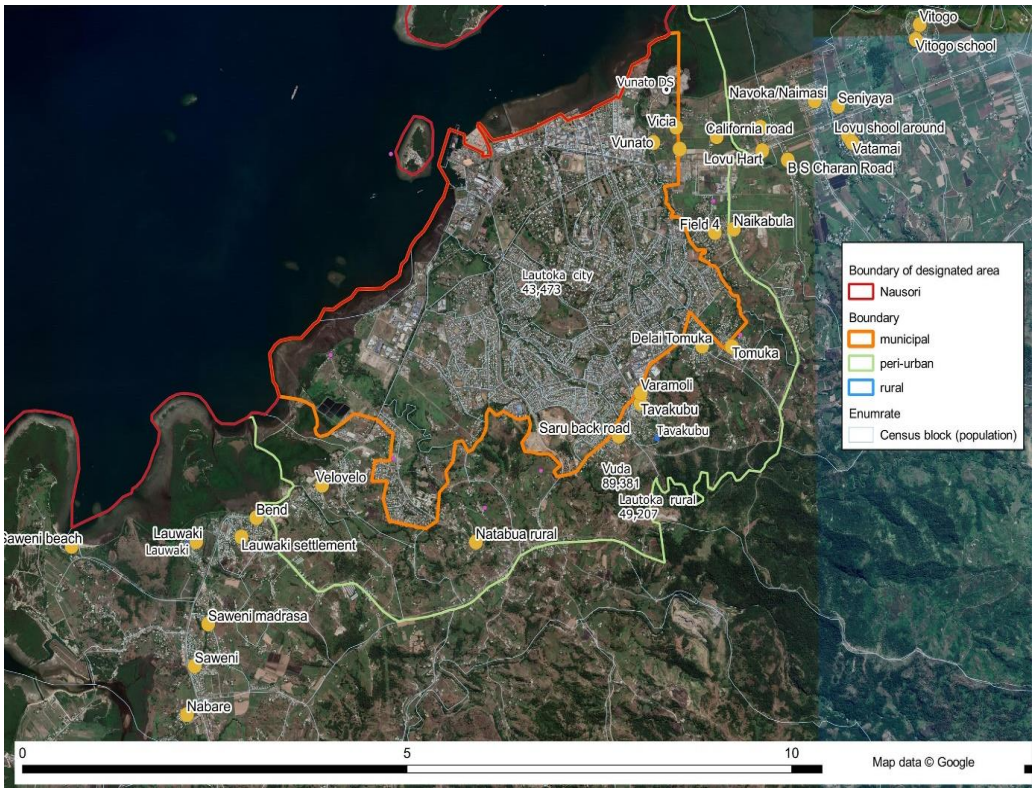
The SWM Plan aims to improve SWM issues by addressing 8 Priority areas namely:

1. Waste Minimization and Recycling (3Rs + Return)
2. Enhance Waste Collection Services
3. Stakeholder engagement
4. Awareness
5. Enforcement
6. Disaster Waste Management
7. Vunato Disposal Site (VDS) – Operation, Management and Rehabilitation
8. Capacity Building of staffs

2.5 Scope and Geographical coverage of the contingency plan

The DWM C/P is specific to cyclones and flooding. It covers whole of Lautoka City area as well as the periphery areas which are adjacent to the city areas. This makes up an area of 16.19 km^2 and directly impacting around 48,000 residents within the municipality.

Figure 2: Map of Lautoka City – Coverage of DWM C/P



3.0 Estimation of Expected Disaster Waste Quantity

3.1 Disaster waste quantities in the past

An average of **1640 tons** of waste is generated every disaster. LCC has to make provisions for adequate resources to address the disaster waste. Provision is needed from the clearing phase, collection and transportation, temporary storage, resource recovery (Waste Minimization) and final disposal phase.

Table 2 : Record of Disasters that affected Lautoka City and Waste Disposal Amounts

Cyclone	Category	Dates	Waste Disposed (t)
Evan	4	Dec 9 - 19, 2012	2134
Lusi	3	March 7 - 14, 2014	1457
Winston	5	Feb 7 - 25, 2026	5955
Donna	5	May 1- 10, 2017	545
Gita	5	Feb 3-19, 2018	442
Josie	1	March 29 to April 2, 2018	1231
Keni	3	April 5-11, 2018	1434
Harold	5	April 1-20, 2020	2000
Yasa	5	Dec11 -19, 2020	459
Ana	3	Jan 26 - Feb 1, 2021	744
Total			**16401**

3.2 Expected Disaster Waste Quantity Based on previous Disaster Scenario for planning purposes

Based on data presented in Table 2, LCC can **estimate** the tonnage of waste that need to be collected and disposed off at disposal site. These data is available from the reports retrieved from weighbridge system.

3.3 Waste quantity estimation methodology

JPRISM I experience of Pilot projects in Fiji and Samoa has proved successful with the volume estimation method in terms of estimating disaster waste generation amounts. This is just an estimation not accurate indication of actual generation amounts. However, it is very useful tool is providing estimated volumes which helps in planning for waste collection, transportation, recovery and final disposal.

Disaster Waste Piled alongside road after disaster

The procedure is as follows:

1. Plot on maps the streets requiring disaster waste removal and thus the estimation.
2. Measure using measuring tape the size of pile in terms of length, width and average height.
3. **Calculate the volume by multiplying LxWxH = cubic meter of waste pile**
4. Repeat above step for other waste piles and add to estimate total volume per street and then ward.

From the above method we can estimate the number of trips that will be made using standard trucks. For instance, if total volume of waste in area is 5,000 cubic meters, total of 500 trips will be made using a 10 cubic meter truck.

4.0 Important Assumptions and Conditions

4.1 Current Waste Management Interventions and capacity

The Council has adopted and implementing an Integrated Waste Management System (IWMS). It is responsible for the following waste management activities:

- Creating Awareness on waste management and pollution control
- Garbage collection services including to rural extended areas
- Landfill management at Vunato landfill site where average of 100 tons of waste per day is managed.
- Enforcement of relevant legislation pertaining to waste management
- Complaint investigation of waste management grievances
- Park and vegetation management.
- Public area cleansing which includes the following:
    - ✓ Drain cleaning and grass cutting
    - ✓ Street sweeping
    - ✓ Market cleaning
    - ✓ Public convenience cleaning
    - ✓ Park cleaning
    - ✓ Vegetation management
- Bulky waste collection on user pay concept
- Waste minimization and 3R Promotion
    - ✓ Home composting
    - ✓ Clean schools' program
    - ✓ Market waste composting
    - ✓ Green waste chipping
    - ✓ Collection of recyclables
    - ✓ Eco bag promotion

Hence, it is assumed that councils IWMS will be sustained in future as it is the main pillar and foundation of effective DWM recovery efforts and will compliment this DWM C/P. The IWMS was the strategy in place in 2016 which significantly helped in quick recovery from impact of TC Winston.

Waste Management activities of Lautoka City Council

4.2 Waste Minimization

This DWM C/P recognizes the importance of Waste minimization and resource recovery initiatives and practices. The plan will strive to promote waste minimization efforts through:

- ✓ Cash for work program with waste pickers in green waste chipping. The generated wood chips would be utilized for mulching and composting (home compost and market composting).
- ✓ Partner with waste pickers in resource recovery efforts through reuse and recycling of disaster waste.
- ✓ Promotion of biofuel (firewood) of green wastes.

