REPUBLIC OF FIJI

Post-Disaster Needs Assessment Guidelines

Housing Sector

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The housing sector guidelines for Fiji follows the structure of the UNDP's *Post-Disaster Needs Assessment Guidelines: Volume B – Housing*, paying particular attention to pre-disaster planning and the incorporation of vulnerability assessment and risk reduction in keeping with the tenet of the global agenda to "build back better, stronger and more inclusive".

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Table of contents

List of figures

List of tables

List of acronyms

BBB	Build back better
DBGA	Department of Building and Government Architect
DRR	Disaster risk reduction
Fijian dollar	F$
GDP	Gross domestic product
GFDRR	Global Facility for Disaster Reduction and Recovery
INGO	International non-governmental organization
kWh	Kilowatt hour
M^2	Metres squared
M^3	Metres cubed
NBC	National Building Code
NDMO	National Disaster Management Office
NGO	Non-governmental organization
NHP	National Housing Policy
PDNA	Post-Disaster Needs Assessment
PRB	Public Rental Board
SPO	Strategic Planning Office
UNDP	United Nations Development Programme
WASH	Water, sanitation and hygiene

Glossary

Build back better (BBB): The use of the recovery, rehabilitation and reconstruction phases after a disaster to increase the resilience of nations and communities through integrating disaster risk reduction measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies and the environment (https://www.undrr.org/terminology/build-back-better).

Capacity-building: Capacity-building is defined as the process of developing and strengthening the skills, instincts, abilities, processes and resources that organizations and communities need to survive, adapt and thrive in a fast-changing world (https://www.un.org/en/academic-impact/capacity-building).

Community: A social group of people living in the same place and who often have a common cultural and historical heritage.

Disaster: A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (https://www.undrr.org/terminology/disaster).

Disaster risk reduction (DRR): Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development (https://www.undrr.org/terminology/disaster-risk-reduction).

Reconstruction: The restoration and improvement, where possible, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors. It is focused primarily on the construction or replacement of damaged physical structures and the restoration of local services and infrastructure (Jha et al., 2010).

Recovery: Decisions and actions taken after a disaster to restore or improve the pre-disaster living conditions of the affected communities while encouraging and facilitating the necessary adjustments to reduce disaster risk. It is focused not only on physical reconstruction, but also on the revitalization of the economy, and the restoration of social and cultural life (Jha et al., 2010).

Relocation: Process whereby a community's housing assets and public infrastructure are rebuilt in another location.

Resilience: The ability of a system, community or society exposed to hazards to resist, absorb, accommodate, adapt to, transform and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions through risk management (https://www.undrr.org/terminology/resilience).

Retrofitting: Reinforcement or upgrading of existing structures to become more resistant and resilient to the damaging effects of hazards (https://www.undrr.org/terminology/retrofitting).

Risk: Risk is the probability of an outcome having a negative effect on people, systems or assets. Risk is typically depicted as being a function of the combined effects of hazards, the assets or people exposed to hazard and the vulnerability of those exposed elements (https://www.undrr.org/building-risk-knowledge/understanding-risk).

Vulnerability: The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards (https://www.undrr.org/terminology/vulnerability).

1

1 Introduction and background

The main objective of the guidance notes is to enable the Government of Fiji to carry out a Post-Disaster Needs Assessment (PDNA) and prepare a recovery strategy in the aftermath of a disaster. The purpose is to ensure that the Government of Fiji is in the driving seat of the PDNA process. The guidance notes are designed to provide a good understanding of a disaster's effect and impact, and the needs of the affected population. It will help the PDNA team of Fiji to draw a recovery roadmap and recovery action plan.

The guidance notes will enable the PDNA team to define a strategy for mobilizing the financial and technical assistance required for housing and settlement response appropriate to the needs in the event of a disaster in Fiji.

It has been based on previous PDNA reports of other countries and especially the report on Cyclone Winston in Fiji.

To contextualize the guidance notes, a detailed consultation process was undertaken by involving the major stakeholders in the domain of housing in Fiji (refer to Appendix 3). The consultation has helped to take into account people's livelihood issues and has identified their capacities and available resources to reach the level of recovery and initiate repair, retrofitting and reconstruction. In the context of housing recovery (repair, retrofitting and reconstruction), it is important for the PDNA team to examine the ground situation of access to expert as well as general services and goods required in the recovery interventions.

Depending upon the scale of a disaster and other factors, the duration of a PDNA exercise will be between 6 and 12 weeks. The guidance notes will assist the Government of Fiji to have an adequate understanding of the effects and impacts of a disaster in the housing sector and improve the qualities of the outcomes from the recovery process. The guidance note is based on the *Post-Disaster Needs Assessment Guidelines: Volume B – Housing* (United Nations Development Programme [UNDP], Global Facility for Disaster Reduction and Recovery [GFDRR] and the European Union, 2014) developed by UNDP, the World Bank, GFDRR and the European Union.

1.1 Post-Disaster Needs Assessment team, Fiji

It may be reiterated that the Fiji housing sector PDNA guidance notes have been contextualized. This document has been designed for members of the PDNA housing assessment team, who will be drawn from the Ministry of Housing and other related ministries/institutions.

Table 1.1: The PDNA team

	Ministry/institution	Rank of the officer nominated for the PDNA
1	Ministry of Housing	Senior Technical Officer, Disaster Risk Reduction (DRR)
2	Ministry of Public Works, Transport and Meteorological Services	Senior Technical Officers (Policy Division)
3	Ministry of Rural and Maritime Development and Disaster Management	Divisional Teams National Disaster Management Office (NDMO) Risk Assessment Teams

4	Ministry of iTaukei Affairs	Provincial Office of the Roko Tui
5	Republic of Fiji Military Forces	Engineers Corps
6	Ministry of Finance, Strategic Planning, National Development and Statistics	Sectoral Teams

1.2 Funding

The last two PDNAs of Fiji (2013 Tropical Cyclone Evan/2016 Tropical Cyclone Winston) were co-funded by the Government of Fiji and UNDP. UNDP funded the engagement of international PDNA experts who provided guidance to the sector assessment process. These experts supported the work of sector government officials who were part of the assessment teams deployed to the affected areas. While UNDP funded the development of the PDNA report, the Government of Fiji covered the deployment cost of the assessment teams, with the assistance of development partners.

The PDNA process in Fiji is activated by the Government through the declaration of emergency in the aftermath of a disaster. This puts the government machinery on alert and disaster response becomes the immediate priority. All government resources are seconded to the National Disaster Controller who may require the use of assets and human resources of other ministries as the controller considers fit.

The decision to conduct a PDNA remains the prerogative of the Fiji Government as was the case in the last two PDNA exercises in Fiji. The Government may need to make budgetary provisions under the NDMO portfolio in anticipation of future disasters.

1.3 The Fiji housing Post-Disaster Needs Assessment context

According to Fiji's Natural Disaster Management Act 1998, the NDMO will carry out the day-to-day operations during any disaster response. The approval for a PDNA exercise is the prerogative of the Ministry of Finance, Strategic Planning, National Development and Statistics, as it was in the last two PDNAs in Fiji.

In a non-emergency situation in Fiji, the Ministry of Housing oversees the strategic direction of the housing sector assessing the housing needs of the Fijian people. The rural housing unit focuses on rural housing needs and provides assistance by subsidizing cartage costs of construction materials to rural sites.[1] Public buildings fall under the purview of the Ministry of Public Works, Transport and Meteorological Services whereby the Director for the Department of Building and Government Architect (DBGA) are responsible for its upkeep. The Housing Authority of Fiji is also another important stakeholder that looks after a portion of housing stock in the urban areas.

During a disaster, all response initiatives are coordinated through the Ministry of Rural and Maritime Development and Disaster Management and the NDMO. The NDMO will then direct the use of resources and personnel to meet the emergency needs of the affected communities. The housing sector assessment is done by the government officials who are part of the multisectoral assessment teams deployed to the affected areas. As has been the practice in the past, government officials conducting assessments on a site might have to conduct assessments on sectors that they may not be fully aware of. In such cases, the Government's resources are stretched and appropriate people are appointed to conduct assessments for the sector. The housing assessment team will include representatives from the housing cluster as shown in Table 1.2.

1 Affected households pays a third of the materials and cartage cost to the site, and the Government pays two thirds through the Rural Housing Scheme.

Table 1.2: Members/partners of the Fiji housing cluster

Government lead	Co-lead	Key partners
• Ministry of Housing • Ministry of Education (Assets and Monitoring Unit) • Director for DBGA	• Republic of Fiji Military Forces Engineers Corps • Ministry of iTaukei Affairs • Divisional Commissioners • Rural Housing Assistance programme	• Habitat for Humanity Fiji • Development partners • UNDP

The work of the National Emergency Operations Centre under the leadership of the NDMO of Fiji spans from preparedness to early recovery. While the NDMO collects data through the Initial Damage Assessment and the Detailed Damage Assessment, they will hand this data over to the Strategic Planning Office (SPO) for analyses and preparation of the PDNA. In Fiji's context, the NDMO weans off its responsibility after the response has crested and hands over the early recovery and rehabilitation work to development planners. While the involvement of the NDMO may continue through early recovery, it is more focused on the conclusion of the response phase.

The housing team will work in collaboration with representatives from other sectors/clusters, particularly the water and sanitation team, gender and social support teams.

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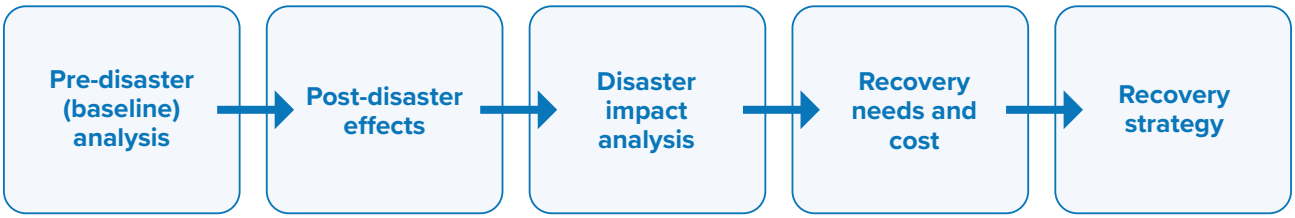
2

2 The Fiji housing post-disaster needs assessment process

The PDNA process has five assessment steps:

1. Pre-disaster baseline (context) analysis
2. Post-disaster effect (damage and loss) analysis
3. Disaster impact analysis
4. Recovery needs and cost assessment
5. Recovery strategy development

Figure 1: The PDNA methodology



In Fiji, the PDNA lead is the responsibility of central agencies such as the Ministry of Finance, Strategic Planning, National Development and Statistics. This is because of its role in development budgeting and the need to conduct a gap analysis in the aftermath of a disaster. They will work with sector officials in determining the sector disaster impact under the assistance and guidance of the experts.

The PDNA housing team will be responsible for data collection and analysis, estimation of damages, losses, recovery needs and cost, and development of the recovery strategy.

The team will also be responsible for drafting the housing sector report.

Fiji's PDNA exercise is multisectoral in its approach given the resource constraints and capacity to use the methodology to identify gaps. The guidance notes have the opportunity to enhance the capacity within the housing sector, particularly the rural housing team at the Ministry of Rural and Maritime Development and Disaster Management to work with Shelter Cluster members in conducting sector assessments. Table 2.1 shows the PDNA process for the housing sector.

Table 2.1: Housing sector PDNA process – timing, activities and actors

Timing	Activity	Lead agency	Other participants
Week 1	Initiation and overall planning: • Form the housing sector PDNA team and set up coordination mechanisms. Select sector lead and decide the responsibilities of the team members. • Agree on terms of reference with key stakeholders. Include related sectors to be assessed and understand the geographical scope of the assessment and timelines. • Define the scope of the housing sector analysis. • Orientation training on the methodology of the PDNA. • PDNA sector baseline data collection and review.	• SPO – Housing Desk Officer • Housing sector representative(s)	• UNDP • Shelter cluster • Rural Housing Assistance programme representative(s) • Shelter cluster representative(s) • Lead Technical Assistance – PDNA sector expert • Republic of Fiji Military Forces Engineers Corps • DBGA representative(s) • Ministry of Finance, Strategic Planning, National Development and Statistics
Week 2 - 3	Assessment stage: • Local authority to carry out data collection on damages and losses of the housing sector and share the findings with the PDNA housing team. • Conduct field survey (including community consultation). • The PDNA housing team cross-checks, validates and synthesizes the collected damages and losses data into one aggregate assessment. • The PDNA housing team calculates the disaster's effects (damages and losses).	• SPO – Sector Desk Officer • Shelter Cluster Sector Lead	• Divisional Commissioners • DGBA representative(s) • Rural Housing Assistance programme representative(s) • Republic of Fiji Military Forces Engineers Corps
Week 4	Analysis stage: • Macroeconomic analysis. • Human impact analysis. • Cost estimation of repair, retrofitting and reconstruction, and recovery needs. • Report drafting.	• SPO – Sector Desk Officer	• Housing sector expert • Gender expert • Shelter Cluster

Timing	Activity	Lead agency	Other participants
Week 5 - 6	Dissemination stage: • Publishing and launch of the final PDNA report.	• SPO – Sector Desk Officer • Ministry of Rural and Maritime Development and Disaster Management	• Ministry of Foreign Affairs

The PDNA team has to provide a detailed report on the effects and impacts of the disaster on housing infrastructure and services, and then recommend a recovery strategy. The report should emerge with:

» the monetary value of the effects (damage and loss) and impacts;

» an estimation of recovery needs and costs of rebuilding the housing sector;

» a clear statement on the basic assumptions of the assessments; and

» mentioning all sources of data, and in the case of more than one source of data, state the reasons for selecting a particular source.

The PDNA should document all the collected data and information, both in its original and edited formats, and submit to the NDMO as evidence, for reference and future access. The following points will help in writing the PDNA housing report:

» Start with the contents page (e.g. section 3 to section 7 of the guidance notes) and consult it with the PDNA team leader and the government. Note that the contents sheet depends upon the type, scale and place of disaster. Make the contents page suitable to the context.

» Involve the government personnel at province, district and village level in the process of assessment and share findings at early stage of the PDNA.

» Acquire damage data and start working on the analysis. One should carry out analysis based on the format and typology of the damage assessment data provided by the Government.

» There might be difficulty in data acquisition and lack of transparency of the data collection process. One should be prepared for that and try to mend the gaps during the field visit. Triangulate data, if possible.

» Consult the relevant government departments at major points during analysis of data and report writing.

» Use international good examples to promote the concept of green technologies – many traditional buildings may withstand cyclone/earthquake/flood with minimum damage. Make note of these.

» Share the findings with the PDNA team leader and the government at intermittent stages.

» Prepare a summary table with damages, losses and recovery needs.

» Prepare an executive summary clearly stating the context, process and major outcomes of the PDNA exercise.

» Share draft report with the central writing team, which prepares and finalizes the overall PDNA report.

» Once the draft PDNA report is submitted, it is circulated by the Government to various ministries/departments for their comments, validation and endorsement.

» Incorporate the comments from the Government to finalize the PDNA report.

3

3 The pre-disaster context: Housing

To conduct a PDNA for the housing sector, it is very important to understand the pre-disaster housing context of Fiji as a whole and the vulnerable areas in particular – the population, demography, housing typologies, human and material resources, etc. The PDNA team has to understand the demand for housing of different categories, the supply and the gap, the existing housing stock, etc. The housing here refers to the urban and rural housing. One of the most crucial issues in the housing sector is to have a thorough understanding of the existing institutional structure of housing supply, maintenance and eventually demolition, where the government is in lead position supported by the development partners, non-governmental organizations (NGOs), international non-governmental organizations (INGOs), civil society organizations, etc. The PDNA team should know how the local planning body/municipality:

- functions in the issuance of building permits;
- monitors quality of construction;
- ensures safety of the existing housing stock; and
- works with the communities.

The baseline data on housing in the pre-disaster context would form the basis of assessing what existed before the disaster so that the extent of damage and loss could be identified and calculated, which would eventually help in costing recovery and its implementation to get back to the pre-disaster situation with enhanced resilience to cope with future disasters. There could be several sources of data, and if possible, data validation by triangulation should be done. This section shows a list of the relevant set of data on the existing housing stock and institutional system that will help to understand the pre-disaster situation of Fiji. Appendices 1 and 2 provide information and data on the pre-disaster housing context of Fiji.

3.1 Overview of housing, land and settlements

Housing is a collection of houses that enjoy certain common facilities in a settlement. A household means a group of people eating out of the same kitchen of a house. The housing domain could be defined as follows.

Every house is situated on a piece of land of a particular tenure and having:

- a basic minimum covered area;
- number of rooms with adequate light;
- ventilation and thermal comfort;
- multi-hazard resilience;
- drinking water;
- sanitation;
- solid and liquid waste disposal system; and
- energy supply.

If a disaster strikes an area, the mentioned components of a house would be disturbed. To get back to the pre-disaster situation would take time, skills, materials, technologies, money and an efficient management system. The more resilient a housing system, the quicker and more economical the recovery would be. Therefore, the quality of assessment of the extent of damage, loss and recovery needs, and designing the implementation process would largely depend upon the accuracy of the baseline information/data on housing.