CPRs engaged for Green Waste Chipping and recovery of recyclables under cash for work scheme by LCC

4.3 Aligning waste management to Council, National and Regional level guidelines

The Disaster Waste Management Contingency Plan (DWM C/P) will be aligned to Disaster Management SOP and SWM Plan of LCC, National SWM Strategy and Regional DWM Guideline. The relevant polices and guidelines are mentioned in section 2.0 of this document, on institutional policies and agreements.

Part B: Main Framework of DWM Contingency Plan

5.0 Guiding Principles of DWM C/P

5.1 Waste Minimization underpins Waste Management Hierarchy

This plan prioritizes waste minimization initiatives (3R's Promotion approaches) when dealing with disaster waste as illustrated below. Plan focuses on waste reduction, promoting reuse of waste where possible and resource recovery through recycling and biofuel production. The remaining wastes which cannot be further recovered shall be safely disposed at designated disposal facilities.

Figure 3 – Waste Management Hierarchy

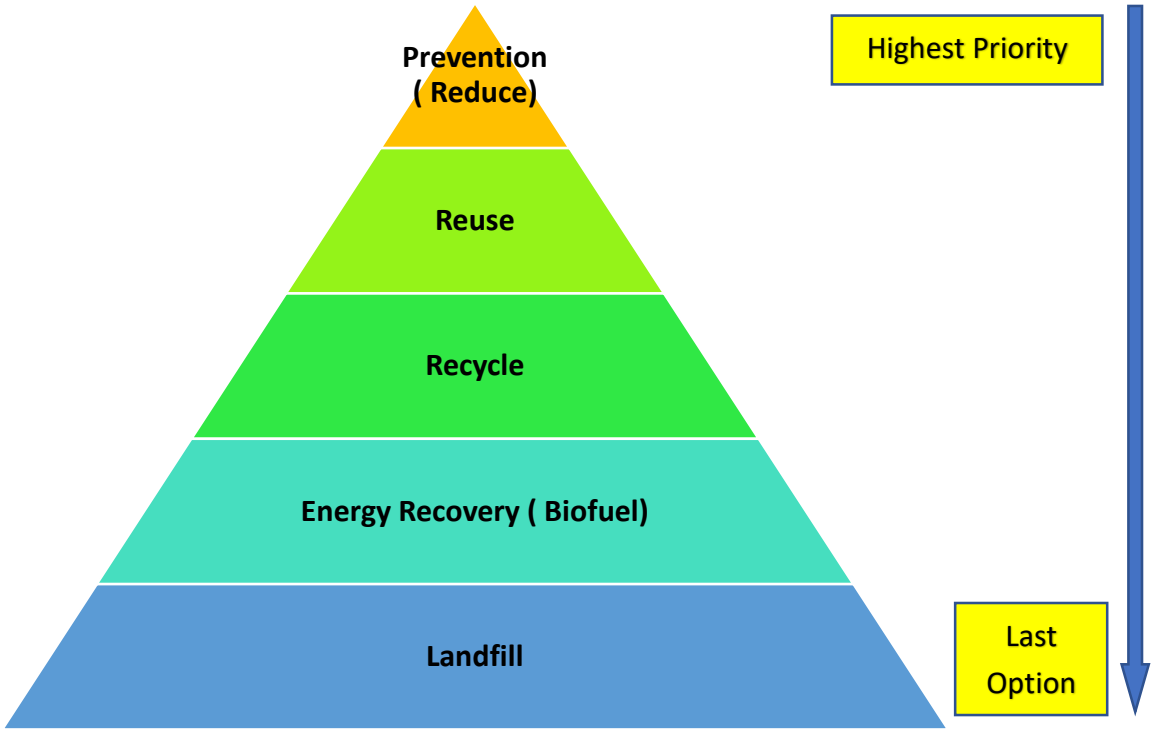


Table 3: Showing DWM Options and specific activities that can be implemented

DWM Option	Activities
Prevention (Reduction)	• Regular Vegetation management (pruning) is crucial especially along roads and near buildings to avoid excess green waste generation and prevent road blockages which usually hampers emergency response works. This also applies to aged and termite infested trees which may fall and not only pose hazard to people and buildings, but also generate wastes. • Regular maintenance and upkeep of public infrastructure like drain cleaning works and creek/river dredging works is crucial to prevent flooding. • Pull or demolishing of unstable structures to avoid unnecessary damages/safety risk and wastes.
Reuse	• Make timber from fallen trees for rebuilding works. • Reuse corrugated iron and other metal pieces for building structures. • Reuse containers and bottles for harvesting rain- water or storing water. • Reuse concrete rubble and silt for landfill access • Work in partnership with waste pickers to recover any materials that is of use to them.
Recycle	• Reuse damaged food for animal feed. • Promote recovery of resources for recycling by partnering with recyclers and waste pickers. • Chip green waste for mulching and composting
Recovery	• Promote use of green waste for firewood or biofuel for boilers.
Final Disposal	• Residual waste which cannot be minimized further shall be safely disposed at designated disposal sites

Pictures of green waste chipping, drain cleaning by LCC

5.2 Precautionary and Safety Principle

Disaster waste management work involves various stakeholders and especially workers working under precarious conditions which pose risk of injuries or fatalities. Hence, adherence to principles of safe work practices and occupational health and safety principles is paramount to avoid unnecessary tragedies. Everyone involved in DWM from the need assessment process, rapid waste assessments, handling of disasters wastes especially hazardous wastes, waste pickers and landfill staffs need to wear appropriate personal protective equipment's. This also aligned with Fiji's labor regulation xxxx.

Also, emergency lifesaving operations shall take precedence over all other disaster response efforts.

5.3 Win-Win Partnership Concept/ Work for Cash Incentives

The DWM C/P reinforces the need to establish partnerships with stakeholders like contractors, waste pickers, donor agencies, RFMF, corrections department, NGO's, NDMO and waste recyclers. This will ensure the swift and smooth disaster waste management interventions in post disaster response and recovery.

The council may lack certain resources like manpower, machinery, equipment and budget during a disaster. Thus, a need for an established and coordinated participatory approach with relevant stakeholders. This will compliment available resources and help council to respond, recover and rebuild much faster and cost effectively. For instance, lack of staffs (manpower) can be boosted with casual employments offered to waste pickers under the "cash for work" incentive to assist in waste collection, sorting, green waste cutting and green waste chipping works.