There are three different systems of land tenure in Fiji:

1. Native (87 percent)
2. Freehold (7 percent)
3. State land (6 percent)

The market demand for urban housing is mostly on the last two categories (Esler, 2016). While majority of Fijians have houses, the housing conditions vary considerably. In the urban areas, the efforts towards housing supply has been inadequate owing to a rapid growth of squatter settlements.

3.2 Baseline data and information: Housing

Baseline data refers to the statistical information prior to a disaster, which is collected to carry out scientific study on the extent of change that has been brought about by a disaster. Accuracy of baseline data is crucial for the post-disaster damage and loss analysis. There are many types of data in the housing domain. However, considering the limitation of time for a PDNA exercise, the most important ones that are directly related to the damage, loss and recovery needs have been considered in the guidance notes. It is important to note that only those data that could be used for analysis and inferences in the context of PDNA should be collected. The following is a list of the different aspects of housing in Fiji:

- Institutional structure
- Housing stock and related components
- Building materials and technologies and multi-hazard maps
- Capacities: architects, engineers, contractors and construction workers
- Finance

The subsequent sections in this report are on:

- Sources of baseline data (3.3)
- Housing policy and enforcement (3.4)
- Social housing programmes/schemes: Government and others (3.5)
- Governance through government-people partnership (3.6)

3.2.1 Institutional structure

The knowledge about the existing institutional structure and the way it functions provides an idea on how quickly and efficiently Fiji could respond to a post-disaster situation in a cost-effective and sustainable manner. This knowledge also helps in understanding the kind of external support they might need should there be a disaster. The following is a short note based on existing literature.

The Ministry of Housing was established in 2018[2] as a dedicated stand-alone ministry, responsible for strategy, policy, funding assistance, monitoring and regulation of Fiji's housing system. It plays a lead role in promoting and facilitating the provision of accessible and adequate housing for low- and middle-income households and people living in informal settlements. The Ministry of Housing reviews:

- the national housing policy and strategy;
- increase in public and private housing supply;
- modernization of the housing sector legislation; and
- increase in access to affordable housing for people to rent and buy.

It works closely with other central and local government agencies.

The National Housing Policy (NHP) is the key strategic policy document for the housing sector in Fiji, and its prime goal is to achieve "affordable and decent housing for all". The Ministry of Housing oversees and contributes to the development and monitoring of all housing-related legislation such as:

- Housing Act 1955
- Fair Rents Act 1965

2 See https://www.housing.gov.fj/copy-of-about-us.

» Unit Titles Act 1985

» Residential Tenancies Act (draft)

The Housing Authority of Fiji plays a critical role in providing affordable housing to low- and middle-income earners across the country. The Public Rental Board (PRB) provides affordable and appropriate rental flats for low-income earners. To get a comprehensive idea on how the housing system works in Fiji, it is important to know who does what in the housing sector (Table 3.1).

Table 3.1: Responsibility matrix – different stakeholders in housing and their responsibilities

	Ministry/department/ NGOs/INGOs etc. led by*	Roles and responsibilities in housing sector	Strength/weakness
Provinces	1		
	.....		
Districts	1		
	.....		
Villages	1		
	.....		

** Related to land, building design, construction, materials, skills, loan/grant, building permit, etc.*

3.2.2 Housing stock and related components

Table 3.2: Housing stock in Fiji by type of roof and wall material (Appendix 1)

	15 provinces														
Wall urban															
Wall rural															
Roof urban															
Roof rural															

Appendix 1, which is based on Census housing data (2016), shows that 50 percent of urban houses and 74 percent of rural houses in Fiji have metal and wooden walls. In Fiji, 97 percent of urban houses and 98 percent of rural houses have a metal (see Appendix 1). About half of the urban houses and a quarter of the rural houses in Fiji have concrete/cement/brick walls. Over the years, the use of traditional *bure* housing has given way to concrete and fixed timber frame construction, which lends itself to easier fitting of plumbing and electricity supplies. At present, *bure* constitutes only a small percentage of the overall housing stock. Esler reports that drawing on the digitized building footprints collated under the Pacific Catastrophe Risk Assessment and Financing Initiative, the median floor area of Fiji's houses is large, around 80 metres squared (m^2) (concrete) and 60 m^2 (timber frame), which have been achieved incrementally by the homeowners over a number of years. According to the construction industry experts consulted during the course of the PDNA post-Winston (Esler, 2016), "like-for-like" house replacement costs (in Fijian dollar [F$]) would be in the order of F$750 per m^2 for concrete houses and F$650 per m^2 for timber frame housing, equivalent to a median house value of F$60,000 (concrete) to F$40,000 (timber frame).

This paragraph is primarily based on the PDNA carried out after Cyclone Winston. Appendix 2, item number 13 provides the cost figures collected from Fiji in 2023. It is important to note that all the data presented here should be updated when the PDNA is conducted and hence, data under the following list should be collected for the pre-disaster situation analysis in the housing domain:

- Tabular data format on various aspects of housing in Fiji
- Cost of materials and labour, total number of working days of the construction workers and duration of construction of the different housing types (Table 3.5)
- Amount of average rentals in F$ per month per house
- Number of women-led households per province

The PDNA team would circulate the following tables for pre-disaster data collections. The tables are self-explanatory and should be filled out by the appropriate line departments.

Table 3.3: Minimum standard of housing unit (refer to Appendix 2, items 1, 2, 3, 5 and 6)

	Items	Urban	Rural
1	Minimum plot size per household		
2	Minimum covered area per house		
3	Required minimum water consumption per household per day (drinking and washing)		
4	Type of acceptable sanitation system*		
5	Energy requirements in kilowatt-hour (kWh) per household		
6	Expected building life (years)		

Note: All water, sanitation and hygiene (WASH) elements that are inside the house are accounted for by the housing sector and elements pertaining to WASH that are outside the house is dealt with by the WASH sector team.

Table 3.4: Baseline information on population, household, ownership type, etc.

Province	Population			Change with respect to Census 2017 (%)	No. of households		No. of houses owned		Houses rented (%)	People with disabilities (%)
	Total	Urban	Rural		Urban	Rural	Urban	Rural		
Province 1										
Province 2										
Province										
Total										

Table 3.5: Baseline information on different housing typologies – area, cost, physical conditions

	Housing typology	Total no.		Average area m^2		Unit cost F$/$m^2$		Physical condition (%)		
		Urban	Rural	Urban	Rural	Urban	Rural	Good	OK	Poor
1	Concrete									
2	Timber frame/ wood									
3	Timber frame/tin iron									
4	*Bure*									
5	Makeshift/ other									
6	Livestock shed attached to houses									

Table 3.6: Baseline information on different housing typologies – province-wise

Provinces	No. of units made from/different typologies						Multi-hazard risk*
	Concrete	Timber frame/ wood	Timber frame/ tin iron	Bure	Makeshift/ other	Livestock shed in plot	
Province 1							
Province 2							
Province ..							
Total							

Note: Modify table as per Fiji nomenclature.
* Cyclone (C), Tsunami (T), Flood (F), Earthquake (E), Landslide (L) → there could be more than one hazard

Table 3.7: Baseline data on services (charts for Central, Eastern, Northern, Western Divisions)

	Services	Total no. of households		Cost (F$/unit)		Physical condition (%)		
		Urban	Rural	Urban	Rural	Good	OK	Poor
Toilet	Septic tank							
	Pit							
	Other type 1							
	Other type 2							
DW	Piped supply							
	Well							
	Other sources							
Energy	Connected to power grid			-	-	-	-	-
	Solar			-	-	-	-	-
	Wind			-	-	-	-	-

Note: Modify the table as per the nomenclature of Fiji.

Table 3.8: Land tenure by type and by division

Division	No. of plots: Native land			No. of plots: Freehold land			No. of plots: State land		
	Urban	Squatter	Rural	Urban	Squatter	Rural	Urban	Squatter	Rural
Central									
Eastern									
Northern									
Western									

3.2.3 Building materials and technologies

Small islands, in general, have very limited options for construction materials. They are dependent on import, which makes housing expensive and less green. In a post-disaster situation, the sudden rise in demand for construction materials makes recovery extremely difficult.

> **The high cost of building construction in Fiji has been attributed to the high cost of import, cost of transportation, monopolistic practices and scarcity of supply, etc. These need to be addressed by a national policy on housing. There is a need to look at unexplored local materials with the potential for making multi-hazard safe housing.**

Fiji already has its time-tested *bure*, which could be rejuvenated by making it safe as per the National Building Code (NBC) of Fiji safety standards. While doing that, major emphasis should be on the environmental sustainability and ecological balance of the island. The PDNA team should explore the possibility of using treated structural bamboo as a roof truss. These are the potential materials for housing that would be green, generating local employment and cost-effective. Data on the construction materials in the format shown in Table 3.9 would be an important database for calculating damage and recovery costs.

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Table 3.9: Detail of cost of materials (charts for Central, Eastern, Northern, Western Divisions)

	Materials	Source	Cost at source	Distance (kilometres)	Mode of transport	Time for transport	Cost of transport	Taxes	Total cost	Remarks
1	Brick									
2	Cement									
3	Sand									
4	Aggregate									
5	Timber									
6	Reinforcement									
7	Bamboo, ...									
	.....									

Note: Modify the table as per availability and nomenclature of the building materials in Fiji.

3.2.4 Capacities: Architects, engineers, contractors and construction workers

Post-disaster intervention is an additional burden on any country since it adds on to the target of the existing housing development programmes. Therefore, it is important to understand the level of preparedness of human resources to cope with the increased demand post-disaster. Aquino and others (2017, p. 478) reports that majority of the house builders available in the villages in Fiji do not have any formal education in engineering or carpentry, nor are they aware of the NBC for Fiji safety provisions. Knowledge is handed down from father to son. There is a shortage of experts in housing. In Fiji, there is one qualified wind engineer per 10,000 households. As a result, building construction is rarely supervised by an engineer. Another fact is that out of 17,000 skilled construction workers in Fiji, 67 percent are in urban areas, resulting in a situation where rural people have inadequate access to skilled workers. In a post-disaster situation, while the demand for reconstruction, repair and retrofitting would increase significantly, proportionate access to the assistance of engineers or skilled builders would not be possible. This would increase the vulnerability of the reconstruction programme because of non-compliance with safety standards. For additional information on construction workers, refer to Appendix 3 (Stakeholders' consultation). Table 3.10 would help in division-wise skill mapping in Fiji. However, the major challenge in reconstruction would be to reach the doorsteps of the affected households in small isolated islands with small populations.

Table 3.10: Human resources availability in construction sector (prepare charts for Central, Eastern, Northern, Western Divisions)

Human resources	Existing no.	Average level of skill in build back better (BBB)* (new construction)	Average level of skill in repair and retrofitting	Special notes
Architects				
Engineers				
Supervisors				
Skilled Artisans				
Carpenters				
Electrician				
Plumbers				
Contractors				
Buddy group				
Bure builders				
Number of building inspectors in local municipality				

* Build back better (BBB): The use of recovery, rehabilitation and reconstruction after a disaster to increase the resilience of nations and communities through integrating DRR measures into the restoration of physical infrastructure and societal systems, and into the revitalization of livelihoods, economies and the environment (see https://www.undrr.org/terminology/build-back-better).

3.2.5 Finance

Access to financial institutions is a pivotal element in housing recovery, especially for the lowest income group and the vulnerable population. In Fiji, irregular incomes of people living in poverty and their inability to provide collateral makes it difficult for them to qualify for institutional finance under standard banking practices. Many low-income households are incapable of paying for even the basic standard rental units provided for them. The main constraints are their poverty, low incomes and unpredictable earning capacities. Fiji has a well-developed banking system, dominated mostly by the foreign-owned banks. There is a need for promoting individual community-based savings and credit facilities for individual or community housing schemes. In the pre-disaster context analysis, it is important to get to know:

- who are entitled for a grant/loan;
- the quantum of loan amount and the payback period for different economic groups;
- prerequisite for release of tranches;
- interest amount and equated monthly instalment; and
- who are the financial institutes in the domain of housing and how does one approach them.

Table 3.11 will provide an idea on the sources of funding for different economic groups of the people in Fiji.

Table 3.11: Financial institutes in housing – grant, loan, etc.

Financial institutes/ funding agencies	Location: Division/ province/ village	Schemes for housing: General	Schemes for housing for the economically disadvantaged	Special notes

3.2.6 End note: Baseline data

Section 3.2 shows the required tables for baseline data/information collection covering different aspects of housing in Fiji. This pre-disaster data/information would enable the housing sector team to figure out what existed before a disaster and form the basis of the post-disaster gap analysis and recovery plan. Practical experience of working in a PDNA revealed that some of the tables shown in section 3.2 were not available in previous assessments, forcing the PDNA team to idealize, assume and extrapolate data to carry out the assessment. Wherever such assumption/ idealization is required, the PDNA report must clearly mention it. While this guidance note aims to prepare the country's own human resources to carry out a PDNA on their own, it also provides an opportunity for preparedness towards resilient housing. Therefore, if Fiji does not at present have all the data/information mentioned in this section, the Ministry of Housing may plan for acquiring them, which would be the first step of preparedness towards resilience. Appendices 1, 2 and 3 provide important data/information, which was acquired by Government of Fiji personnel in 2023 through a consultative process by involving the key stakeholders. The PDNA team should study the appendices and update them wherever necessary.

All housing-related data should be collected in Microsoft Excel format for the analysis of housing damage, loss and recovery interventions. Validation of data by triangulation should be explored. Meetings involving consultation with housing-related line departments, ministries, NGOs, INGOs and civil society should be conducted by the assessment team. The collected data should be brought by the team during the field visit for reference and cross-checking.

3.3 Sources of baseline data

Esler (2016) states that no single public agency in Fiji is responsible for housing, and that housing-related legislation is spread over at least 14 separate acts including, e.g. the Town Planning Act, Subdivision of Land Act, Public Health Act, Local Government Act and the Act to Provide for the Regulation of Fijian Affairs, all administered by different ministries. One needs to know the different sources of housing-related data from where the data matrices (Table 3.1 to Table 3.11) could be filled out. Table 3.12 should be filled out showing all the housing-related data sources including the government, development partners, NGOs, INGOs and others.

Table 3.12: Housing sector – existing baseline data sources

	Primary data source	Type of data available	Contact
1	CENSUS		
2	NDMO		
3	Housing Authority		
4	Fiji Bureau of Statistics (FBOS)		
5	INGOs		
6	NGOs		
7	.....		

Note: Fill out the table by modifying and/or adding relevant information in the context of Fiji.

3.4 Housing policy and enforcement

The prime objective of the NHP in Fiji, is to provide "affordable and decent housing for all, the key to building better communities". Fiji has a comprehensive NHP that provides detailed information on how to achieve the national objective of housing for all. The PDNA team needs to study the NHP and examine it with respect to their experience of the field visits, consultations and interviews to identify if there are gaps. In the recovery strategy, the specific interventions in the NHP should be suggested.

One of the key issues in any policy is the mechanism by which it is implemented at the grass-roots level. Building codes and legislation are the two most important components of housing delivery and maintenance. In the context of Fiji, there are suggestions that the NBC for Fiji standards and approval procedures need to be rationalized and simplified (Fiji, 2011, p. 9). It is suggested that there is a need for shifting the focus of planning from "policing" (development control) to "enabling" to encourage private initiatives and building regulations to provide for reduced/flexible standards to a level affordable by people.

It is important to understand the governance and decision-making processes involving the key housing stakeholders:

- Providers of public and social housing
- Infrastructure authorities
- Representatives of municipal councils
- iTaukei Land Trust Board (formerly known as the Native Land Trust Board)
- Lands Department
- Provincial administration
- Ministry of iTaukei Affairs
- Some financial institutions

The PDNA team should write the housing policy and its enforcement based on literature, data and most importantly, by interviewing government officials at the ministry, as well as divisional and provincial officials, and by interacting with the villagers, especially women and the vulnerable to get their views on the housing policy and its enforcement.

Views of the building inspectors, local businesspeople (materials suppliers) and contractors would be crucial for the understanding of the housing policy and its enforcement. Refer to Appendix 3 to get an idea on the key stakeholders' views on housing.

3.5 Social housing programmes/ schemes: Government and others

It is important to document the existing social housing schemes in Fiji. In an effort to assist lower income groups, the Government of Fiji provides subsidized serviced housing lots and mortgage loans for home ownership (Housing Authority of Fiji) or PRB apartments. A number of privately established and funded social (subsidized) housing schemes exist for people living in extreme poverty and destitution, supported by charitable groups (e.g. the Model Towns Charitable Trust), church groups (e.g. the Housing Assistance and Relief Trust) and NGOs (e.g. Habitat for Humanity Fiji). The houses under all these schemes are well constructed with concrete or timber frame/ tin iron materials. However, such efforts towards the supply of public and social housing has been unable to keep up with the growing demand. The market demand survey done by the Housing Authority of Fiji in 2013 estimated that the demand for housing units was 18,948, most of which (16,816) were in the Central Division. The PRB has a waiting list of around 4,600 housing units. Overall, Fiji's housing stock is largely (9 percent) in private ownership (Esler, 2016).