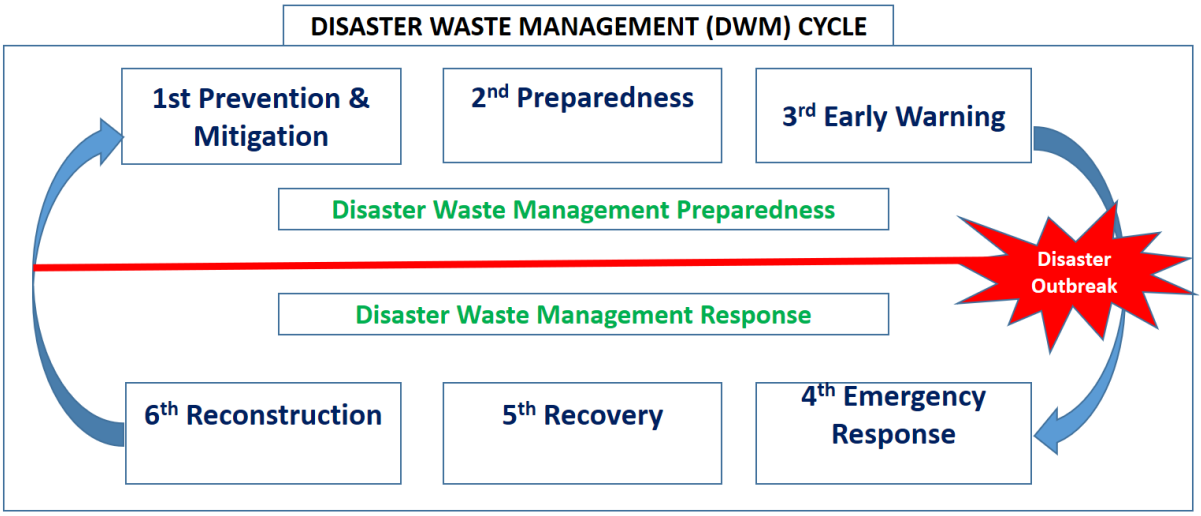
5.4 Build Back Better

Build back better principle is indispensable towards building councils' capacities and resilience to future disasters. For instance, all buildings constructed, equipment's/plants procured, or any projects undertaken in the future should meet build back better principle to minimize the need to replace or reconstruct the same post every disaster.

5.5 Proposed Disaster Waste Management Cycle

Figure below illustrates the proposed basic Disaster Waste Management Phases applicable in Pacific region and is in line with the *Pacific Island Countries Disaster Waste Management Guideline.*

Figure 4: Showing the Proposed DWM Cycle for Lautoka City



Adopted from Pacific Island Countries Disaster Waste Management Guideline

Table 4: Shows the DWM Phases, Time Period and Activities

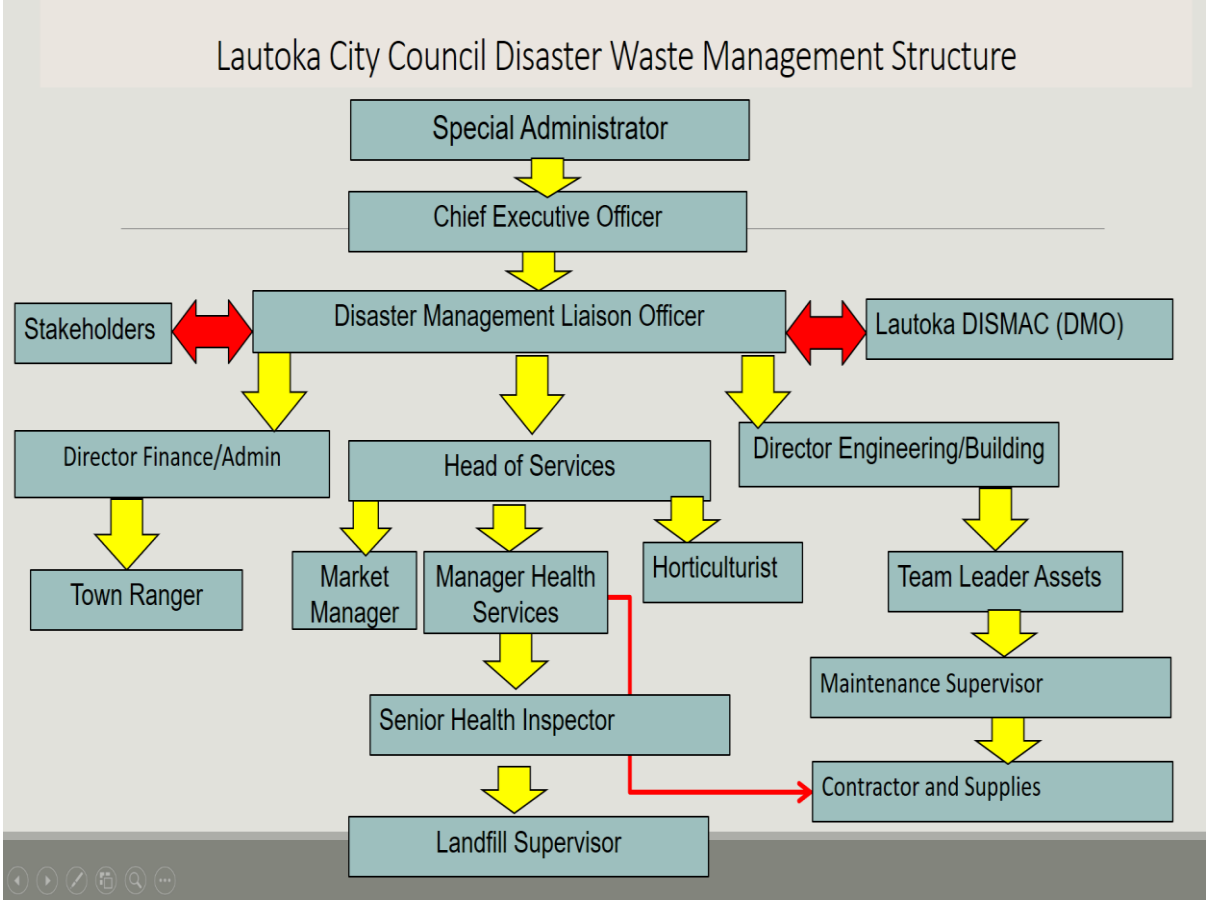
	DWM Phases	Timing	DWM Measures/Activities
1	**Prevention & Mitigation** – refers to Disaster Risk reduction Measures (DRR's).	Implemented whole year	Mitigation measures to safeguard facilities and infrastructures from damages, reduce disaster waste generation amounts and prevent Disaster waste management risks to environment and people's health.
2	**Preparedness** – refers to preparatory works before disaster strikes or prior to disaster season.	Implemented 1 month before disaster season and continues through the disaster season	Refers measures undertaken to reinforce and strengthen the DWM C/P in readiness for disasters. Eg prepositioned contracts/suppliers, inventory of stocks and supplies, necessary procurements, preventative maintenance, building control and planning works, awareness, training, short refresher trainings for members of DWM committee, streamlining the roles and responsibilities, establish designated disaster waste disposal cells and temporary disposal sites, establish partnerships and secure DWM contingency funding. Also refers to establishment of Integrated Waste Management Systems.

3	**Early warning –** refers to established communication and warning platforms to create awareness to public regarding approaching disaster	Commences after 1st warning is issued by Met office	Refers to mobilization and use of existing communication and awareness networks and platforms to disseminate all necessary precautionary advise and warnings to public and stakeholders regarding an looming disaster. This will give ample time for everyone to prepare and take precautionary and preventive measures to reduce impact of disaster.
4	**Emergency Response** – life saving and access clearing works as soon as disaster calms	As soon as disaster ends to 48 hours	Refers to clearing of road blockages starting from emergency routes, lifesaving exercises, isolating hazards and from public access.
5	**Recovery** – measures to return to normalcy	within 2 months of disaster	Refers to disaster waste clearing and cleaning works to restore normalcy as quickly as possible
6	**Reconstruction** – measures taken to rebuild or reconstruct damaged facilities and infrastructures	2 months to 1 year after disaster	Refers to replacement of damaged infrastructures, facilities and equipment and reconstruction of damaged waste management facilities. Also refers to preparation of disaster waste disposal cells as existing cells become overwhelmed with disaster wastes or reconstruct access and drainage to disposal sites and preventative maintenance works to machineries in preparation of future disaster.

6.0 Administration

6.1 DWM Organization Structure of LCC

Figure 5 : Shows Proposed DWM Structure for LCC



6.2 Roles and responsibilities (Key Personnel involved in administering, managing and maintaining the contingency plan; overall disaster waste manager)

Table 5: Positions and Responsibilities of Members of DWM Committee

Positions	Responsibilities
Special Administrator	Overall approval for the disbursement of funds and decisions from the councils side.
Chief Executive Officer	Leading the LCC Disaster Management Committee and providing overall guidance to Council management team and staffs including stakeholders

Disaster Management Liaison Officer	Act as key link and play liaison role between LCC and DISMAC team. Would facilitate requests for machinery, trucks for the cleaning of disaster debris. Provide regular updates.
CWD (DISMAC)	Lead the Disaster relief, rehabilitation and reconstruction work in whole of Lautoka District including the greater western region. Provide usual support to LCC in DWM matters.
Services Team (HOS/MHS/SHI/Landfill Supervisor/MM/Horticulturist)	The team leads and coordinates emergency response and recovery works in liaison with Engineering team. Horticulturist is responsible for vegetation management works. Create awareness to citizens. MHS acts as overall Disaster Waste Manager.
Finance/Administration Team (DFAS/SAO/TR)	Budgeting, support procurement of supplies/equipment's, receipting, reimbursement and financial report to reflect funds utilized
Engineering Team (DES/DBS/TLA/MS)	Work closely with Services team in ensuring effective and efficient Disaster response, recovery and reconstruction works. Secure and mobilize required resources.
Contractors	Support the council in ensuring timely Disaster recovery works especially clearing, clean up and reconstruction.
Suppliers	Ensure timely supply of emergency supplies including maintaining of adequate stocks pre-disaster season.

Stakeholders: (NGO's/MOHMS/Ratepayers Association)	Capacity building programs thorough NGO's. Proper health regulations thorough MOHMS. Ratepayers association- funds?
RFMF/FPF/Correction Services	Manpower needed for cleaning, sorting waste, storage and assist in landfill.
Collection Pillars of Recycling (Formerly known as Waste Pickers)	Play major role in waste (resource) recovery work through reuse and recycle of disaster debris. Cash for work recipient particularly green waste chipping and clean ups
Waste Recyclers (Fiji) Ltd Pacific Recycling Foundation	Assist in Resource recovery work of Disaster Waste especially Metals for recycling

6.3 Multi-sectoral Coordination and Networking

Figure 5 and Table 5 above shows the composition of proposed DWM Committee and their roles. Key persons of contacts are identified including stakeholders. This illustrates multi-sectoral approach in terms of coordination and networking. Awareness and understanding of their roles is very critical to ensure collective effort to achieve speedy recovery post disasters.

6.4 Budgeting and financial Arrangements

It is proposed that the council allocates $100,000 FJD annually for Disaster Waste Management. Funds will accumulate yearly when no flooding or cyclone affects Lautoka city. Example, $100,000 x 5 years'= $500,000 which can be specifically for addressing DWM interventions.

Funds can be sourced from:

1. Annual council budget – rate payers should be made aware of the problem and mitigation place (e.g., waste storage facilities, wood-chipper, resource recovery facility)
2. Compost sales by LCC
3. Litter fines generated from litter enforcement works by Litter Prevention officers
4. MOA's drafted and finalized with business owners to allow the use of their vehicles and equipment's to support the council.
5. Landfill tipping fee

7.0 Pre-Disaster Strategies

7.1 Prevention and Mitigation Measures

When mitigation measures a in place, a lot of the waste that is forecasted during disasters can be controlled. It is vital to have proper measures in place to lessen the load of waste accumulated after cyclones and flooding in Lautoka.

7.1.1 Vegetation and Green Waste Management

Green waste makes up more than 50% of waste accumulated after disasters. Measures need to be put in place to ensure that this is mitigated when a disaster strike. These includes:

- Remove existing trees along the road-side – prevents future blockage during emergency operations and green waste accumulates
- Regulate tree species species and distance from the road when landscaping – plants that grow more than 3 meters must not be planted near main public roas. Trees like *dilo* (*Callophyllum inophyllum)* are wild resistant trees that can be planted.

7.1.2 Hazardous Waste

These are waste accumulated from building constructions, like asbestos which can become the main hazardous concern during cyclone. Used oil and chemical spillage is also a big problem after disasters. The following measures can be made to mitigate hazardous waste:

- Identify and locate old existing buildings with asbestos materials which can pose a problem later- efforts should be made for safe removal of hazardous materials
- If for legal reasons, hazardous materials cannot be removed- the council should inform the public of the existence of asbestos with clear signages.
- Regularly monitor and enforce existing laws and regulations of hazardous materials. This includes substances and chemicals used in the healthcare, agriculture, businesses, farms, schools, university, pharmacies, etc.

7.1.3 Garbage Collection

- Currently in the council, there is garbage collection three (3) times a week and this will continue after disasters.
- Home composting containers and equipment's available in the council for households to manage food waste at household levels
- Enforce proper waste management with the Lautoka Market Vendors to mitigate waste accumulation during floods and cyclones
- Train and prepare waste collectors in disaster preparedness.

7.1.4 Waste Management Facilities

- Identify and prepare waste collection facilities in the municipalities
- Ensure proper MOA's and MOU's are in place with businesses and rate payers who will be assisting with the provision of equipment's and funding to facilitate this
- Ensure that the Vunato landfill is properly managed in case of surge of waste during cyclone seasons in Fiji (November to April)

7.1.5 Upkeep of Public Infrastructures

Building debris represent a large percentage of waste accumulated after disasters (disaster waste). The following measures can be enforced to reduce disaster waste accumulated from damaged buildings:

- Ensure existing building codes for all new building construction is followed to prevent damages during disaster.
- Identify unstable/unsafe building within the municipality and implement mitigation measures. This includes either total demolition or repair existing structures to ensure building aligns with Fiji's building code.
- Building should not be constructed along the coastlines especially in areas highly exposed to other disasters like tsunamis or earthquakes.