Esler, 2016 informs that the Housing Assistance and Relief Trust programme is targeted at providing immediate and temporary housing assistance for vulnerable families – single mothers, victims of domestic violence, etc. There is a strong need for the PDNA team to document all the social housing programmes, their strengths and weaknesses as well as their coverage, which would be required in context analysis.

3.6 Governance through government-people partnership

Fiji has experienced a number of tropical cyclones, tsunamis, earthquakes, etc. Analysis of the gaps identified in past interventions would be a good premise for enhanced response in the future. The efficiency of the recovery governance in a post-disaster situation largely depends on the nature of government-people partnership. A worldwide trend in post-disaster housing recovery is to adopt an "owner-driven" and/or a "community-driven" model. Therefore, it is important for the PDNA team to know the level of preparedness that exists in this regard in Fiji. Several questions need to be answered:

- Is the community consultation in recovery a part of the existing policy?
- Are the communities aware of their roles and responsibilities and that of the government's?
- How do the communities know about their rights as well as the government's responsibilities?

An understanding of this is important for the PDNA team and would immensely help in designing the medium- and long-term recovery interventions.

It has been observed in many countries that the government officials who had the best hands-on experience of managing post-disaster situations have either retired or moved on to other places, weakening the government institutional memory. For the PDNA team, assessing the institutional memory could be done by interviewing government officials in the disaster management units and by checking the available documents on post-intervention appraisal reports upon exit of the full recovery cycle. Generally, the community wisdom on handling disasters has been cumulative and extremely rich. It is often untapped in PDNA and recovery planning. For the PDNA team, community wisdom should be understood through an interactive process by adopting appropriate tools and documenting the acquired knowledge during field visits.

3.7 Summary

The pre-disaster database on housing would make the PDNA team knowledgeable about the existing housing stock in Fiji, their condition and multi-hazard vulnerability. The situation of housing demand, supply and gap would enable one to assess the degree of adequacy of the existing financial, human and material resources and institutional efficiency to reach the goal of housing for all in Fiji. By comparing this with the post-disaster damage and loss, the PDNA team would be able to calculate the appropriate housing recovery cost and frame a strategy so that the damage and loss could be restored back to the pre-disaster situation at the earliest with the additional dimensions of greenness and resilience in Fiji.

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4 Assessment of post-disaster effects: damage and loss

Effect of wind, flood, earthquake, tsunami and landslide

Fiji is one of the island countries located on the Pacific Ring of Fire. This makes Fiji vulnerable to natural disasters such as earthquakes, tsunamis, etc. However, the two most frequently occurring natural hazards in Fiji were cyclones followed by floods (Fiji, 2017, p. 49). Large floods are induced by tropical cyclones. Storm surges aggravate flood levels in the coastal zone. Flash floods are restricted to smaller sub-catchments. The major cause of housing damage and loss in Fiji is due to cyclone followed by flood.

This section of the PDNA guidance notes is on the process of assessing the effects of disaster resulted from the above-mentioned hazards. Since this section is followed by impacts of the disaster, it is important to clarify the meanings of these two terms. The term effect here means the result of a disaster and impact signifies the disaster's influence. This section is focused on the effects of a disaster. While writing a PDNA report, the effects of a disaster in the housing sector are measured under the following four heads (Esler, 2016):

1. Housing damage: Partial damage or destruction – buildings, physical assets and services (damage)
2. Disruption to the existing production of, delivery and access to goods and services (loss)
3. Disruption to the existing housing governance system (loss)
4. Increased risks and vulnerabilities (loss)

This section shows the process of assessing the disaster effects under the four heads. The accuracy of the assessment would largely depend upon the degree of disaster preparedness of a country. For example, well-trained human resources for data collection on housing damages with appropriate tools and data acquisition techniques (modern equipment) should be in place with an efficient data transmission and validation system to the national disaster management centre.

4.1 Housing damage

Damage means physical harm to a building and its attached services that impairs its value, usefulness or normal functioning. Damage could be minor, partial, major or total destruction of physical assets existing in the disaster-affected area. Damage is measured in physical units (i.e. per housing unit, per toilet, water per household, etc.). The degree of damage is measured as a percentage of the replacement costs according to prices prevailing just before the event (UNDP, GFDRR and the European Union, 2014).

The pe-disaster reconstruction cost of a house is crucial for damage assessment. There are two very important components of the costing:

1. The average standard of the plinth area of a house belonging to a particular socio-economic group.
2. The unit cost of construction acceptable to the government and the people.

> **There may be differences between the government unit cost of construction and the market rate. Therefore, there is a need for consultation with local contractors, material suppliers, construction workers and the community to acquire unit costs of the different housing typologies and interact with the government engineering department to arrive at a reasonable cost that would be acceptable to all parties.**

This consultation is especially important for island countries like Fiji, which is partially dependent on imported materials. There may be variation in unit cost in different divisions and provinces, which could be ascertained by interacting with the stakeholders and during the field visit.

Since the damage cost calculation is based on the pre-disaster reconstruction cost of different housing typologies, Table 4.1 should be filled out after

consulting the government, contractors and the local market. In a similar way, pre-disaster costs of destroyed household goods and services restoration should also be acquired. The best source for acquiring the cost of traditional buildings would be traditional construction workers and villagers who build their own houses. If possible, the PDNA team should acquire the detailed bill of quantities of different housing typologies.

Table 4.1: Housing types and costs in F$

Typology	Average plinth area (m^2)		Pre-disaster unit cost (F$ per m^2)		House cost (F$)	
	Urban	Rural	Urban	Rural	Urban	Rural
Concrete						
Timber frame/ wood						
Timber frame/ tin iron						
Bure						
Makeshift/ other						

Note: The PDNA team, if required, should change the above typologies suitable to the local context. All costs are just before the disaster.

As mentioned in section 3, a house consists of six components:

1. A plot of land
2. Rooms with adequate light, ventilation and thermal comfort
3. Adequate quantity and acceptable quality of drinking water
4. Hygienic toilet with septic tank/pit
5. Electricity
6. Solid and liquid waste disposal system

When a disaster strikes a place, it may partially damage the six components of a house or may totally destroy the house and the attached services. Even the household assets, such as furniture, other gadgets and stored food grains are affected by a disaster.

One of the most crucial aspects of damage assessment is to acquire data on the number of buildings affected by a disaster. The extent of the damages is expressed in terms of the percentage of its pre-disaster replacement cost. For example, a 50 percent damage means that the cost of damage

would be half of the pre-disaster replacement cost of a building. Fiji used to broadly categorize building damages into two:

1. Partly damaged
2. Destroyed

A recent assessment has introduced the following scales of damage:

- <25 percent
- >25 percent to <50 percent
- >50 percent to <75 percent
- 75 percent to 100 percent

There is an opportunity for the national Shelter Cluster to review and further define and harmonize these damage categories (refer to Appendix 3,, item number 15). However, exact values between the ranges, e.g. 62.5 percent damage (category >50 percent to <75 percent) should be decided during a PDNA in consultation with the Government of Fiji.

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The damages of buildings and services could be categorized as follows (refer to Table 4.2 for details of damage classification):

- For all houses of >75 percent to 100 percent damage, the damage cost will be the corresponding current replacement cost of the different structural typologies, e.g. concrete, timber frame/wood, timber frame/tin iron, *bure*, tent/other types.
- For all the substantially damaged (>50 percent to <75 percent) houses, the damage cost would be an average cost of 62.5 percent of the current replacement cost by the typologies mentioned above.
- For all the moderately damaged (>25 percent to <50 percent) houses, the damage cost would be an average cost of 37.5 percent of the current replacement cost by the typologies mentioned above.
- For all the minorly damaged (<25 percent) houses, the damage cost would be an average cost of 12.5 percent of the current replacement cost by the typologies mentioned above.
- For all damaged cattle sheds, the damage cost would be current replacement cost of the existing structural type.

For all water, sanitation and hygiene (WASH) components inside the house, the damage cost would be based on the damage category of the house (e.g. 100 percent/62.5 percent/37.5 percent/12.5 percent).

Note: There could be some buildings that did not suffer any damage in the current disaster, but found to be vulnerable to future disasters. For such buildings, the cost of upgrading them to the standard of BBB should be calculated as a loss under the category of increased vulnerability. However, they should be included under the recovery as a mitigation measure by categorizing them under reconstruction, repair or retrofitting.

Table 4.2: Damage categories and cost

Grade	Damage description	Replacement cost as per pre-disaster market rate (%)
G1	Minor damage (no structural damage, slight non-structural damage)	<25%
G2	Moderate damage (slight structural damage, moderate non-structural damage)	>25% <50%
G3	Substantial damage to heavy damage (structural and non-structural)	>50%<75%
G4	Very heavy damage/destroyed	>75% up to 100%

Note: The above damage classification has been provided by the Government of Fiji in August 2023 (Appendix 2).

Table 4.3 shows the format for data collection on the damage categories of five housing typologies found in Fiji. While this data should be acquired from the respective government department, the PDNA team needs to cross-check such data during the field study. They should carry the damage table of the particular place which they would visit. The PDNA team needs to split during the field visits to cover a wider area to assess the extent of accuracy of the damage data since the data collectors' capacity of interpretation would vary from person to person. However, the main aim of the PDNA team would be to provide a credible and useful estimate of the extent of the effects rather than maintaining utmost accuracy. This will form the basis for developing a realistic recovery strategy.

Table 4.3: Province-wise damage pattern of housing – Fiji

Serial no.	Province name	No. of concrete buildings				No. of timber frame/ wood buildings				No. of timber frame/ tin iron buildings				No. of bure				No. of makeshift/ others
		Very heavily damaged/destroyed (>75% to 100%)	Substantially damaged (>50% to <75%)	Moderately damaged (>25% to <50%)	Minor damage (<25%)	Very heavily damaged/destroyed (>75% to 100%)	Substantially damaged (>50% to <75%)	Moderately damaged (>25% to <50%)	Minor damage (<25%)	Very heavily damaged/destroyed (>75% to 100%)	Substantially damaged (>50% to <75%)	Moderately damaged (>25% to <50%)	Minor damage (<25%)	Very heavily damaged/destroyed (>75% to 100%)	Substantially damaged (>50% to <75%)	Moderately damaged (>25% to <50%)	Minor damage (<25%)	Destroyed/partially damaged

The total damage cost would be calculated based on Table 4.4. From Table 4.3, obtain the number of different categories of damages for the five housing typologies and place in column C of Table 4.4. The unit cost in column D of Table 4.4 should be obtained from Table 4.1. The cost of damage for every damage type would be calculated as E = C × D (Table 4.4). This way, the total damage cost would be calculated in Table 4.4.

Table 4.4: Cost of damage to housing

A	B	C	D	E
	Damage	**No.**	**Unit cost**	**Amount**
Urban	Concrete (>75% to 100%)			
	Timber frame/wood (>75% to 100%)			
	Timber frame/tin (>75% to 100%)			
	Bure (>75% to 100%)			
	Concrete (>50% to <75%)			
	Timber frame/wood (>50% to <75%)			
	Timber frame/tin (>50% to <75%)			
	Bure (>50% to <75%)			
	Concrete (>25% to <50%)			
	Timber frame/wood (>25% to <50%)			
	Timber frame/tin (>25% to <50%)			
	Bure (>25% to <50%)			
	Concrete (<25%)			
	Timber frame/wood (<25%)			
	Timber frame/tin (<25%)			
	Bure (<25%)			
	Damaged makeshift			

A	B	C	D	E
	Damage	**No.**	**Unit cost**	**Amount**
Rural	Concrete (>75% to 100%)			
	Timber frame/wood (>75% to 100%)			
	Timber frame/tin (>75% to 100%)			
	Bure (>75% to 100%)			
	Concrete (>50% to <75%)			
	Timber frame/wood (>50% to <75%)			
	Timber frame/tin (>50% to <75%)			
	Bure (>50% to <75%)			
	Concrete (>25% to <50%)			
	Timber frame/wood (>25% to <50%)			
	Timber frame/tin (>25% to <50%)			
	Bure (>25% to <50%)			
	Concrete (<25%)			
	Timber frame/wood (<25%)			
	Timber frame/tin (<25%)			
	Bure (<25%)			
	Damaged makeshift			
	Cattle shed (>25%)			

A	B	C	D	E
	Damage	No.	Unit cost	Amount
WASH	Drinking water + overhead water tank + toilet + pit/ septic tank within the household plot (>75% to 100%)			
	Drinking water + overhead water tank + toilet + pit/ septic tank within the household plot (>50% to <75%)			
	Drinking water + overhead water tank + toilet + pit/ septic tank within the household plot (>25% to <50%)			
	Drinking water + overhead water tank + toilet + pit/ septic tank within the household plot (<25%)			
		Total damage cost		

Sources: Estimation by the assessment team should be based on official information.
Note: The table should be prepared in consultation with the Government of Fiji and the format modified to fit the context.

4.2 Losses (changes in economic flow)

Due to a disaster, there would be changes in economic flows with respect to the pre-disaster situation. This change should be measured in current values (just before disaster). One such loss could be due to damaged or destroyed household goods, which is difficult to calculate because of the lack of reliable average data. In a post-disaster situation, field observation coupled with interviewing people, NGOs and government staff at the village level could be a basis for carrying out a rough estimate of the loss of household goods. Because of the disaster, the following types of losses linked to housing could happen:

- People who lost their houses may lose their daily earning because they cannot work anymore.
- There may be the need for the government or people to build temporary shelters.
- There could be rental loss from the homeowners.

Some such effects may continue to exist and losses should be calculated until the projected full recovery is achieved.

4.2.1 Effects on delivery and access to goods and services (losses)

In any country, facilitating housing construction, repair and retrofitting is done by the industry producing construction materials and equipment. There are also locally available materials, which are used both in modern and traditional construction. Access to finance is another important component in housing. The skilled and unskilled construction workers, along with the support of architects, engineers and contractors, are needed to implement the construction process. There is a supply chain link to facilitate goods and services in housing construction.

> **The assessment of change in economic flows due to a disaster should be assessed based on comparing the construction sector's pre-disaster capacity and the post-disaster demand. It is necessary to introduce temporary interventions to mend any gap until complete recovery is achieved.**

A disaster temporarily disrupts the pre-disaster supply chain of goods and services in the housing domain. The assessment of change in economic flows due to a disaster should be assessed based on comparing the construction sector's pre-disaster

capacity and the post-disaster demand. It is necessary to introduce temporary interventions to mend any gap until complete recovery is achieved. The recovery assessment should provide the time frame for such interventions (e.g. temporary shelter) indicating the duration and phased discontinuation of any such temporary schemes for the normalization of the sector. The following change in economic flows are typical of the housing sector:

Temporary shelter

Disaster may render families temporarily homeless because of their destroyed houses or those that are unsafe or in an unlivable condition. Tropical Cyclone Winston in February 2016 wreaked havoc, leaving approximately 131,000 Fijians homeless. The cost of accommodating such families in temporary shelters, hosted accommodation and making damaged buildings habitable until they get back to their new/restored houses should be estimated as loss. The cost of temporary accommodation should include the related building services such as electricity, drinking and wash water, toilets, etc. Costs of temporary accommodation and services are generally calculated on the basis of average area in square metres and the unit cost of construction of each item.

In Fiji, significant quantities of building materials are imported from neighbouring countries. In a post-disaster situation, there would be an increase in the overall construction cost, which can result in long waiting periods before a house can be assembled. This would increase the recovery time and costs. According to Esler (2016), over and above the normal framing timber requirements, the short-term housing reconstruction caused an immediate shortfall of 10,000 metres cubed (m^3) treated framing timber. The difference in pre- and post-disaster import cost could be calculated per house by multiplying the change in cost and the number of housing units.

The number of required temporary shelters should be calculated based on the number of families who have lost their homes, and not the number of dwellings destroyed (which may have housed more than one family per unit). This is important since a temporary shelter is meant for one family per unit.

Rental loss

During Cyclone Winston, private households suffered the largest loss. Prior to the cyclone, they had rented out one or more rooms to supplement their household income. Considering a rental of F$200 per month per room in 2016, assuming that the households took 24 months to rebuild (including an additional room for rental purposes), a loss of household income of F$13.9 million was estimated.

Debris: Demolition and removal

Debris costing involves the cost of demolition and safe removal, which depends upon the type and intensity of the disaster and the structural resilience of the buildings and services. This cost is different from the cost of building component demolition or debris removal, which is initiated right after a disaster when an immediate rescue operation is carried out to locate, rescue and assist victims. Costing of demolition and debris removal is highly variable since it depends upon the types of structures, materials used, location, equipment, human resources, method of demolition, transportation, and recycling or safe disposal. Apart from the debris of the collapsed buildings, landslides and floods bring in large quantities of boulders, mud, etc.

Costing of debris is done based on volume and unit cost. A rough estimate of debris related to a collapsed building could be based on the volume of materials consumed by a representative housing typology. The volume of materials in a collapsed building would be more than their stacked form. Hence, during the field visits, a percentage increase of volume of materials would be assumed based on visual judgement to match the actual volume of debris. The unit volume should be multiplied by the number of affected buildings due to the disaster.