7.1.6 Bulky/Yard Waste collection incentives and Clean up Campaigns

The council have usefully implemented waste management programs in schools and communities. Clean-up campaigns can be incentivized thorough competitions iamongst schools and youth groups in the Lautoka city area. The following measures can also be put in place:

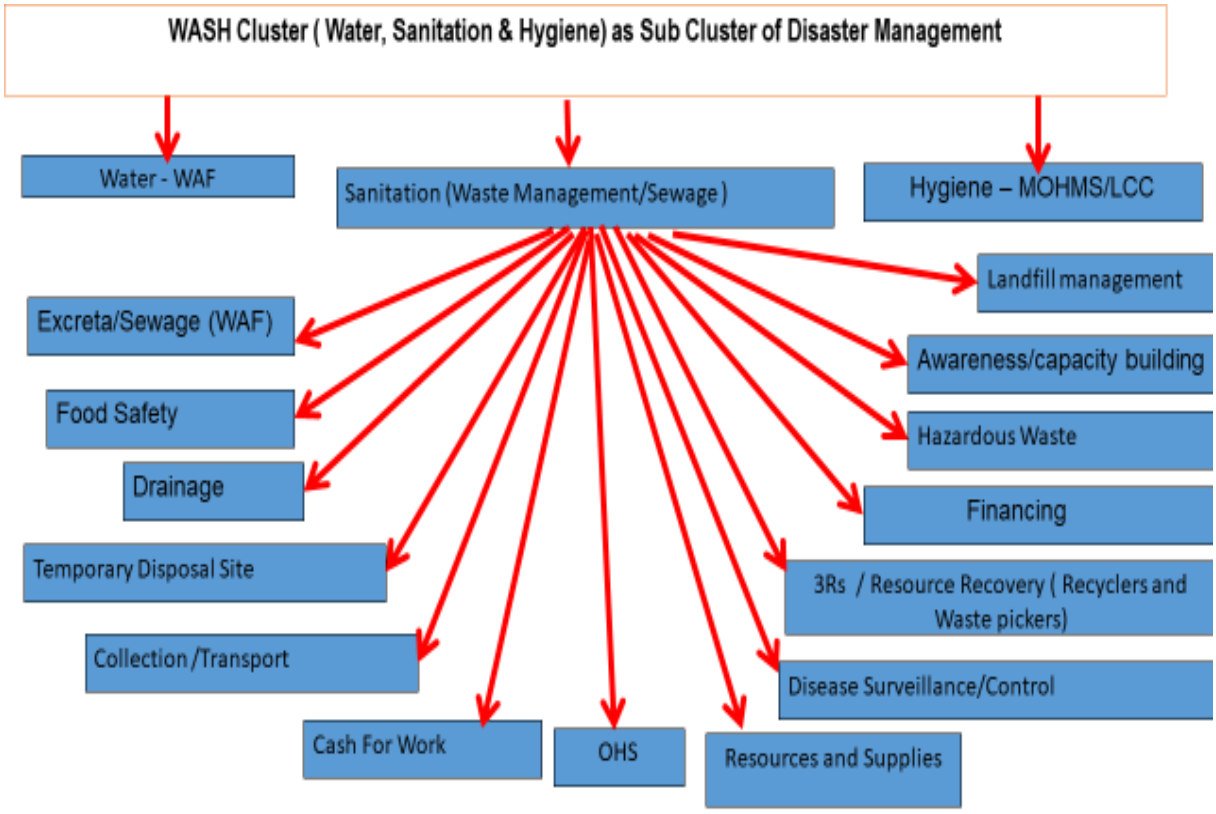
- Extending the municipalities reach to include rural areas, in terms of waste collection and bulk waste collection before cclone seasons
- Ensure that stringent measures are in place for contractors who clean the market to mitigate the accumulation of green waste during floods
- Implement incentives for ratepayers to volunteer and pay for collection of bulk items prior to cyclone season as mitigation measures to minimize disaster waste
- Increase litter levy that Litter Prevention Officers collect, and direct this towards Disaster Waste contingency funds

7.1.7 Current WASH Programs as Sub-Cluster of Disaster Waste Management

The figure below illustrates inter linking issues which are closely related to successfully implemetation of WASH programmes and intitaives with respect to Disaster Waste Management. These issues ought to be considered during every stage of DWM.

The council should continue to chamion disaster waste management as a success pilot for other municipalities in Fiji.

Figure 6: Shows WASH Cluster Applicable to Lautoka City



7.2 Preparedness

Preparation is vital for the successful interventions targeted towards disaster waste management in Lautoka city council and the areas under its jurisdiction. Strategies need to be full proof to ensure a faster response immediately after a disaster.

7.2.1 Maintenance of Waste Management Facilities, Plants and Equipment's

Council shall make every effort to upgrade, service and maintain all SWM facilities to ensure they are operational and can be used without any major challenge post and disaster.

Equipment and Machineries

All Equipment and machineries referred to in Appendix 1 shall be regularly serviced and maintained. This also includes procurement of back up parts, prepositioned suppliers, maintaining adequate fuel/oil stocks, establishing backup service contractors and hire trucks/machineries etc. Regular training of mechanics and provision of proper tools and appropriate Proper Protective Equipment's (PPEs) is also important.

Waste Disposal

Council shall ensure that arrangements are made to prepare following:

- Adequate space prepared and reserved for disaster waste with proper access and drainage facilities at Vunato Disposal Site.
- Make provision for green waste disposal and chipping area at VDS.
- Ensure proper all weather access and proper drainage at VDS at all times.
- Adequate space is prepared for general waste with accessibility and good drainage.
- Provision for special Waste Area for disposal of animal carcasses, condemned food, other hazardous waste.
- Establish **Temporary Disposal Site (TDS)** at strategic locations for temporary storage of disaster waste including garbage. Temporary Disposal Site will act as back up in case the road to VDS is not accessible due to flooding near Vunato settlement/Reliance Road.

7.2.2 Pre-positioned contracts for service contractors and supplies

Council shall ensure that contracts referred to in Appendix 3 are valid for service contractors and suppliers. This includes timely renewal of these contracts to avoid any issues during a disaster.

7.2.3 Capacity Building and awareness

Council shall partner with NDMO and other agencies working in the area of DWM to train staffs and laborers involved in waste management. This includes training on OHS, use of plants/equipment's, conducting rapid assessments, handling of special waste and hazardous materials etc.

Regular awareness for citizens is also indispensable to ensure everyone are aware of their responsibilities and level of preparedness required for disasters. This can be easily done via local newspaper, website and council Facebook which is very active (8.9k followers as of November 2022)