The unit cost of debris per building should be calculated by including the cost of equipment and human resources for demolition, transport, and safe disposal or recycling of the debris. Costing of debris should be carried out by housing type (volume per house × unit cost × number of affected buildings), and then summed up to get the basic cost of debris clearance. The overall management cost and cost of hiring demolition experts should also be accounted for in costing of debris clearance. Families affected by the Winston cyclone faced the enormous task of salvaging materials for repairing and rebuilding their homes, and stockpiling the remaining debris for subsequent collection and safe disposal by the authorities.

Relocation of dwellings

It has been observed that people generally do not like to be relocated for many reasons (e.g. socio-economic). However, some of them might reconsider relocation as an option if they experience repeated disasters resulting in, among others:

- Unhealthy indoor conditions
- Loss of working days
- Loss of household assets and food grains

While the affluent households can deal with such situations, the economically weaker households do not have the capacity to cope with the loss and may fall into the poverty trap. They may want to relocate. Consultation with the affected people during field visits would reveal whether they would like to relocate and if they do, what options of relocation would be socioculturally acceptable to the affected people.

The cost of relocation should not include the cost of evacuation incurred during the emergency stage. It should be based on the:

- Value of the relocation land
- Infrastructure cost: access road, water, sanitation, power, telecommunications and related basic services
- Cost of settlement planning
- Cost of transporting household goods to new location: furniture and equipment, etc.
- Cost of new dwellings

The total relocation cost should be calculated under the individual heads or, alternatively, in terms of the overall cost of relocation per housing unit multiplied by the number of households to be relocated.

4.2.2 Effects on governance and decision-making processes

As per the market demand survey done by the Housing Authority of Fiji in 2013, the demand for housing units in Fiji was 18,948, most of which (16,816) were in the Central Division. The PRB of Fiji had a waiting list of around 4,600 units. Overall, Fiji's housing stock is largely (90 percent) in private ownership (Esler, 2016). Appendix 1 shows the building tenure types according to the 2017 Population and Housing Census (Census 2017). The housing needs of people living in poverty who live in urban areas is where government efforts were found to be inadequate. One of the main reasons for that was a rapid growth of squatter settlements. The NHP of Fiji informs that an estimated population of 60,000 people comprising nearly 15 percent of the urban population were believed to live in about 200 squatter settlements. Squatters were a major source of unskilled labour in the industrial section of Suva.

The previous paragraph shows the housing gap that existed during the post-Winston PDNA (Esler, 2016). The vision of the NHP of Fiji is: "Affordable and decent housing for all, the key to building better communities". To achieve the NHP's target, Fiji has its own system of governance, decision-making process, implementation policies and enforcing regulations that are highly engaging. In the case of a disaster, the ability of the governance system and the decision-making process of Fiji to respond to the emergency and plan for a medium- and long-term recovery will be adversely affected due to the sudden increase in housing demand. Such effects on the existing governance structure and processes caused by a disaster can lead to economic costs that can be summarized as the following.

- In a post-disaster situation, there may be a need for establishing a cell/unit within the existing top-level management system for dedicated actions to implement the housing recovery. This would require additional cost, which would be withdrawn upon completion of the recovery process.
- The government documents and baseline data (paper or electronic) on housing, land and settlements may be damaged due to the disaster. These documents form the basis of damage assessment and recovery planning. Additional expenditure would be required to mend the situation.
- The local government staff involved with the routine housing supply, maintenance, rental, building permit, housing loan, etc. would be busy in the post-disaster situation since they have to immediately respond to the crisis situation by carrying out immediate safeguard measures,

supporting the affected people and other stakeholders, carrying out impact assessments, etc. Additional cost would be required for transport, equipment and other logistics.

» Loss of staff would disrupt key decision-making, policy and strategy formulation and coordination in the housing sector.

» The NGOs, communities and other civil society organizations generally work in parallel with the authorities to assist vulnerable members of the population (older persons, women, girls, people with disabilities, people who are ill) to access services. This would be disrupted by a disaster and would require financial assistance to return to their pre-disaster capacity/ability to address the social cause (housing).

4.2.3 Effects on increased risks and vulnerabilities

In a disaster-affected area, the PDNA team should identify the pre-existing vulnerabilities and factors that contributed to damage and loss in housing during the current disaster. Focused study on this aspect and field visits would provide an idea on these factors. A place affected by disaster (caused by a particular hazard) may have the risk of other potential hazards, such as flood, landslide, etc. These may get triggered by an approaching rainy season with possibilities of further cyclones and floods, leading to greater housing loss if certain measures/actions are not implemented in a timely manner. This would adversely affect the recovery process. Therefore, it is important to assess such possibilities and take additional measures.

Reaching the affected people's doorsteps right after a disaster is crucial. Any delay in this would lead to increased multiple risks and vulnerability of the affected people. Past experience of a PDNA revealed that due to the delay in reaching the people with techno-managerial support, the affected people started repairing/rebuilding their damaged structures in the same way (without BBB) as they used to do in the pre-disaster situation, resulting in increased risk. The following key indicators should be assessed to mitigate the increased risks and vulnerabilities:

» Identify the additional hazards and risks, including the sociopolitical risks and conflicts due to displacement and long-term stay in temporary shelters.

» Safety concerns of women and children in temporary shelters, lack of privacy and cramped living arrangements, and women and girls' heightened risk of sexual and physical violence.

» Older persons, people with disabilities and people living in poverty weak section would be especially vulnerable in temporary shelters.

» Safety risks related to the presence of severely damaged buildings and people occupying inadequately repaired houses that do not have BBB elements.

» Scarcity of safe drinking water, solid and liquid waste disposal from households may affect people's health, and lack of suitable toilets may lead to open defecation.

» An approaching rainy season associated with the possibility of flood and cyclone. Prioritized mitigation measures would be needed.

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The loss could be assessed by calculating the cost of interventions to mitigate the increased risks and vulnerability in future hazards. In housing, this is based on effects costed for infrastructure, enhancing the capacity of human resources, and the administrative and institutional capacity to respond to disaster or implement risk reduction. The existing knowledge gap among engineers, architects, construction workers, etc. can be addressed by capacity-/awareness-building and outreach. Table 4.5 shows the format for calculation of loss. Table 4.6 shows the format for calculating the total cost of damage and loss caused by a disaster.

Table 4.5: Estimation of loss

Reason for change in economic flow	Description	Cost component	Value
	Temporary shelter	Average cost per household	
Disruption: Goods and services	Removal of debris	Machineries, labour and transport	
	Rental loss and rental fee waived	Average monthly rentals for different income groups	
	Provision of electricity, water to temporary facilities	Cost per month	
Disruption: Governance	Additional cost of coordination (temporary)	Average cost per affected areas on staff and resources to respond and manage recovery process including community participation	
Risks	Cost for response and recovery management		
	Cost of awareness campaign for BBB		
	Other costs		

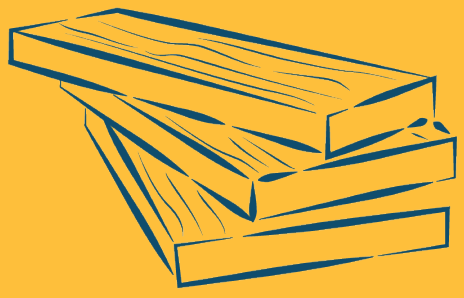
Note: Modify the table to suit the context.

Table 4.6: Estimated damage and loss caused by a disaster in F$

Items	Damage	Loss	Total	Import component
Very heavily damaged/destroyed (>75% to 100%)		Not applicable		
Substantially damaged (>50% to <75%)		Not applicable		
Moderately damaged (>25% to <50%)		Not applicable		
Minor damage (<25%)		Not applicable		
Drinking water+ overhead water tank + toilet + pit/septic tank within the household plot (>75% to 100%)		Not applicable		
Drinking water + overhead water tank + toilet + pit/septic tank within the household plot (>50% to <75%)		Not applicable		
Drinking water + overhead water tank + toilet + pit/septic tank within the household plot (>25% to <50%)		Not applicable		
Drinking water + overhead water tank + toilet + pit/septic tank within the household plot (<25%)		Not applicable		
Debris clearance	Not applicable			
Destroyed household goods	Not applicable			
Rental loss/waiver	Not applicable			
Temporary shelter cost	Not applicable			
Other costs	Not applicable			

Note: Estimation by the assessment team should be based on both official and private information.

5



5 Assessment of disaster impacts

Disaster impacts are the results or consequences of disaster effects. The consequences are assessed under two heads:

1. Macro and microeconomic impacts
2. Human development impacts

The impacts are viewed in terms of short-, medium- and long-term implications. The PDNA team has to work closely with the Ministry Finance, Strategic Planning, National Development and Statistics (for the macroeconomic analysis) and the Ministry of Social Development and Family Welfare and other related departments (for human development) to estimate the cost of the impacts of disaster effects at the macroeconomic level and the society.

5.1 Micro- and macroeconomic impacts

Economy is split into:

» Macroeconomy – how the overall economy works

» Microeconomy – how single markets function (Rodrigo, 2017)

In a post-disaster situation, it is important to identify, prevent and address the emergence of harmful macro and microeconomic imbalances that could adversely affect the economic stability of a particular area.

The macroeconomic impact assessment could be done by including an estimation of the disaster's likely effects on gross domestic product (GDP), the balance of payments, the fiscal sector and inflation.

For the macro and microeconomic analysis, the housing sector assessment team has to estimate the following and submit it to the appropriate experts in the PDNA team:

» Fiji is partially dependent on imported structural timber and other building materials to facilitate its regular housing supply and maintenance. Right after a disaster, the demand for imported materials would increase considerably.[3] The PDNA team has to calculate the amount of money required for importing materials for reconstruction for the housing sector and express it as a percentage of the total estimated reconstruction cost. This data would be used for macroeconomic impact analysis with respect to the balance of payments.

» After a disaster, the additional expenditure on temporary shelter, the cost of demolition and removal of debris, etc. would be over and above the government's regular budget for housing. This data would be used for the analysis of the macroeconomic impact on fiscal budget.

» There would be rental loss that private sector owners would suffer during the repair, retrofitting or reconstruction of the rented house damaged as a result of a disaster. This data would be used by the macroeconomists for the estimation of GDP impact.

» Households living in a rented house (microeconomic level): If a rented house has been destroyed/substantially damaged, the household may have to pay higher rent in a new place until the rented house has been reconstructed/repaired. This will impact the GDP.

» Occupiers who were previously owners (microeconomic level): If they are displaced, they have to pay rent in the new place of living, again impacting the GDP.

3 According to Esler (2016), approximately 38 percent of building materials will need to be imported over and above the normal framing timber requirements. The short-term housing reconstruction needs show an immediate shortfall of 10,000 m^3 treated framing timber.

» The PDNA team should calculate any higher cost of transportation spent by a household or its members during their temporary occupation of shelter camps or alternative housing arrangements (microeconomic level).

» In Fiji, women often derive income from within their homes. In Ra and Tailevu (Western and Central Divisions respectively), most women were engaged in mat and basket weaving at home (Esler, 2016, p. 76) prior to Cyclone Winston. After the cyclone, such economic activities came to a halt due to the destruction of houses, kitchens, raw materials and equipment. To assess microeconomic impact, the PDNA team has to calculate any loss of home-based entrepreneurship for livelihood and the cost of temporary arrangements to operate.

5.2 Human development impacts

The human development index[4] is a measure of a country's achievements in three basic aspects of human development:

1. Health (life expectancy)
2. Knowledge (years of schooling)
3. Standard of living

All three are closely linked with housing. Across the world, a house is considered to be an important asset to low- and middle-income households. A happy and productive family, living in a healthy house with school-going children, gets shattered when struck by a disaster. A disaster deteriorates every aspect of the human living condition including their productivity.

A home could be a source of livelihood. Home-based entrepreneurship for livelihood generation is common in many countries, e.g. growing fruits and vegetables within the plot, weaving, etc. As mentioned, most women in Ra and Tailevu were engaged in mat and basket weaving at home (Esler, 2016). Therefore, destruction/damage of shelter severely impacts people living in poverty and the vulnerable (especially small and marginal) households because they lose their place of living as well as face loss of income and employment. This increases the number of households below the poverty line and may have a lasting impact on socio-economy and human development, leading to socio-economic inequality. Disaster-induced poverty will slow down the speed of achieving the Millennium Development Goals at the provincial and national levels.

The PDNA housing team should estimate the impact of a disaster on national and provincial poverty levels over time (for rural and urban areas). The team needs to revisit the existing criteria for determining poverty level. To estimate the human development impact of a disaster, the following should be assessed:

» A key indicator in impact assessment of human development is the proportion of household income that it (the household) spends on house- and housing-related activities. The pre- and post-disaster data would enable the housing team to calculate this difference.

» With reference to pre-disaster data on households living in sub-standard conditions, the assessment team would calculate the increase in such number due to the disaster. The percentage increase in the number of such households would be an indicator of the human and social impact of the disaster. This increased number would help calculating the additional time, money and human resources needed to achieve the Sustainable Development Goals at the provincial and national levels.

» The PDNA housing team should analyse the performance of pre-disaster human development components based on the pre-disaster baseline data/information:

- Human development trends
- Key challenges
- Salient features of the implemented policies.

4 See https://www.who.int/data/nutrition/nlis/info/human-development-index

Based on the analysis, forecast how the human development performance would be in future had the disaster not occurred. In the PDNA report state clearly all the assumptions in such projections.

» Identify the worst affected areas and prioritize those households that have suffered the highest human impact or poverty. This would help with the adjustment of national development plans, poverty reduction strategies and social protection programmes.

» Analyse how the impact on humans may influence the achievement of national Sustainable Development Goals targets and policy considerations.

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6 Cross-sectoral linkages

Housing is not just about buildings. Every household needs electricity, water, sanitation, access roads connecting schools, hospitals, etc. Quite often, after a disaster, households suffer due to the disruption of water and electricity supply, and sometimes access roads (due to street flooding). Snapped gas pipelines may lead to fire. The housing sector would provide important inputs to the five stand-alone sectors (mentioned below) of a PDNA exercise. For example, employment generated by the reconstruction and retrofitting works would be an important input to the livelihood sector. The quantities and types of debris generated due to house collapse would be important to the DRR sector. Therefore, housing has its linkages with the other sectors of a PDNA. While carrying out a PDNA, the housing sector team should connect with the related sectors as well.

> **There are human issues in a post-disaster situation beyond buildings.**

For example, the earning member of a female-headed household who works in an informal sector may become unemployed if the enterprises she works in have been totally or partially destroyed as a result of the disaster. The number of such households should be prioritized in recovery. The following are the areas of typical linkages with the housing sector that must be looked into and should be highlighted in housing sector report.

6.1 Culture

Each society has its own language, religious belief and family structure, which must be respected in the recovery interventions. Communication plays a very important role in a post-disaster situation where the responsibilities of the government and the people should be clearly articulated with the affected people to avoid any misunderstanding that may lead to conflict. Communication should follow local culture and be language-sensitive. The layouts and designs of the houses should be through a participatory process by involving the affected people, particularly women and people who are vulnerable and marginalized, to make recovery suitable to the people's pattern of living and culture. Traditional architecture is an important part of culture and hence, the PDNA team should ensure its continuity in the recovery, alongside suggesting cement- and steel-based houses.
Too much focus on cement-based new building construction in some places after the 2015 Nepal earthquake drastically changed the visual landscape of the earthquake-affected areas and left the people deprived of the rich cultural and traditional heritage in which they lived (UNDP, 2021, p. 60).

Fiji has a very strong cultural heritage of its vernacular plan layout and building technologies (*bure*), which must be taken into consideration in recovery planning (refer to Appendix 2). *Bure* is a socially-acceptable building form evolved holistically over a long time. It is a cultural icon of Fiji and has performed well in the past in moderate cyclones. *Bure* should be revisited in light of the NBC and upgraded to the present NBC provisions of safety. People's participation in the design development process would make the reconstruction socio-economically, culturally and ethnically relevant, and would make the recovery a catalyst for the cultural continuity of Fiji's own architecture.

6.2 Gender

A very important component of post-disaster intervention would be to ensure that the recovery is equitable and just, and that women's voices are heard. Women and men should be equal partners in the participatory decision-making processes in planning, design, implementation, monitoring and control of the post-disaster recovery. There is tremendous potential for women to get involved in reconstruction, which would enhance their skills and enable them to earn their livelihoods even after the end of recovery.

Many families affected by Tropical Cyclone Winston were constrained to live in temporary shelters until

the time they can move back into their reconstructed houses. Esler (2016, p. 76) informed that the cramped living conditions, lack of privacy for women in the temporary shelters or while living with extended families or friends can put women and girls at a heightened risk of sexual and physical violence. Therefore, the PDNA team should consider the safety and privacy issues of women and girls while designing temporary shelters.

6.3 Livelihood

Disasters almost always have negative impacts on people's livelihood.[5] It reduces their ability and opportunity to support their families. Sometimes, it may take a couple of years to restore the pre-disaster conditions, especially in places where disasters occur frequently, e.g. in coastal Bangladesh and India.

Reconstruction, repair and retrofitting under the recovery programme would create a variety of livelihood opportunities for local people. The PDNA housing team should calculate the total number of working days of the skilled, semi-skilled and unskilled workers required for the recovery. The PDNA team should explore the possibility of engaging women in construction work, which could be an opportunity for their skill-building and income generation. This data would be useful for the livelihood sector.

6.4 Environment

After a disaster, debris from collapsed houses include crushed/broken building materials, appliances and electronic items, vegetal waste, soils and hazardous materials such as asbestos, dust particles and chemicals. The PDNA team should carry out a rough estimate of the quantities and types of the debris. In building and other infrastructure design, the team should suggest maximization of the use of recycled construction materials to reduce negative environmental impacts. These data would be important to the DRR team.

For sustainable development, there is a strong need for environment-sensitive housing. A building designed without environmental considerations would have negative impact in terms of depleting natural resources, embodying non-renewable energy, emitting carbon dioxide, etc. Without adoption of the right building orientation, appropriate walling, roofing materials and window size, a house would be thermally uncomfortable with inadequate indoor illumination. Hence, there is a need for adopting a green approach to housing. Greenness could be achieved by adopting correct building orientation as well as appropriate materials and technologies.

Designs should be appropriate to the local culture and geo-climatic conditions, which are comfortable, based on locally available materials and capable of creating green jobs. Green housing is resource-efficient throughout its whole life cycle with optimized use of natural resources, energy and materials. In recovery, the PDNA team should suggest efficient water use by installing showers and low-flow taps for kitchens, toilets and bathrooms, double-flush toilets, etc. The team should promote renewable energy, such as solar energy and reuse/recycling of resources. Green buildings reduce the operational cost on lighting, ventilation, etc. On the whole, green housing supports healthy, happy and more productive lives of the occupants.

Various actions to achieve greenness (discussed above) should be incorporated in the recovery. The additional cost of recovery to achieve greenness would be on account of promoting production of green materials, seeking alternative energy sources, skilling people in new technologies and awareness-building of homeowners. Suitable incentives might be proposed to promote this concept. The PDNA team might suggest the use of green technologies and designs based on local and renewable materials.

Immediately after a disaster, low-income households may attempt to temporarily protect the roof and walls against rain, cold, wind, etc. until the recovery interventions are implemented. The PDNA team should take note of these types of temporary materials such as plastic (United Nations India, Asian Development Bank and World Bank, 2019, p. 146) and check if they are detrimental to the environment. The cost of reuse and safe disposal of such harmful materials should be assessed.

5 See https://interconnectedrisks.org/impacts/loss-of-livelihoods.

The building and construction sector have a significant contribution to global emissions,[6] with a major source being the production of cement, steel, brick, glass, etc. Climate change mitigation strategies in housing are focused on lowering the carbon footprint. The use of local materials in housing would reduce carbon dioxide emission.

The PDNA housing team should assess the total emission of carbon dioxide due to reconstruction, repair and retrofitting under recovery. If less carbon-intensive materials (compared with brick, cement, steel) are available locally, the PDNA team should assess the approximate savings in carbon dioxide emission and suggest adoption of that in the recovery programme. Such assessment would be approximate and any assumptions should be clearly stated in the report. Appropriate awareness campaigns, promotions and incentives should be taken into account to encourage the affected people to use green housing.

6.5 Disaster risk reduction

Sustainable housing must be risk-informed. The main objective of DRR in housing is to ensure that the reconstruction and retrofitting under recovery are resilient. The PDNA housing team should carry out the pre- and post-disaster situation analysis to understand the reasons for building failure. There could be several reasons for that:

- Poor land use planning with respect to the intensity of hazard risk
- Lack of risk-based planning of settlement/housing colonies
- Not adopting appropriate disaster-related safety features in design and construction
- Poor quality materials and inadequate skill of construction workers
- Gaps in the existing building codes
- Poor maintenance of structures for prolonged periods
- Poor enforcement of regulations and lack of appropriate institutional mechanism for accountability in case of non-compliance

Based on the findings of the causes of building failure, the teams should examine if there is a need for policy revision for mainstreaming DRR through BBB. They should interact with the Ministry of Housing and the local government officials who enforce the building regulations building codes. They should also assess their capacity (technical and human resources) to support resilient housing construction. During a field visit, the team should interact with the homeowners to get their suggestions to improve pre-disaster building regulations and local building by-laws. The PDNA team should interact with local experts to get their opinions on the adequacy of the existing building codes and where the gaps are, if any (refer to Appendix 3).

BBB is an integral part of DRR. The objective of BBB in a post-disaster situation is to view the housing recovery as a scope for increasing resilience of the communities. It could be done by integrating DRR measures into the rehabilitation, reconstruction and retrofitting of damaged houses. Adopt appropriate design, material, skills and technologies that revitalizes livelihoods, economies and the environment. Community wisdom is a good resource for DRR. One important dimension of DRR is to carry out community-assisted vulnerability assessments to identify possible risks and what the remedial measures could be, based on people's past experience. Develop short-, medium- and long-term recovery interventions to ensure BBB.

The PDNA team should enquire if there is a provision for insurance to protect personal property and belongings, and whether such facilities are accessible and affordable to the people, especially low-income and vulnerable households.

6 The building and construction sector accounted for 36 percent of final energy use and 39 percent of energy- and process-related carbon dioxide emissions in 2018, 11 percent of which resulted from manufacturing building materials and products (Global Alliance for Buildings and Construction, International Energy Agency and United Nations Environment Programme, 2019).

7

7 Housing recovery needs and strategy

7.1 Recovery needs

Housing recovery needs are derived directly from the effects and impacts of a disaster. The recovery needs should be identified, quantified and then costed. The quantities of totally destroyed and partially damaged houses as well as the losses involved would be the premise of the housing recovery needs assessment. Additional components of the recovery are the actions to make housing resilient with BBB features, awareness- and capacity-building, and institutional strengthening. There is a need for triangulation of data/information on the damage and loss in housing (e.g. government data, private data, field visit, etc.).

The PDNA team should examine if there is a need for institutional strengthening/capacity-building for the planning and implementation of housing recovery. If it is found that housing damages were due to improper location, faulty design/construction or non-compliance with safety standards, it would be necessary to review the existing housing and rural/urban development policies, planning, building code and by-laws, and the capacity of the institutional structure from the ministry down to the local government. There may be a need for robust building regulations, system for building permits and quality control. This could be done by interacting with the top-, middle- and local-level officials as well as the homeowners. Institutional strengthening by capacity-building is an important component of recovery needs.

If the disaster-affected place is in multi-hazard zone, the reconstruction, repair and retrofitting must consider all the hazard risks and not limited to the current cause of the disaster. The architectural and structural design as well as the quality of implementation should be in compliance with the current NBC of Fiji, hazard maps and in particular safety against cyclone and flood, which are frequent. Recovery should be integrated with DRR measures built into it (Priority 4 of the Sendai Framework). Resilient development is possible only when the whole recovery team from the top to stakeholders at grass-roots level understand the philosophy of BBB. Therefore, training and awareness-building of all of them should be the top priority in recovery.

> **Before framing a system for integrating BBB with the recovery process, ensure that the suggested interventions are in line with the pre-existing national development and/or poverty reduction strategies.**

There is a need for an intersectoral meeting right in the beginning of the PDNA to avoid any kind of double counting of the recovery needs and costing. For example, the recovery needs of toilet and drinking water facilities within the house is under housing recovery. Any recovery needs of drinking water and toilets outside a house would be under WASH. In addition, there is a direct impact from damaged roads and bridges that could make the transportation of materials time-consuming and costly. In the context of Fiji, damaged jetties would make water transport difficult. The following should be the basis of recovery needs calculations:

- The total number of destroyed and partially damaged houses of different typologies would determine the quantities of reconstruction, repair and retrofitting needs. This need should be compared with the Fiji's capacity to respond to the disaster. Any deficit in this regard should be addressed under the recovery needs section.
- The need for introducing DRR measures in reconstruction, repair and retrofitting for resilient recovery.
- The need for relocation, if any.
- The need for reconstruction of destroyed and damaged services, such as drinking water supply, sanitation, electricity and waste disposal should be calculated. All these services within a house would be under housing recovery needs. The WASH sector would take care of the water and sanitation facilities, which are outside a house. The electrical works outside a house would be under the power sector. However, this issue has to be sorted out in consultation with the WASH and power sectors.

» Owner-driven post-disaster housing recovery has worked well in Nepal, Kerala (India), etc. If the PDNA team suggests owner-driven housing recovery in a post-disaster situation, it has to consider additional needs such as:

- Establishing housing facilitation centres (HFCs) to provide techno-managerial support at the doorsteps of the disaster-affected households
- Establishing small centres run by self-help groups for the production of affordable and environment-friendly materials based on local resources
- Training of construction workers, contractors and engineers on BBB

The quantities of such additional needs would be based on the number of damaged/destroyed houses, terrain conditions and the geographical distribution of the disaster-affected households.

» The need for restoring and strengthening the disrupted housing governance system for recovery, which could be in terms of additional human resources, capacity-building, equipment, etc. There might be a temporary need for additional time-bound strengthening of the existing governance system with skilled human resources to make the implementation feasible within the time frame. Civil society organizations can actively participate in the process.

Based on the above guidelines, housing reconstruction, repair and retrofitting needs to get back to the pre-disaster levels with BBB and DRR would be tabulated by the PDNA team as shown in Table 7.1. The PDNA team would also calculate the reconstruction, repair and retrofitting needs of toilet and drinking water supply, which are within the house. Based on the data in Table 7.1 and Table 7.2, the housing recovery cost would be calculated in Table 7.3.

Table 7.1, Housing recovery needs

	Total no. of houses	Concrete				Timber frame/ wood				Timber frame/tin				Bure				Makeshift/ other – damaged	Loss of land due to disaster
		G1	G2	G3	G4	G1	G2	G3	G4	G1	G2	G3	G4	G1	G2	G3	G4		
Ba																			
Bua																			
Cakaudrove																			
Kadavu																			
Lau																			
Lomaiviti																			
Macuata																			
Nadroga/ Navos																			

	Total no. of houses	Concrete				Timber frame/ wood				Timber frame/tin				Bure				Makeshift/ other – damaged	Loss of land due to disaster
		G1	G2	G3	G4	G1	G2	G3	G4	G1	G2	G3	G4	G1	G2	G3	G4		
Namosi																			
Ra																			
Rewa																			
Serua																			
Tailevu																			
Rotuma																			

Note: For damage categories G1 to G4, refer to Table 4.2.

Relocation of families: There may be places where the occurrences of disasters are frequent and cause destruction and damage of housing and services as well as disrupts livelihood. Low-income households do not have the capacity to cope with such recurrent situations because of their limited resources. Hence, there may be a need for relocation in such cases. Relocation is complex, time-consuming and requires money, land, infrastructure, etc. In general, people are found to be reluctant to relocate. There are many instances where relocation efforts have failed.

Relocation should be considered if exposure to the risk due to existing or potential area-specific hazards such as landslide, flood, etc. cannot be mitigated with reasonable means, or if there are immediate public safety issues. Relocation, if needed, should be based on the sociocultural and economic context, and it should be community-driven. Relocation may be feasible where people have already relocated or are in the process of relocation due to a disaster. However, government support and promotion are needed to move to a safer location for the settlement of people at risk. Relocation should be the last option in a housing recovery programme.

7.2 Recovery cost

Once the housing recovery needs have been identified and spelled out, as described in section 7.1, the PDNA team should calculate the costs of each and every recovery need. Cost of housing recovery should consist of:

- The physical aspects, such as reconstruction, repair and retrofitting.
- The soft support to the entire domain of institutional (both government and private) activities, such as planning, designing, implementation, monitoring, and control and emergence of a system that would support continuously resilient housing even after the end of the recovery process.

> **The domain of costing should be discussed with the interlinked sectors to avoid double counting.**

Cost of reconstruction and repair/retrofitting: The principles adopted for undertaking reconstruction, repair and retrofitting are outlined below:

- Reconstruct very heavily damaged/destroyed (>75 percent to 100 percent) houses of all typologies in line with BBB.
- Reconstruct all makeshift type shelters.
- Reconstruct damaged livestock sheds.

- Repair and retrofit substantially to heavily damaged (>50 percent to <75 percent) buildings of different housing typologies in line with BBB (excluding makeshift types).
- Repair and retrofit moderately damaged (>25 percent to <50 percent) buildings of different housing typologies in line with BBB (excluding makeshift types).
- Repair buildings with minor damage (<25 percent).
- Repair buildings of different housing typologies in line with BBB principles (excluding makeshift types).
- Reconstruct totally destroyed and severely damaged toilets and drinking water systems.
- Repair and retrofit partially damaged toilets and drinking water systems as per the damage categories G1 to G3 (<25 percent, >25 percent to <50 percent, >50 percent to <75 percent).

The unit cost of construction should be based on the government schedule of rates, market study, and interaction with local contractors and local artisans. The PDNA team should acquire construction cost from different sources and adopt the rates for reconstruction, repair and retrofitting in consultation with the concerned ministries. There is a need for calculating the cost of introducing BBB features separately to distinguish the unit cost of reconstruction between the high- and low-hazard risk zones of the country. In a post-disaster situation, the unit cost of reconstruction would increase due to the sudden rise in demand for materials and construction workers.

Resilience in housing could be achieved through appropriate site selection, design, construction and implementation.

However, resilience of a building would largely depend upon the quality of construction, which depends upon the skills of the people and techno-managerial support to the affected people, especially the vulnerable and marginalized households. There is also additional cost for institutional support for the whole cycle of recovery interventions, including media campaigns.

The next step of recovery cost calculation is to decide on the average covered area of a housing unit. Esler (2016) informs that:

- The median floor area of Fiji's houses is large – about 80 m^2 (concrete) and 60 m^2 (timber frame), which are incrementally developed by homeowners over a number of years. Appendix 2 (item 1) shows the minimum standard of housing in Fiji.
- The construction of about one room (15 m^2 floor area) should withstand a Category 3 wind speed.
- Like-for-like house replacement costs are around F$750 per m^2 for concrete houses and F$650 per m^2 for timber frame housing, equivalent to a median house value of F$60,000 (concrete) to F$40,000 (timber frame).

These are the 2016 costs. Hence, the PDNA team would need to use the current cost of reconstruction. In consultation with the Government of Fiji, the average covered areas of different housing categories should be determined. There is a need for calculating the reconstruction cost and area for rural and urban areas separately since they would be different. The costs should include BBB features and services such as electrical wiring.

Assumptions and sources of data that have been used as a basis for determining the cost of reconstruction, repair and retrofitting of the houses should be written down. The following steps should be adopted for calculating the housing recovery cost:

- Estimate the cost of reconstruction of a house based on the government-approved covered area with electricity (wiring + one fan + one lightbulb) and toilets in rural and urban areas.
- Reconstruction and design renewal cost of the livestock shed should be calculated based on the government-approved rate.
- Repair and retrofitting of partially damaged houses of different typologies should be in line with BBB principles. In addition, design renewal (architecture) of partially damaged buildings should also be considered for enrichment of the households' quality of living.

- Cost of totally destroyed toilets should be calculated with the area and unit cost of construction acceptable to the government.
- Repair/retrofitting and design renewal cost of partially damaged toilets should be calculated.
- Calculate the cost of running HFCs at convenient places to provide techno-managerial support at the doorsteps of the affected people (Table 7.2).
- Calculate the cost of establishing and running small production centres by self-help groups.
- Calculate the cost of training and awareness-building.
- The Government of Fiji would decide the strategy for reconstruction, e.g. whether the reconstruction would be as per the existing housing areas and typologies (like-for-like), or all of them should be of uniform structural type and area.

Table 7.2: Cost of running an HFC for the first XX months of the recovery period – short-term intervention

Items: Expenditure of the Housing Facilitation Centre	Unit cost	No.	Amount (million F$)
(Architects/engineers monthly salary + transport, communications) × XX months × number of HFCs			
(Technical assistants' monthly salary + transport, communications) × XX months × number of HFCs			
Capital cost/HFC × number of HFCs			
Communication: Awareness campaign, workshops, peer review, evaluation, etc.			
Add an overhead of 25% of the total cost of establishing and running of the HFCs			
Total amount			

Note: The post-disaster recovery period depends on the scale of damage and destruction of houses and the country's capacity to implement the recovery. In Nepal,[7] the post-earthquake (2015) recovery period was five years since the scale of damage was high and the terrain was difficult for reaching the affected people. In case of a five-year recovery period, the first 18 months would require intense technical support at the doorsteps of the affected people (short-term: 0–18 months, medium-term: 0–36 months, long-term: 0–60 months).

Table 7.3 shows how to calculate the recovery cost in a PDNA, which is an example only. In the case of a PDNA, each and every item of the table as well as the assumptions must be decided in consultation with the government and other important stakeholders. Since the cost of temporary shelters and resettlement are very much contextual, the PDNA team should calculate the quantities and the unit costs in consultation with the multiple departments and stakeholders during the PDNA exercise and add those to Table 7.3.

7 In the Nepal earthquake in 2015, nearly 500,000 houses were destroyed and more than 250,000 houses were partially damaged Nepal, National Planning Commission, 2005, p. 3).