7.2.4 Capacity Building in terms of Resources

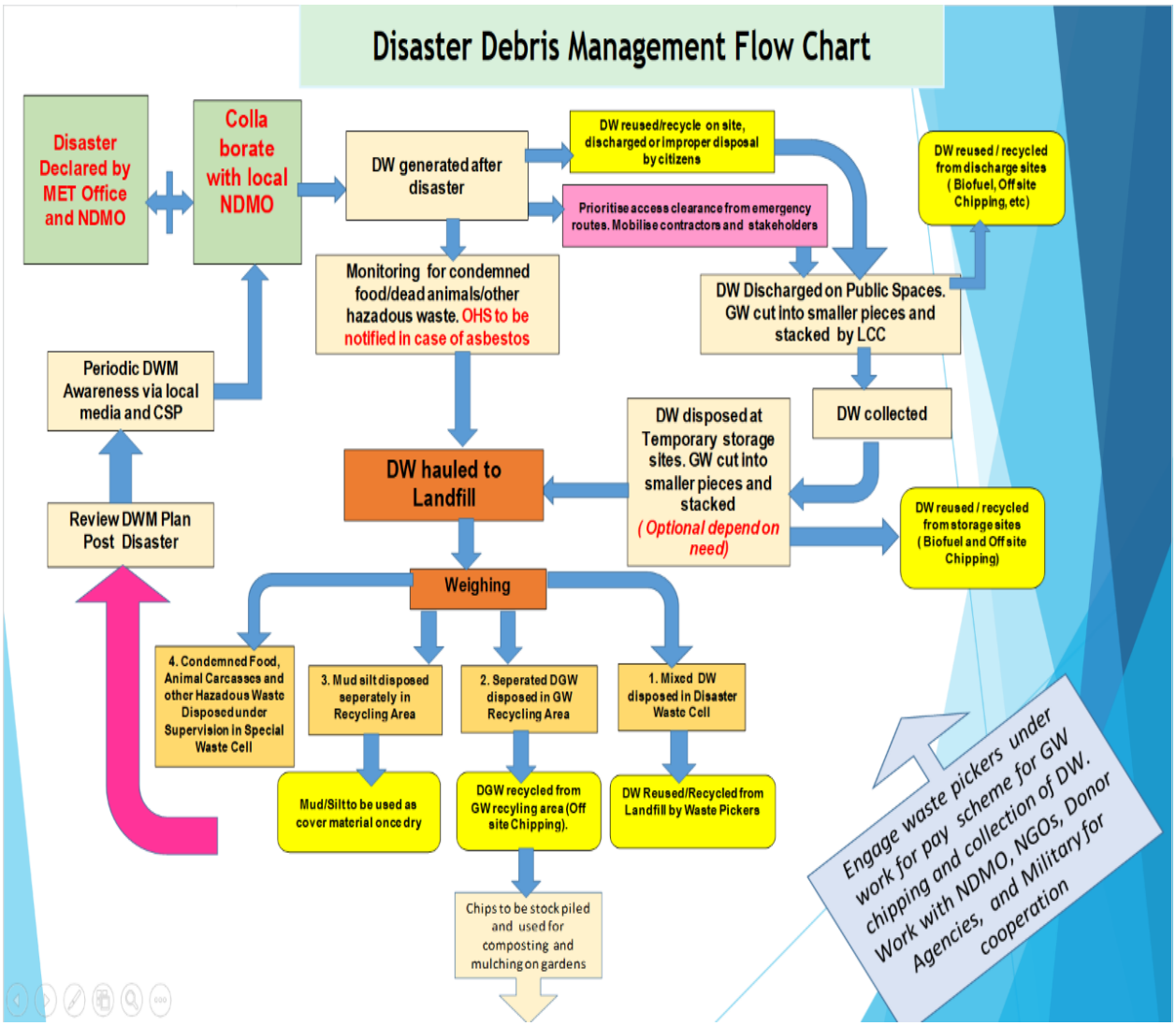
Council shall make every effort to ensure that all resources related to DWM (staffs, equipment's, facilities, supplies etc) are maintained at all times.

Council shall establish partnership with NGOs and volunteer groups who can assist post disaster in the recovery works.

7.2.5 Logical scheme for waste sorting, collection, transport, treatment, disposal

Figure 7 below illustrates the proposed flow of disaster waste from generation, storage, sorting, collection, resource recovery to final disposal. There will be some challenges in terms of reluctance of citizens to pile disaster green waste (wood) for biofuel due to eminent threat from termite infestation which is another disaster itself in Lautoka City.

Figure 7 : Flowchart for Debris Management for Lautoka City



7.2.6 Establish Priority and Secondary Collection Routes

The focus on aftermath of a cyclone/flood is to clean all road and drains and should be done in an orderly manner**.**

Methodology

The work will be carried out in stages as follows.

Stage1:

- Clearing a minimum access on all roads within 24 hours mainly involves cutting and pushing fallen/ branches off the carriageway. Backfill washed off road sections.
- Clear blocked drains causing flooding.
- Work to be in liaison with EFL, FRA. Water and Sewerage sections.

Stage 2

- Remove all debris from roads, footpath in the following order: -
  i. Drasa Avenue
  ii. Hospital Road
  iii. Tavewa Avenue
  iv. Central Business District
  v. Vomo Street
  vi. Sukanaivalu Road
  vii. M N Naidu Road
  viii. Natabua road
  ix. Clearing of specific areas requested by the utility providers [EFL and FRA] for restoration of service.

Clearing of emergency routes post disaster

Stage 3.

- Clearing of each ward by the respective contractor with additional council resources as and when required**.**

7.3 Early warnings

7.3.1 Strengthen Communication Arrangements (Education, information and communication campaigns)

Based on previous experiences, Fiji Meteorology and other weather forecasts like Na Draki and Windyty indicates possibility of tropical depressions and its formation into cyclones around 1 week before a cyclone makes landfall. Both mainstream media and social media also plays a critical role in dissemination of such early warnings to members of public. This also applies for other disasters like heavy rain, storm surges and tsunami.

Council shall activate the Lautoka City DWM Committee and start having preparatory meetings which shall include "stock take", reiterate members and departments their responsibilities, make arrangements with back up resources, contractors and suppliers etc. to ensure the city stands ready and prepared for any disasters. Vibre group can be created for effective communications as long as communication is available.

Council shall make every effort to create awareness to citizens through its face book, local media, web page and audio announcements (hailer /vehicle mounted sound systems). The target shall be the most vulnerable members of public living in low lying flood prone areas, informal settlements with substandard building structures and coastal areas.
Awareness and notices shall emphasize the cooperation and roles of citizens in discharge/storage and sorting of disaster waste highlighting the importance of resource recovery. Safety measures required in dealing with disaster waste shall also be shared.

Back up team shall be mobilized had setup up base at Churchill Park and ready to kick start the emergency responses post disaster.

7.3.2 Coordination with NDMO

Council shall work very closely with NDMO and ensure that council is represented in every preparatory or emergency taskforce meetings where councils readiness plan and challenges shall be shared. Council shall take directions from NDMO lead agency in terms of Disasters and provide support wherever possible. During disasters, interdepartmental, holistic and collaborative approach is crucial to compliment each others response strategies. The last thing that we want is wastage of resources through duplication of interventions by agencies.

8.0 Post Disaster Response Strategies

8.1 Emergency Response

Emergency response refers to responses implemented with 48 hours after a disaster and includes following Rapid DWM Assessment, lifesaving Operations and Disaster Waste Collections

8.1.1 Rapid assessment

This shall be undertaken within 24 hours after disaster to have a brief idea regarding the type, quantity and location of wastes including priority areas. The assessment shall include:

- Wastes blocking priority roads leading to hospital and service facilities like supermarkets, bakeries, pharmacies etc.
- Identify locations and nature of special or hazardous wastes.
- Assess wastes that can be reused and recycled.
- Assess Disaster wastes hampering restoration of key services like water and electricity. For instances damaged trees on fallen electricity lines/posts.
- Assess need for temporary disposal site based on accessibility to VDS.
- Kobo tool shall be used as it is very handy in carrying out rapid assessments. It has advantage in terms of easy questionnaire survey, capturing geometric locations, pictures and summarizing the report in table form, map etc and can be used offline as well.

8.1.2 Life Saving Operations

Whilst rapid assessments data is trickles in, it is indispensable to kick start lifesaving operations within 24 hours after disaster strikes. Clearing of emergency service routes and primary access ways. This is critical to ensure those injured receive medical care at the earliest to avoid causalities. There can be people or animals trapped underneath fallen trees, buildings, found along water ways or even trapped in flood waters who need to be rescued.