Table 7.3: Housing recovery costs – based on the data in Table 7.1 and Table 7.2

	Recovery cost (urban + rural)	No.	Cost per housing unit (F$)	Amount (million F$)
RECONSTRUCTION	Reconstruction cost of houses under the >75% to 100% damage category: The Government of Fiji to decide the average covered area XX m^2 per household and structural typologies. XX could be like-for-like or of uniform standard. Reconstruct the damaged makeshift shelters, if the Government agrees. Urban: Cost per m^2 × XX × no. of housing units Rural: Cost per m^2 × XX × no. of housing units			
	Reconstruction of revitalized *bure** (>75% to 100% damage): Average covered area XX m^2 The Government of Fiji should encourage this under reconstruction for the continuation of Fijian architectural tradition, which needs incentives. Cost: Cost per m^2 × XX × no. of housing units			
	Reconstruction of livestock sheds: Average covered area XX m^2 Cost: Cost per m^2 × XX × no. of housing units			
REPAIR & RETROFITTING	Repair and retrofitting of houses with substantial to heavy damage (>50% to <75%) (like-for-like): Average covered area XX m^2 per household factor – (50+75)/2 = 62.5% Urban: Cost per m^2 × XX × no. of housing units × 0.625 Rural: Cost per m^2 × XX × no. of housing units × 0.625			
	Repair and retrofitting of houses with moderate damage (>25% to <50%) (like-for-like): Average covered area XX m^2 per household factor – (25+50)/2 = 37.5% Urban: Cost per m^2 × XX × no. of housing units × 0.375 Rural: Cost per m^2 × XX × no. of housing units × 0.375			
	Repair and retrofitting of houses with minor damage (<25%) (like-for-like): Average covered area XX m^2 per household factor – 25/2 = 12.5% Urban: Cost per m^2 × XX × no. of housing units × 0.125 Rural: Cost per m^2 × XX × no. of housing units × 0.125			

	Recovery cost (urban + rural)	No.	Cost per housing unit (F$)	Amount (million F$)
WASH	Reconstruct drinking water system + overhead water tank + toilet + pit/ septic tank within the household plot (>75% to 100% and >50% to <75%) Cost: Cost of one unit × no. of WASH units			
	Repair and retrofit drinking water system + overhead water tank + toilet + pit/septic tank within the household plot (> 25% to <50%) factor – (25+50)/2 = 37.5% Cost: Cost of one unit × no. of WASH units × 0.375			
	Repair and retrofit drinking water system + overhead water tank + toilet + pit/septic tank within the household plot (< 25%) factor – (0+25)/2=12.5% Cost: Cost of one unit * no. of WASH units * 0.125			
DEVELOPMENTAL COST	To ensure BBB elements in reconstruction, repair and retrofitting, calculate cost of: • Artisan's and carpenters' top-up training • Engineers' training • Toolkit gadgets, etc. including information, education and communication			
	Calculate cost of establishing small entrepreneurships for the production of precast reinforced concrete posts and frames of doors and windows, etc.			
	Expenditure of the HFC			
	Run by architects/engineers ➔ salary + cost of transport and communications in the early recovery period			
	Technical assistants of HFC ➔ salary + cost of transport and communications in the early recovery period.			
	Capital cost for establishing HFC			
	Add cost of institutional strengthening			
	Cost of communication: Awareness campaign, Workshops, peer review, evaluation, etc. and overhead about 25% of the developmental cost			
	TOTAL COST OF RECOVERY			Million F$

Note: This table is an example.
* Revitalized *bure* means upgrading it to the present standard of resilience. The PDNA team should include the cost of a temporary shelter. The team should also calculate the cost of relocation, including cost of land, infrastructure and transportation of household goods and people to the relocation site. All these should be done based on local conditions and government policy.

Table 7.4: Summary – cost of damage, loss (from Table 4.5 and Table 4.6) and recovery (Table 7.3) (million F$)

A	B	C	D	E	F	G
Summary of damage, loss and recovery	**Damage**	**Loss**	**Damage + Loss Columns B+C**	**Reconstruction, repair/ retrofitting cost**	**Developmental activity cost**	**Total recovery Columns E+F**
Housing sector	Million F$	Million F$	Million F$	Million F$	Million F$	Million F$

Consequences of recovery on socio-economy and the environment: Housing recovery would need huge quantities of resources, which would have an impact on building materials, livelihood, environment, gender and DRR. Such impacts should be assessed even if it is approximate:

- Impact of recovery on the supply chain system of building materials.
- Impact of recovery on livelihood and employment – reconstruction, repair and retrofitting are opportunities for employment generation.
- Impact of recovery on the environment in terms of carbon dioxide emission and depletion of natural resources.
- Impact of recovery on gender, social inclusion and DRR.

7.3 Sector recovery strategy

Housing recovery (reconstruction, repair and retrofitting) costs are derived from the effect and impact of a disaster, which have been shown in section 7.2. This section on recovery strategy shows how recovery needs could be fulfilled in a planned way by setting a time frame to get back to pre-disaster levels as soon as possible with enhanced resilience by including BBB and DRR in reconstruction, repair and retrofitting.

In Fiji, as elsewhere, a post-disaster recovery might require additional short-term or longer-term human resources to work on a mission mode since the line department staff may already be loaded with the existing housing as well as other projects and programmes. Key to the resilient housing is capacity-building of construction workers, engineers/ supervisors, contractors, etc. An in-depth study on the capacities of construction materials suppliers (imported and local) would help in planning and managing the reconstruction. Since women headed households, people with disabilities, people who are temporarily homeless and older persons have less capacity for coping, they should be included in the first phase of the recovery.

Sector recovery plan: Vision and guiding principles

The main objective of housing recovery is to ensure that the sector gets back to the pre-disaster level at the earliest. The PDNA team should ensure that the reconstruction, repair and retrofitting work under recovery are based on the principles of BBB and DRR. Apart from the buildings' compliance with the code of safety standards, capacity-building at the national level down to the community level on sustainable resilience and green housing should be embedded with the policy, strategy and other interventions. The recovery interventions should be planned to ensure that upon conclusion of the interventions, the capacity and institutional mechanism continues with the mission of green and resilient development in housing.

The post-disaster housing recovery period largely depends on the scale of disaster effects (damage and loss). After the Nepal earthquake (2015), the Kerala floods and landslides (2018) and the Odisha cyclone (2019), the recovery period adopted was five years. Based on the scale of disaster effects, the PDNA team

has to decide the recovery period in consultation with the government, and then identify and define the short-, medium- and long-term housing recovery interventions.

Relocation must be voluntary. People should be in the driving seat in housing recovery, based on participatory processes at every stage. Recovery should ensure that the vulnerable, marginalized, older persons, people with disabilities, etc. are all included and no one is left behind. The land tenure of people affected by disasters should be protected. In a post-disaster situation, the following should be considered to define the strategy for resilient housing recovery:

- The existing institutional system for housing delivery and maintenance, including the government and key private stakeholders.
- Existing policy and regulatory framework.
- Capacity-building at different levels of the institutional system from the top level to the community level.
- Land issues.
- Funding.
- Architectural design.
- Materials available.
- Construction workers' skills and availability.
- Construction technologies.
- Building codes and regulations as well as compliance mechanisms.
- DRR in settlement and reconstruction.

Immediate response

It has been observed elsewhere that people start repairing their damaged houses if there is a delay in reaching them right after a disaster, especially if monsoon season is near. This would increase future risks, and to avoid that, the intervention team has to reach the affected people as soon as possible.

The immediate intervention would be to form a cadre of technicians, expert masons and engineers who have prior experience in resilient construction and retrofitting. Such groups should have access to a convenient mode of transport (e.g. motorcycle/boat) to reach the affected households and provide techno-managerial support. The teams would reach out to the artisans at the site and provide hands-on training. This intervention team should reach the affected people within two to four weeks after disaster.

Role of line departments and other agencies

The line departments dealing with housing supply, maintenance, financing, etc. and other construction departments need to coordinate with each other for the procurement of materials and artisans for implementing the reconstruction work. For techno-managerial guidance at the doorsteps of affected households, monitoring and control, HFCs could be established in all the provinces to assist the affected homeowners in developing designs, sourcing materials and in ensuring quality control. All the work needs to be done in coordination with the NDMO. The roles and responsibilities of intersectoral agencies and development partners in housing recovery should be identified.

Stakeholders' consultation: The PDNA team would identify key partners from government, civil society, NGOs, INGOs, community leaders and others who may participate in a stakeholder consultation. The effects and impacts of the disaster should be discussed with the stakeholders, and their wisdom in reconstruction, repair, retrofitting and other social aspects should be utilized. It would also help in planning the short-, medium- and long-term interventions.

Social processes: It is important to understand the community dynamics for a successful implementation of housing recovery. Information in this regard could be obtained through semi-structured interviews with key informants, focus group discussions and direct observations of the pattern of existing human settlements. Local NGOs may be helpful for implementing the recovery since they may have the capacity to implement and have rapport with the community.

Economic and technical arrangements for reconstruction

The PDNA team, in consultation with the government, would decide who should be the nodal agency for all the reconstruction works in urban and rural areas. The new construction would be based on existing government standards for rural and urban areas, and the affected people will get the same degree of technical support, covered area per household, etc. to avoid social conflict and disparity.

To integrate BBB in the recovery process, there is a need for techno-managerial support at the doorsteps of the affected people. Apart from technical support for the reconstruction, repair and retrofitting, the HFC facilitators would also provide information on the ongoing governmental programmes to the households e.g. financial assistance, toilet and drinking water, solar lighting programmes, and also inform people what they are entitled to. This would make the people informed citizens and make the recovery transparent as well.

Design assistance (participatory process)

The home is the biggest asset of the people, in which all the three pillars of architecture (function, structure and aesthetics) should get equal importance in recovery. Housing recovery should be based on the people's aspirations and safe from multi-hazards.

> **By adopting participatory processes of design involving the affected people, a range of area-specific designs could be developed for the people and by the people. The designs and technologies should have the flexibility of incremental development.**

Women's participation in the design process is crucial. Approximate cost of the participatory design should be added to the recovery cost.

Construction materials and technologies

The reconstruction, repair and retrofitting work would need a significant number of basic materials, such as bricks, blocks, cement, steel, aggregate, sand, etc. Due to this sudden rise in demand, the cost of construction materials would increase. To avoid this situation, it may be prudent to set up small-scale units producing building materials that are run by self-help groups to partially fulfil the needs of the people. The products should preferably be based on local materials that are environment-friendly. This would help in environment protection and create local-level green employment opportunities. Fiji is rich in bamboo, which is a potential alternative to timber. However, the final choice of construction materials under the recovery would rest with the homeowners. The respective government engineering line department should take an audit of quantities of different types of construction materials available in the provincial markets of Fiji, which would help in the material procurement plan for recovery.

Skills upgrading

Every time there is a disaster, new knowledge is added to the process and production of housing supply. Therefore, skills upgrading is a continuous process. Recovery would need the skills of existing construction workers to be upgraded carrying out short-term top-up training on resilient features. There could be at least three categories of trainings:

1. Bridge course (recognition of prior learning) for new construction: The bridge course would be a top-up training for existing construction workers.

2. Multi-skilled technicians for resilient retrofitting: A multi-skilled technician is a person who has the skills of masonry, carpentry, plumbing and electrical all in one person. They would need training on resilient retrofitting. The multi-skilled technicians would serve as a one-stop shop for the people.

3. Special training might be necessary for traditional builders (*bure*) to enrich knowledge in resilient construction as per the latest NBC standards.

In a similar manner, administrative officers would require awareness-building on DRR. Engineers, architects, contractors and technicians would require technical training on BBB.

Implementation method

Based on past experience (e.g. the 2015 Nepal earthquake), it may be said that owner-driven housing recovery with technical support is a sustainable model for post-disaster reconstruction and retrofitting. However, reconstruction of houses for people with physical or mental disabilities, older persons, women-headed households, etc. would need government support as well as additional support from the HFC. The PDNA team should explore the possibilities of community-driven housing recovery since the traditional practice of community-based *bure* construction still exists in Fiji.

Housing financing

Financing is a crucial issue in post-disaster housing reconstruction. The PDNA team should interact with the appropriate ministries, donors and financial institutions such as banks to acquire information on the existing laws that provide grants to the affected people. In addition, households may need to access financial institutes to obtain loans for reconstruction, repair and retrofit of houses as per their aspirations. The economically weaker and marginalized households may not have the required assets and income to be eligible for accessing loans. The PDNA team needs to interact with related departments and ministries as well as study the traditional system of house-building to evolve a system as an alternative to the bank-based house-building loan system.

Monitoring and quality control

There is a need for a high-tech system for monitoring and control of the reconstruction work since high-quality construction and compliance with BBB would reduce frequency of maintenance and enhance the durability of buildings. The technical staff at ground level would use mobile phone-/drone-based systems for data collection, monitoring and control. The HFC would coordinate with the material suppliers and construction workers for the reconstruction, repair and retrofitting works.

Fiji's own resources on green design and technologies

Fiji has experienced a number of disasters in the past and the wisdom developed by the government, NGOs,

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INGOs and the people to deal with such events is rich. The post-Winston interventions in housing recovery had given good opportunities to a number of architects, engineers and construction workers to gain experience in the field of resilient housing. Many of them might be there in the country as a great resource who could be involved in housing recovery. *Bure*, the traditional house, has proved to be safe in moderate cyclones. The PDNA team should acquire data on previous experiences (e.g. post-Winston) of recovery and reconstruction within the private sector, and the current capacity of private construction companies, traders and producers of construction materials.

Fiji has resources such as engineering institutions that could be involved in recovery works. There should be convergence of such in-country resources in housing recovery.

> **Recovery should identify how a house could be built with local materials, cost-effective, disaster-resilient, environment-friendly and involve technologies that are resilient to climate change.**

The reconstruction programme has the potential to set an example of green development. These, in combination with alternative sources of energy and

use of rainwater harvesting, etc., would inculcate a culture of green housing in Fiji.

Additional support for recovery

HFC: Techno-managerial support to the affected people. As discussed earlier, the workload of the line department in housing would increase significantly due to the recovery programme. Therefore, the line engineering departments of Fiji would require additional support from the HFCs to ensure that the recovery is fast and resilient. A feasible option would be to appoint young engineers and architects for the short-term on a contract basis to establish HFCs so that its facilitators can work as a team with the line engineering department during the early phase of the recovery period (the first 18 months). After completing the housing recovery, the HFCs would continue to work in the sector, supporting private and government housing programmes. The facilitators would remain as human resources for future decades to come, thus helping create a resilient and eco-friendly environment.

Local-level entrepreneurship: In a post-disaster situation, it would be very important to take stock of the existing available material resources in the provinces of Fiji so that a comprehensive material procurement planning could be done. The stocktaking would help in understanding the scale of materials shortage and enable the government to device appropriate measures to mend the gap. To reduce the import of materials, the Ministry of Housing and the Ministry of Industry, Trade and Tourism might encourage establishing small-scale production yards run by self-help groups. These should be based on small machineries and would produce walling blocks, precast doors and windows, roofing elements, etc.

Implementation plan

Post-disaster housing recovery is typically discussed in terms of three phases: short-, medium- and long-term recovery. These phases are not independent. Instead, they complement one another and have considerable overlap. Depending on the severity of the disaster, recovery phases can be as short as a few days or as long as several months.

Reconstruction planning should begin with risk-sensitive land use and landscape management based on hazard risk assessments concerned with the ecological, social and economic sustainability at local levels. The following implementation plan is indicative only. It should be prepared by the housing team during a PDNA in consultation with key stakeholders.

Table 7.5: Implementation timeline – short-, medium- and long-term interventions for recovery

Serial no.	Period and task	Who does it	Expenditure on recovery
	Short-term (0–18 months)		
S1			
S2			
-			
	Medium-term (0–36 months)		
M1			
M2			
-			
	Long-term (0–60 months)		
L1			
L2			
-			

At the end of a housing recovery programme after a disaster, Fiji should emerge as a green and resilient society, with full preparedness to face all future hazards.

This could happen only if the interventions are socially appropriate and the affected people are involved at every step of the suggested strategies.

Priorities: The activities in Table 7.5 should be prioritized by the PDNA team. This table should be prepared by the PDNA housing team with input from the Government of Fiji. As an example, the following priorities have been put forward based on the experiences of conducting a PDNA in other countries:

- Reconstruction and retrofitting of houses owned by women, people with disabilities and other vulnerable groups.
- Establish HFCs at the earliest opportunity and make them operational.
- Conduct an audit of how many skilled and unskilled construction workers exist and where they are located (migratory and local). Also, carry out a skill gap analysis and implement BBB training in all the provinces.
- Prepare a procurement plan of the construction materials that are available in the provinces and assess how much imported materials should be acquired.
- Prepare a detailed construction management plan of the reconstruction work, along with human resources requirements and a mechanism for monitoring and quality control.
- Immediately establish a control room at the national level, networked with HFCs at the province level, for tight supervision and technical support to the HFC. The control room should be led by a professional project manager with computerized planning, scheduling, monitoring and control skills.