It is important to clear fallen trees, cut fallen trees and pile on roadsides and clear silt etc from road. Such operation shall be spearheaded by National Fire Authority having the required capabilities. It is also vital that only trained personnel shall use machines and equipment's with proper PPEs.

8.1.3 Disaster Waste Collection and removal

This phase shall be within 48 hours after post disaster. Based on report of Rapid Assessments, all Disaster Wastes shall be cleared following the priority emergency routes, landfill site road, followed by CBD, primary access and secondary access. This shall continue until detailed assessments is carried out.

8.1.4 Resumption of Garbage Collection and Street Sweeping Service

It is critical that Garbage collection service continues as soon as practical to remove uncollected garbage. At times garbage may be left uncollected for 1 or 2 days due to ceasing of the collection service because of disaster. Market waste is generated due to market closure for days. Hence, it is important that market is cleaned as soon as possible and all damaged and deteriorated market produce is cleared and if properly separated, be composted. Similarly, streets and footpaths need to be cleared of all fallen leaves, palm fronds and other flying debris.

8.2 Recovery operations

8.2.1 Detailed Assessment

After 48 hours of a disaster, detailed assessment need to be carried out to grasp better understanding of the disaster waste generated which is crucial for planning and budgeting purposes.

- Detailed assessments can be done based through combination of work about survey, interviews, meetings, taking pictures, mapping, referring to similar situations previously experienced or following the explanation under clause **3.3 on waste quantity estimation.**
- Meet with stakeholders, NGOs and Volunteer groups, contractors and ascertain level of support for disaster waste recovery works.
- Liaise with key donor agencies like JICA for possibility of assistance.
- Meet with recyclers to determine level for support that is available for resource recovery.
- Partner with waste pickers for "Work for Cash", and resource recovery.
- Prepare base maps with collection routes and allocation of areas to separate groups.

8.2.2 Continue Disaster waste collection and removal

Once detailed assessment, planning and budgeting is done, full scale disaster waste cleanup campaign shall commence following the **"disaster waste debris flow". (Figure 7)**

By now, all emergency and priority routes would be completed. The cleanup shall target urban areas (CBD), followed by inner areas. Garbage collection in rural areas can convene at this stage.

The cleanup shall also focus on resource recovery such as involving waste pickers, recyclers, green waste chipping, engaging citizens to reuse timber/wood for biofuel etc.

All records shall be maintained of disaster waste collected and disposed at VDS or TDS including amount chipped.

8.3 Reconstruction phase

8.3.1 Improvement and rehabilitation of Waste Management Facilities

It is indispensable that council prepare and formulate a reconstruction action plan following a disaster which shall address the following:

- Strengthen resources for disaster waste management activities.
- Improve damaged waste management facilities. This may include access to landfill, rehabilitating landfill due to overwhelming disaster waste disposal or repair of weighbridge or waste management vehicles.
- Normalizing waste management services especially garbage collection to rural extended boundaries.
- Improve on infrastructure like dredging of creeks to mitigate flooding risks, improve city drainage system to prevent flash floods and continue with effective vegetation management system.

8.3.2 Build Back Better

It is crucial that council considers and adopt the “build back better” approach when dealing with any reconstruction, new development and procurement of machineries and plants to ensure resilience building. This will not only reduce disaster related risks but also reduce costs from future reconstruction costs.

8.4 Final Phase

8.4.1 Debriefing (evaluation of response; lessons learned; possible improvements)

Council shall convene meeting of Disaster Waste Management Committee and evaluate council’s response and effectiveness of Disaster Waste Management Contingency Plan. It is important to conduct a debriefing exercise to update all members of committee. This exercise shall aim to:

- Strengthen and enhance the good lessons and achievements.
- Fill the gaps and challenges identified.
- Develop capacity and resilience and readiness for future disasters.
- Share experiences and lessons learnt with public and stakeholders.

Based on the outcome of the above meeting, council shall then also carry out a debriefing of Disaster Management Taskforce team based at NDMO office.

8.4.2 Preparation of Reports

Following the debriefing, council shall prepare a report detailing the council's response and document all activities addressing the 6 phases of Disaster Waste Management Cycle (Figure 4). The report shall also include recommendations for improvements and budgetary request to realize the improvements.

Appendices

Appendix 1 List of Available Equipment, Supplies and Resources

Landfill	42 acres Landfill with computerised weighbridge systems (6 cells for general waste, 1 cell for special waste, disaster waste cell and Composting facility
Heavy Machines	Kato Excavator, D6 CAT Bulldozer, 2 x Hired Back hoe
Other Machines	250 mm wood chipper, 3 chain saws, 3 generator, 4 water pumps, 3 x Motorised sprayers, 3 x welding machines, 1 x vegetable shredder
Vehicles	3 x 12 ton Garbage compactor Trucks, 2 x multipurpose tip trucks with high gates, Standby contractor for supply of tip trucks and garbage truck, 1 x cherry picker
Other Facilities/ equipment's	Works Depot, Churchill Park, Botanical Garden, Other Parks, 4 x water tanks, forks/spades/shovels, PPE, knives/files, lifting forks, torch, radio, city map, caution tapes, high pruner, brush cutters, safety belt, tarpaulins etc
Contractors	Street cleaning, drain cleaning/grass cutting, public convenience cleaning, market cleaning, refuse collector
Expertise	4 x welders, 5 x heavy machine operators, 15 x truck drivers, 2 x electricians, 4 x SWM supervision staffs, 3 x wood chipper operators

Appendix 2 List of Contractors (Hire of trucks/plants/machineries, Suppliers, Service Providers)

Name of Contractor	Business Name	Type of Contract/Service	Phone Contact	Email
Ravindra Kumar	Ravindra Kumar Carrier Cargo	Refuse Collection/ Hire of Truck	9952321	
Krishneel Kumar	Krishneel Kumar Haulage	Refuse Collection/ Hire of Truck	2115456	Krishnilk035@gmail.com
Rajnesh Sant	Waste Clear West (Fiji) Pte Ltd	Garbage Collection	9990005	wcw@wasteclearwestfiiji.com rajant7@yahoo.com.au
Sumeet Kumar	S Kumar	Supplier of Heavy Machinery, hard fill mateial	86588187	Kumarsumeet747@gmail.com
Narayan Reddy	West Quality Pest Cleaning Services & Pte Ltd	Grass Cutting Drain Cleaning and Street Sweeping Contractor	9968900	reddywestquality@gmail.com
Mahabir Raj	City Cleaning Contractors	Grass Cutting Drain Cleaning Contractor	9896503	citycleaningcontractors@hotmail.com
Sheik Azmat Sahib	Sheik Azmat Sahib Cleaning Services	Cleaning of Public Conveniences at Carpark, Sugar City Mall & Vendors Accommodation	9606429	azmat.sahib40@gmail.com
Josefa Sokovakagone	Josefa's Cleaning Security Services	Cleaning of Public Conveniences at Tavakubu Satellite Market	9725735	-

Appendix 3 List of Contact Numbers (name, designation and organization, phone, fax, email, alternate contact person)