7.4 Key policy recommendations

To support the housing recovery in Fiji and to bring the sector back to normalcy by promoting resilience, the PDNA team has to put forward key policy recommendations. In reality, the housing team will put forward these recommendations towards the end of the PDNA exercise after having a sound understanding of the disaster effects, impacts and resources available in Fiji. The following policy recommendations are only meant to give an idea:

- **Multi-hazard maps to be in 1:5,000 scale** in order to make decisions on the buildability of safe structures
- **Construct livestock-safe places:** There is a need to refer to the international success stories and adapt the lessons in accordance with the context of Fiji.
- **Land and settlement planning**
  - Plantation within settlements (species in homesteads) and in periphery to be taken up on a large scale.
- **Building rules and enforcement**
  - In an owner-driven housing reconstruction process, certain rules and guidelines regarding good practices in housing need to be framed and enforced.
  - Strengthen enforcement mechanisms in all provinces with adequate staffing of regulatory agencies and capacity-building of regulatory staff members.
- **Suggested recovery interventions to BBB and integrate DRR and environment safety considerations**
  - Establish an enhanced techno-legal regime[8] that stems from the development of the hazard zonation maps at adequate scales, revision of building rules and capacity development of regulatory authorities.

8 Building regulations/by-laws provide the mandatory techno-legal framework for regulating building activity from planning and design to completion of construction.

- Build capacities on construction that is considered safe by the Ministry of Housing in the local building fraternity, including engineers, architects and artisans in all provinces.

- Constitute an expert committee at the national level to examine and certify green technologies to develop guidelines for construction.

- Every household in a hazard zone should be insured. Insurance agencies should train their inspectors to carry out multi-hazard risk assessments of buildings and calculate premiums accordingly. The premium for low-income households could be subsidized.

» **Relocation and resettlement planning**

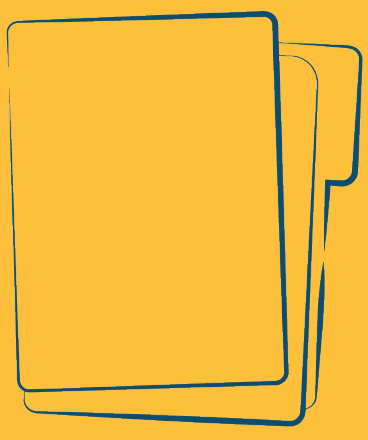
- People may be incentivized to move from hazardous zones to safety. Disincentives could be in terms of higher taxes or ineligibility for any relief or compensation in the event of future natural hazards.

- If “safe” land is not available for separate homesteads, a cluster housing approach may have to be considered. Some of the dwelling units should have an integrated assigned space to allow the residents to continue some of their small livelihood activities. Convergence with various governmental programmes for WASH, access roads, solar lighting etc. should be ensured.

» **Culture of alternative environment-friendly design and technologies**
Revitalize the *bure* and similar vernacular construction in light of the latest NBC. Adopt such structures in government buildings to encourage people

» **Monitoring and control**
Examine if the existing database management system of the Ministry of Housing of Fiji needs strengthening with adequate staff and capacity. Also, mobile phone-based applications should be developed for on-site data monitoring and acquiring data on progress and quality of the construction.

8



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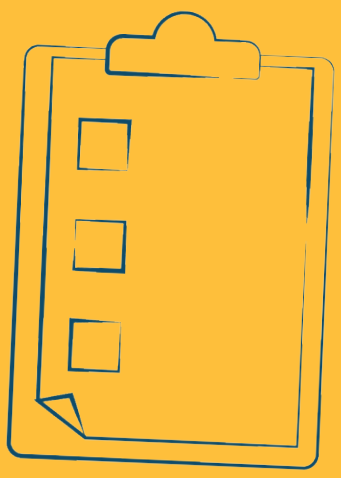
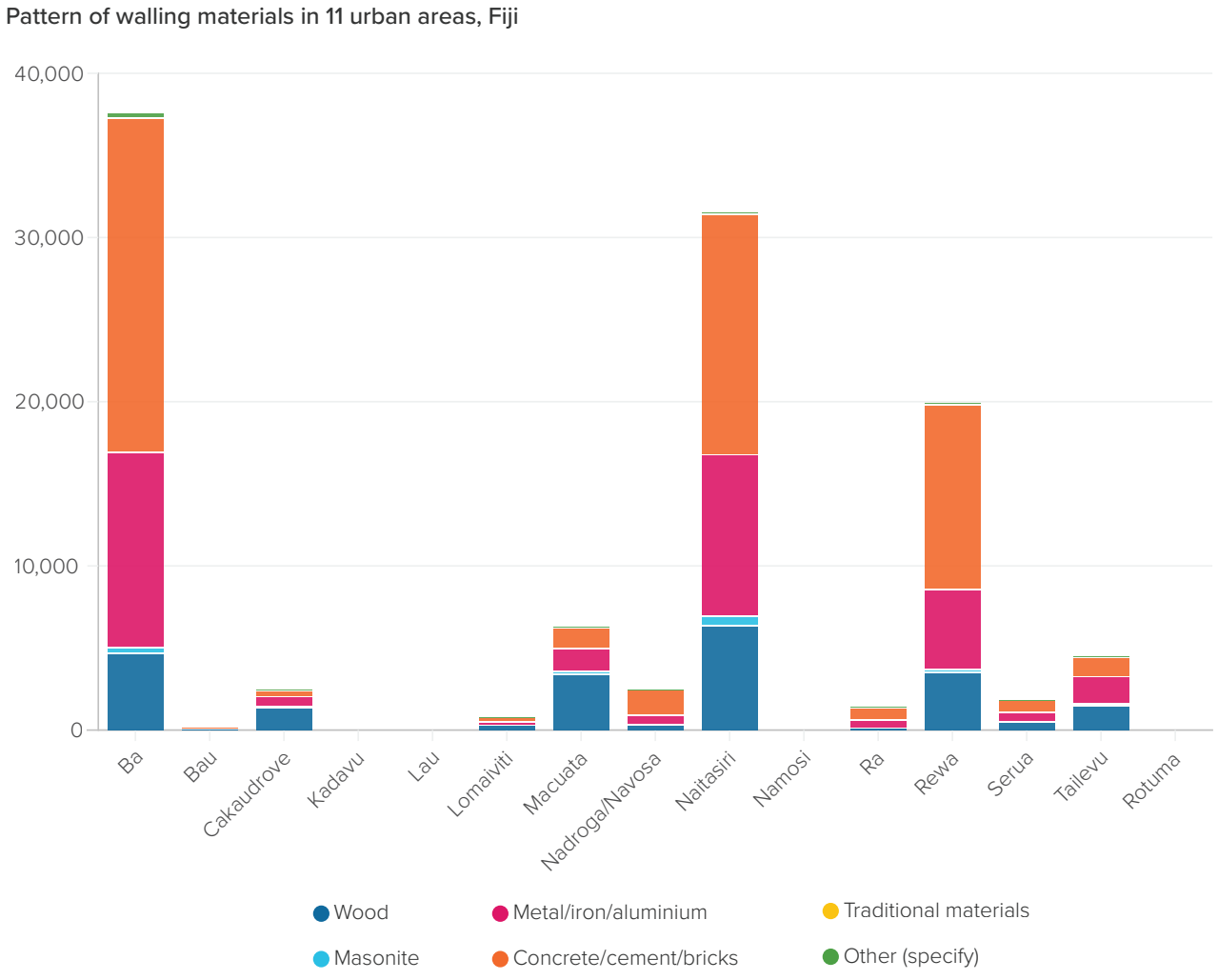


9 Appendices

Appendix 1: Pre-disaster context (Source: Census 2017, Fiji)

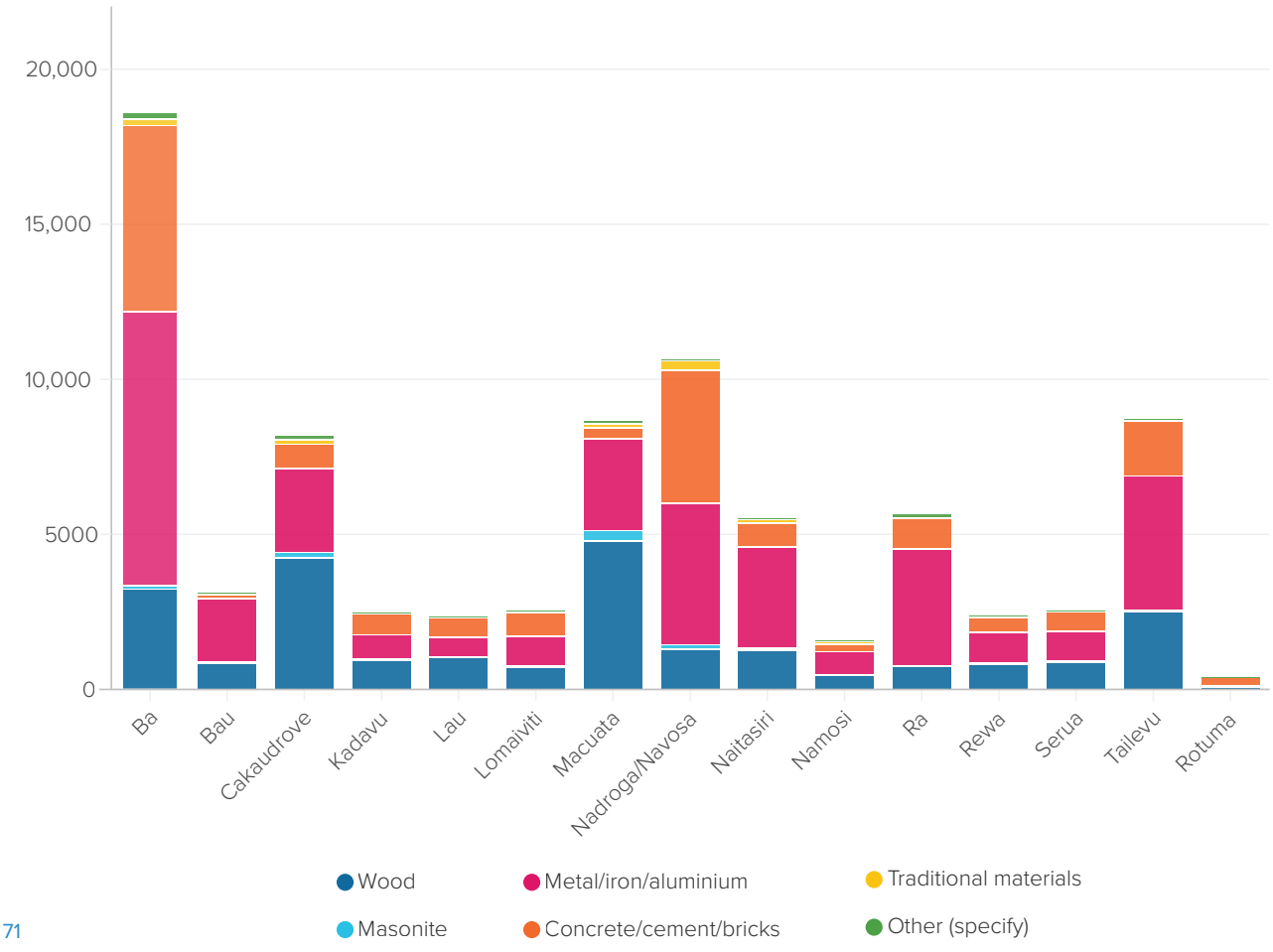
Figure 2: Walling materials in Fiji



Wall: Urban	Wood	Masonite	Metal/ iron/ aluminium	Concrete/ cement/ bricks	Traditional materials	Other (specify)
Ba	4,704	346	11,891	20,338	23	273
Bua	35	4	73	20	-	-
Cakaudrove	1,393	18	615	376	1	16

Kadavu						
Lau						
Lomaiviti	300	1	206	275	-	8
Macuata	3,423	173	1,355	1,292	6	16
Nadroga/ Navosa	304	14	566	1,557	10	1
Naitasiri	6,346	588	9,825	14,638	13	99
Namosi						
Ra	121	2	514	754	-	5
Rewa	3,527	169	4,883	11,242	13	60
Serua	473	13	576	734	1	3
Tailevu	1,504	70	1,677	1,202	-	30
Rotuma						

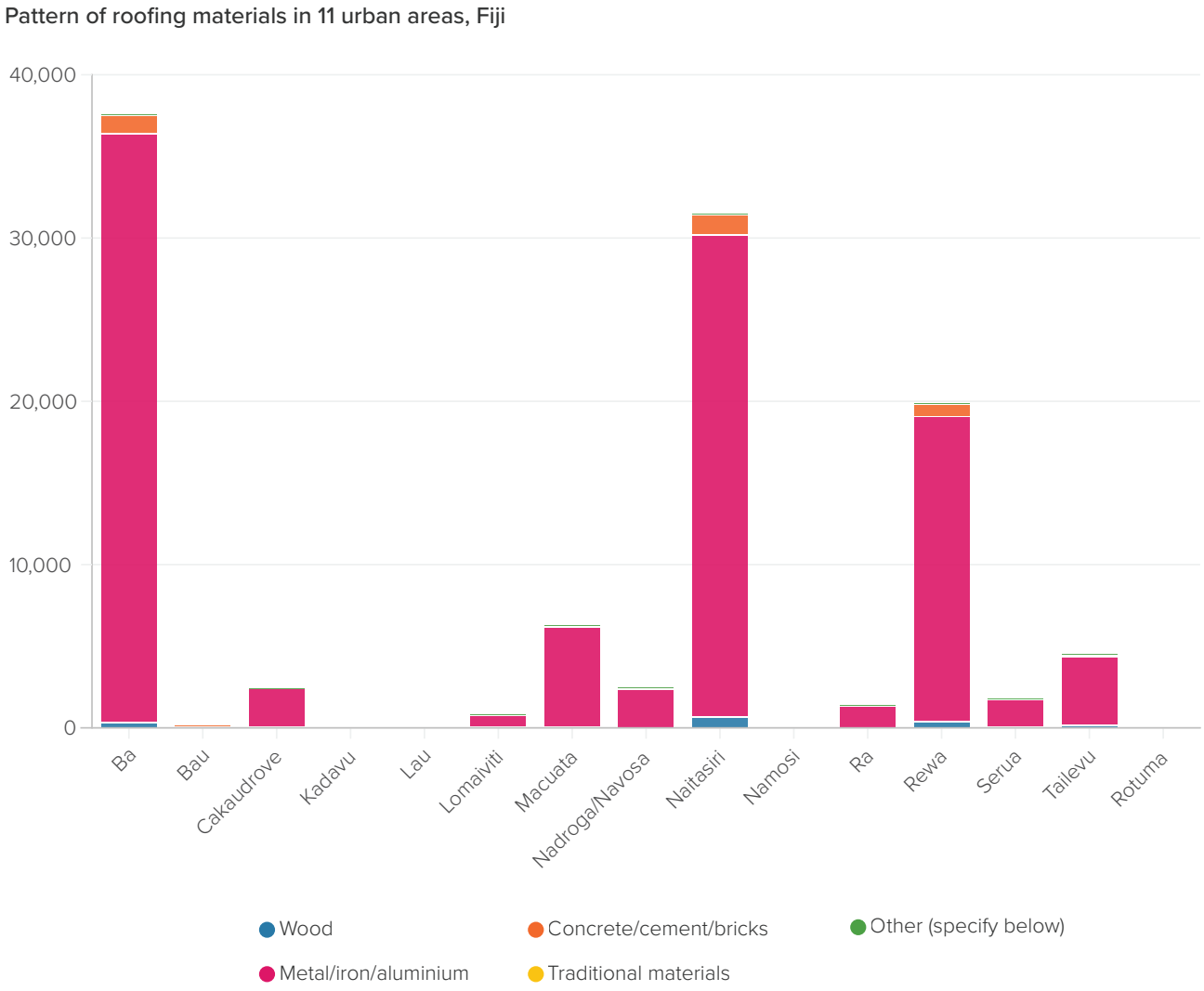
Pattern of walling materials in 15 rural areas, Fiji



Wall: Rural	Wood	Masonite	Metal/ iron/ aluminium	Concrete/ cement/ bricks	Traditional materials	Other (specify)
Ba	3,200	124	8,827	5,986	218	182
Bua	852	43	2,030	109	48	30
Cakaudrove	4,232	180	2,707	783	145	128
Kadavu	934	50	779	685	-	16
Lau	1,031	21	635	639	-	23
Lomaiviti	735	24	956	774	19	37
Macuata	4,775	344	2,962	353	127	72
Nadroga/ Navosa	1,295	138	4,579	4,275	311	39
Naitasiri	1,280	30	3,274	772	118	37
Namosi	454	-	767	244	89	29
Ra	740	21	3,774	1,001	-	102
Rewa	831	25	994	478	26	4
Serua	886	39	958	623	23	11
Tailevu	2,509	45	4,336	1,777	20	43
Rotuma	69	-	33	276	-	5

Note: In urban and rural Fiji, a significant percentage of houses have metal and wooden walls, e.g. Ba, Naitasiri and Rewa. The PDNA team should examine the thermal comfort and high-wind safety of such walls. These two types constitute 50 percent of urban housing and 74 percent of rural housing.