Positions	Phone Contact	Email
Lautoka City Council		
Special Administrator (Chair)	9436035	drakim@lautokacitycouncil.com.fj
Chief Executive Officer	9908550	khanm@lautokacitycouncil.com.fj
Head of Services	9908553	
Manager Health Services	9908485	rouhit@lautokacitycouncil.com.fj
Disaster Waste Management Liaison Officer – Senior Health Inspector	8915053	shalends@lautokacitycouncil.com.fj
Landfill Supervisor	9989739	
Horticulturist		ankreet@lautokacitycouncil.com.fj
Market Manager	9908558	vikash@lautokacitycouncil.com.fj
Director Finance and Administration Services	9908561	
Senior Accounts officer	9989805	israaz@lautokacitycouncil.com.fj
Town Ranger	9908555	charley@lautokacitycouncil.com.fj
Director Engineering and Building	9908557	sdass@lautokacitycouncil.com.ff
Team Leader Assets	9908554	shameer@lautokacitycouncil.com.fj
Maintenance Supervisor	9989740	shivneel@lautokacitycouncil.com.fj
Other Agencies		
Commissioner Western	6660760	apolosi.lewaqai@yahoo.com
District Officer	8076694	sera.tuikoro@govnet.gov.fj
DPC – Fiji Police Force SP Aisake Kafoa (Acting)	(9905980)	aisake.kafoa@yahoo.com
OC – Fiji Police Force ASP Meli Balekinakorovatu	9905670	mbalekinakorovatu@gmail.com
OC – Fiji Correction Services Meli Taito	9905087	
OC – Royal Fiji Military Forces Captain Mesake Navitikula,	9905348	
WAF Water Supply Supervisor	9104835	
WAF – Sewerage Supervisor Engtesh Permal	9104403	epermal@waf.com.fj
Fiji Roads Authority Krishnesh Mani	8939436 /8919017	krishnesh.Mani@fijiroads.org info@fijiroads.org
Health Inspector Lautoka/Yasawa Ifereimi Waqaisese	8918992	ifereimiwaqa@gmail.com

President of Lautoka Rate Payers Association Narayan Reddy	9968900	reddywestquality@gmail.com
President Lautoka Chamber of Commerce Wasu Pillay	9928272	gordonlaw@co+nnect.com.fj shivneshpillay@hotmail.com
SEO West – Department of Environment Kelera Tokalau	9906691	kelera.tokalau@environment.gov.fj
Director of Waste Recyclers (Fiji) Ltd and Founder of Pacific Recycling Foundation	9921067	amitesh@recyclingfoundation.org amitesh@recyclingfoundation.org

Appendix 4 List of Disaster Waste according to disaster

1. Features of Disaster Waste - Flooding

TYPICAL WASTES	**Impacts and Hazards**
Waste from Evacuation centres	Impede access, constrain rehabilitation and recovery works. Encourage disposal of more wastes as long as the wastes remain uncollected. Pose public health risks from breeding of vectors and risk of transmission of diseases like dengue. Risk of injury. Wastes left uncollected for longer duration will become eye sore and lead to complaints from citizens. Risk of fire from dry wastes. increased costs of collection/haulage if wastes remain uncollected for long. Sudden increase of waste amounts may pose burden existing operations/lifespan of landfill. Landfill has to cater for wastes from other areas.
Green Waste	
Household waste from evacuation camps	
Damaged or unusable building/house contents	
Accumulated mud, clay and gravel (potentially mixed with hazardous material) on roads when floodwater recedes	
Mixed solid and hazardous waste (such as cleaning products and electronic goods) from house clearing	
Dead animal carcases	Foul odor/ flies nuisance and public health risks
Condemned food/beverage items	Foul odor/ flies nuisance and risks of food poisoning if not monitored and managed strictly

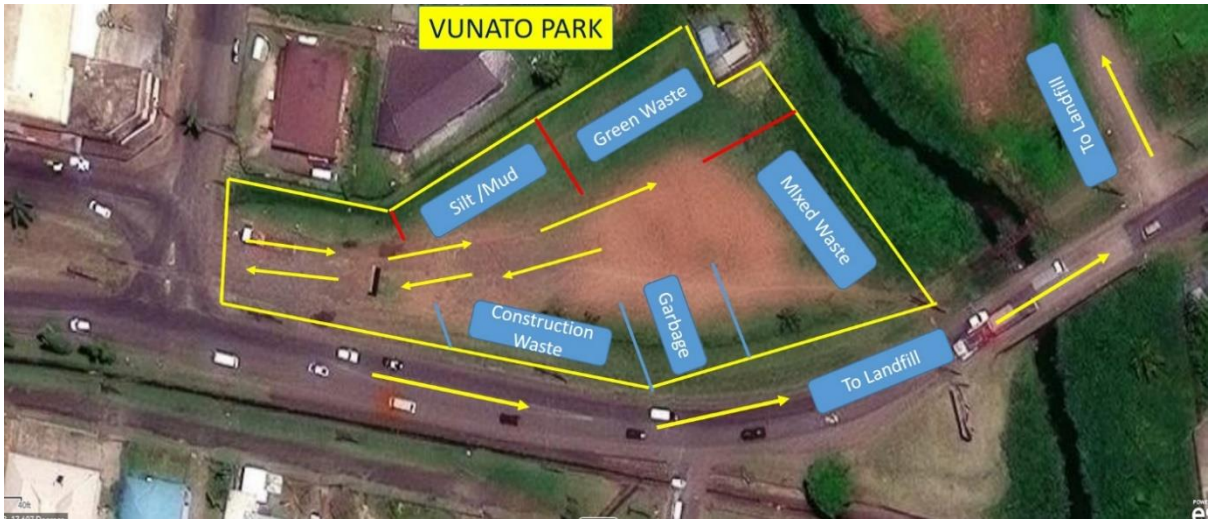
2. Features of Cyclone Waste

TYPICAL WASTES	Impacts and Hazards
General waste from evacuation camps	Impede access, constrain rehabilitation and recovery works. Encourage disposal of more wastes as long as the wastes remain uncollected. Pose public health risks from breeding of vectors and risk of transmission of diseases like dengue. Risk of injury. Wastes left uncollected for longer duration will become eye sore and lead to complaints from citizens. Risk of fire from dry wastes. Increased costs of collection/haulage if wastes remain uncollected for long. Sudden increase of waste amounts may pose burden existing operations/lifespan of landfill. Landfill has to cater for wastes from other areas.
General damaged household waste	
Damaged infrastructure (including electrical and telephone grids/poles) with large quantities of debris such as concrete, bricks etc	
Displaced roofs/ collapsed walls/timber from damaged buildings caused by strong winds (with asbestos potentially present)	
Green Waste from fallen trees and branches	
Damaged electrical and telephone grids, and transformers	
Condemned food/beverage items	Foul odor/ flies nuisance and risks of food poisoning if not monitored and managed strictly

Appendix 5 DWM Temporary Site / Waste Cell Layout Plan

DWM Temporary Site – Vunato Park

Layout of DWM Temporary Disposal/Storage Site – Vunato Park



Appendix 6 Survey Forms – Rapid Assessment Form

This Form shall be filled using tablet or phone and Kobo Tool using link (https://ee-eu.kobotoolbox.org/x/vcKzbN6X)
The Tool will gather basic data as tabulated below:

Location using GPS	Description and details	Type of Waste	Estimated Volumes/loads	Other Remarks