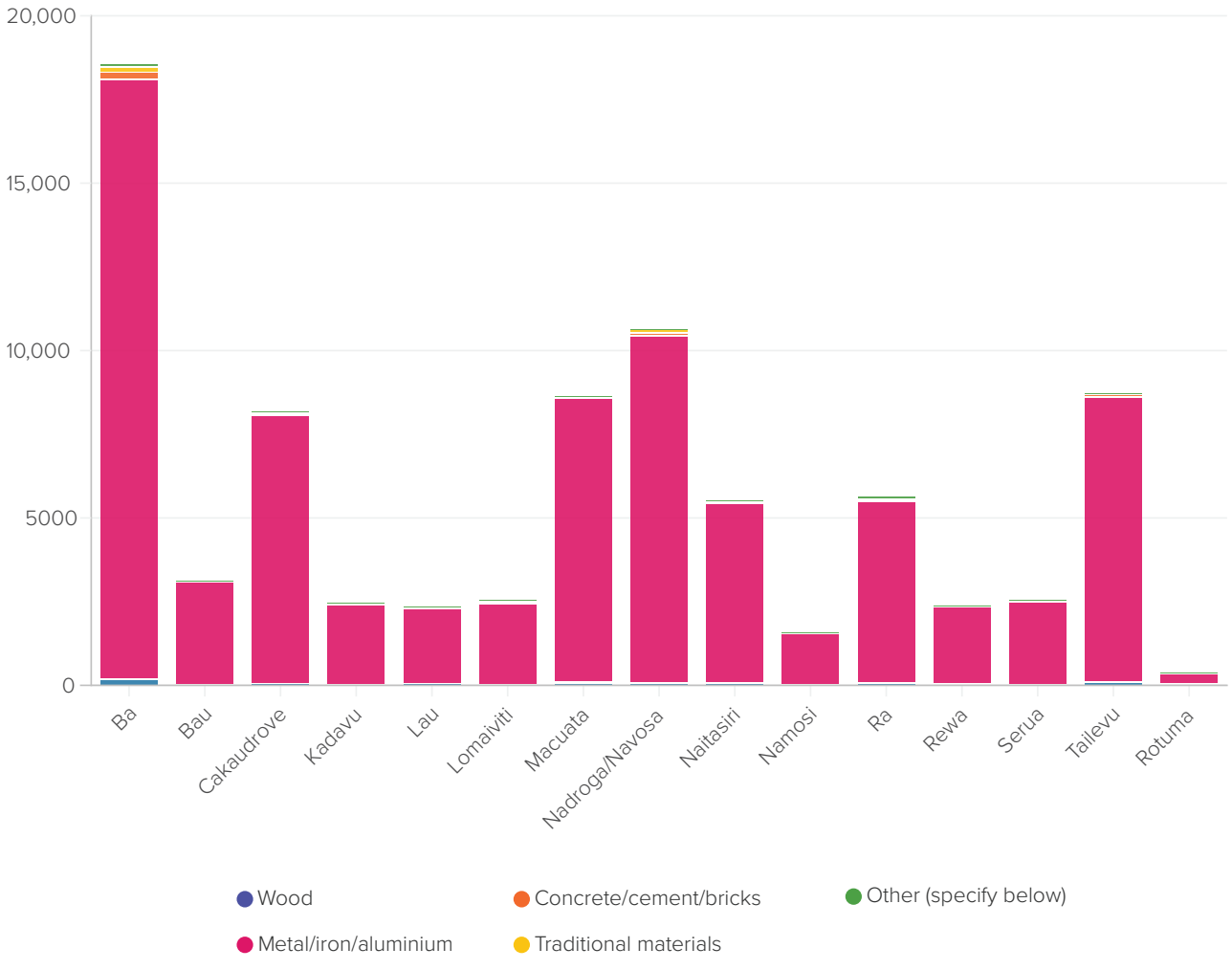
Figure 3: Roofing materials in Fiji



Roof: Urban	Wood	Metal/iron/ aluminium	Concrete/ cement/ bricks	Traditional materials	Other (specify below)
Ba	338	36,029	1,140	27	41
Bua	2	129	1	-	-
Cakaudrove	27	2,359	24	-	9
Kadavu					
Lau					
Lomaiviti	36	732	15	-	7

Macuata	40	6,152	71	-	2
Nadroga/ Navosa	6	2,393	49	3	1
Naitasiri	662	29,501	1,257	22	67
Namosi					
Ra	14	1,341	40	-	1
Rewa	368	18,681	813	13	19
Serua	53	1,699	45	-	3
Tailevu	176	4,175	122	-	10
Rotuma					

Pattern of roofing materials in 15 rural areas, Fiji

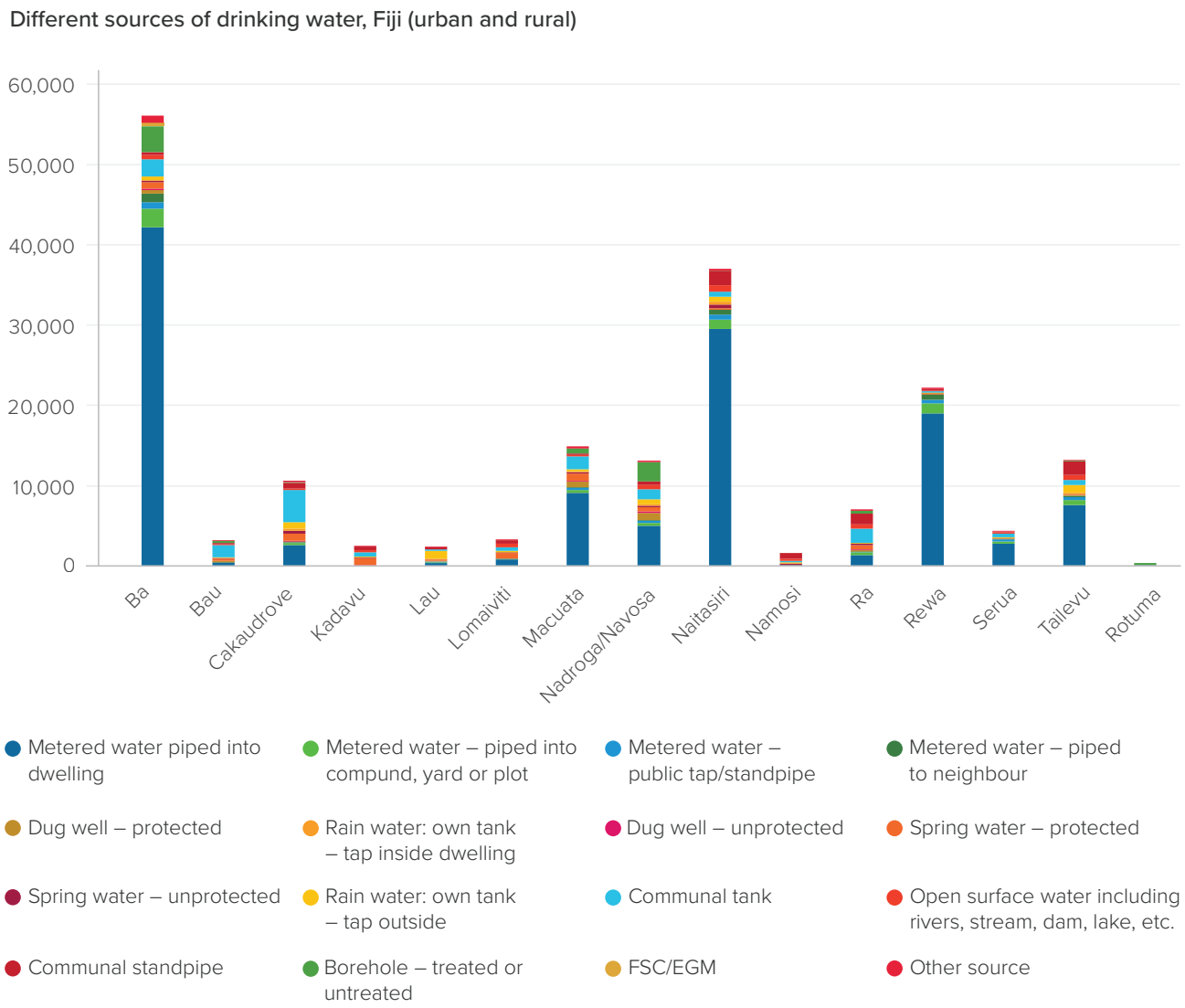


Roof: Rural	Wood	Metal/iron/ aluminium	Concrete/ cement/ bricks	Traditional materials	Other (specify below)
Ba	187	17,914	215	154	67
Bua	12	3,067	14	-	19
Cakaudrove	58	8,020	45	-	52
Kadavu	26	2,400	29	-	9
Lau	54	2,245	36	-	14
Lomaiviti	22	2,428	41	-	54
Macuata	85	8,492	41	-	15
Nadroga/ Navosa	54	10,379	93	104	7
Naitasiri	53	5,379	60	14	5
Namosi	13	1,547	19	-	4
Ra	83	5,419	63	-	73
Rewa	35	2,299	20	3	1
Serua	20	2,476	27	-	17
Tailevu	97	8,521	90	-	22
Rotuma	27	321	-	27	8

Note: In urban and rural areas, majority of houses have a metal roof. In high wind, such structures could be vulnerable without a safe understructure adequately anchored with the wall/frame. Check the anchorage, bracing, connection and detailing of the structural system. In Fiji, 97 percent of the urban houses and 98 percent of rural houses have a metal roof.

Figure 4: Different sources of drinking water supply systems in Fiji

Drinking water supply



A drinking water supply system is an extremely important component of disaster resilience. Restoration of the drinking water supply should be at the earliest.

Figure 4 shows that a majority of the houses in Cakaudrove and Nadroga/Navosa have different sources of drinking water supply other than metered water piped into dwelling units. Most of the houses in Fiji (63 percent) have piped water. The PDNA team should check the quality and quantity of drinking water from the sources, such as, unprotected spring water, river, stream, etc.

Encourage the use of rainwater harvesting as an alternative source of drinking water. Integrate the house design with the rainwater harvesting system including the storage tank.

Figure 5: Different types of sanitation systems in Fiji

Sanitation system

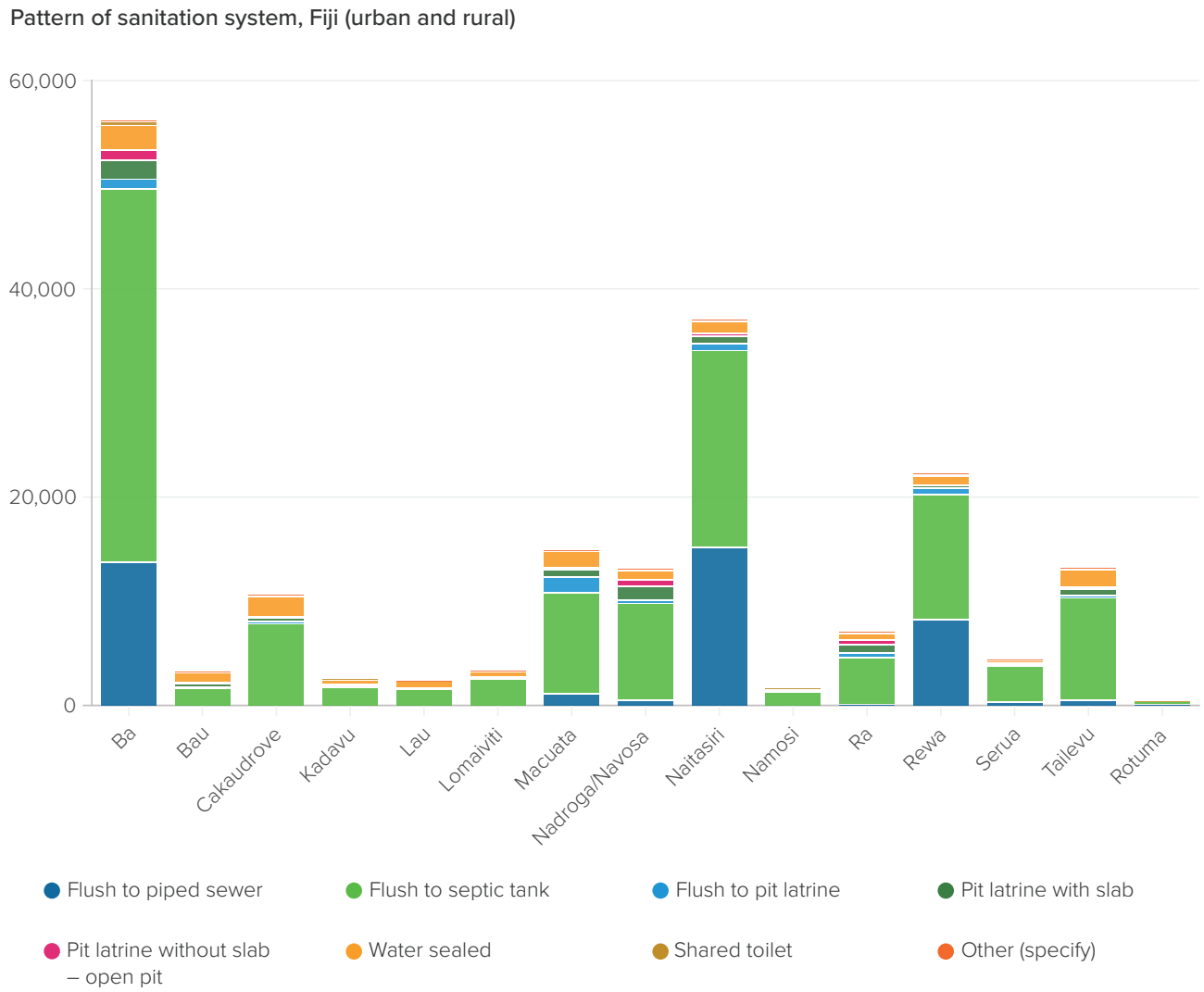


Figure 5 shows the pattern of different sanitation systems that exist in Fiji. Piped sewer systems exist in urban areas such as Ba, Naitasiri and Rewa. The rest of the urban and rural areas have “flush to septic tank” systems.

Majority of the houses in Fiji have flush to septic tank systems. The PDNA team should check whether the septic tanks have safe soak pits.

Figure 6: Different types of waste disposal systems in Fiji

Waste disposal systems

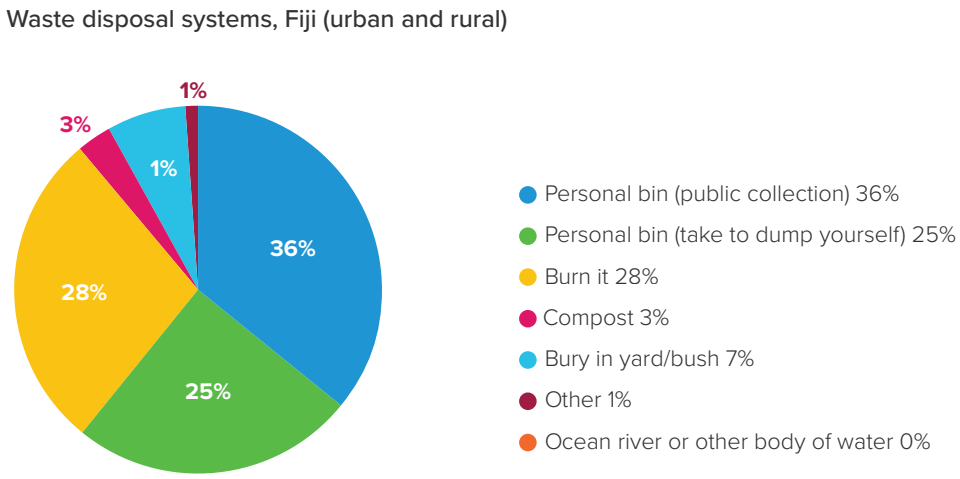
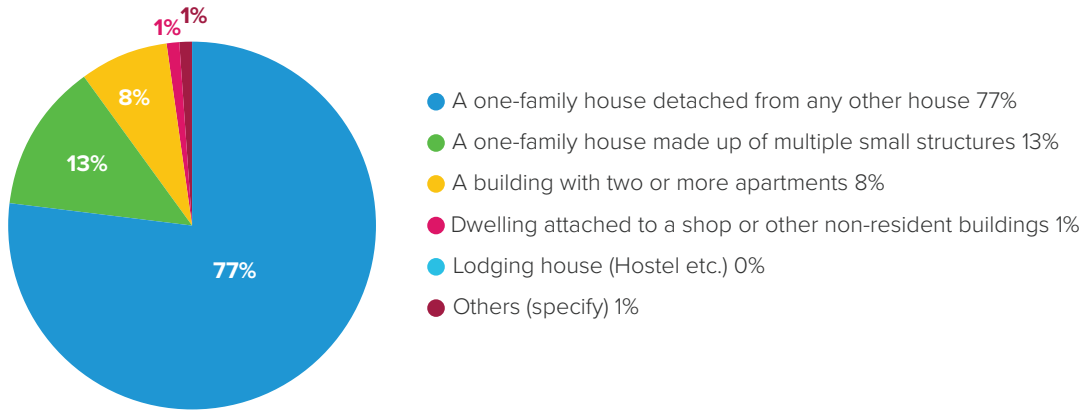


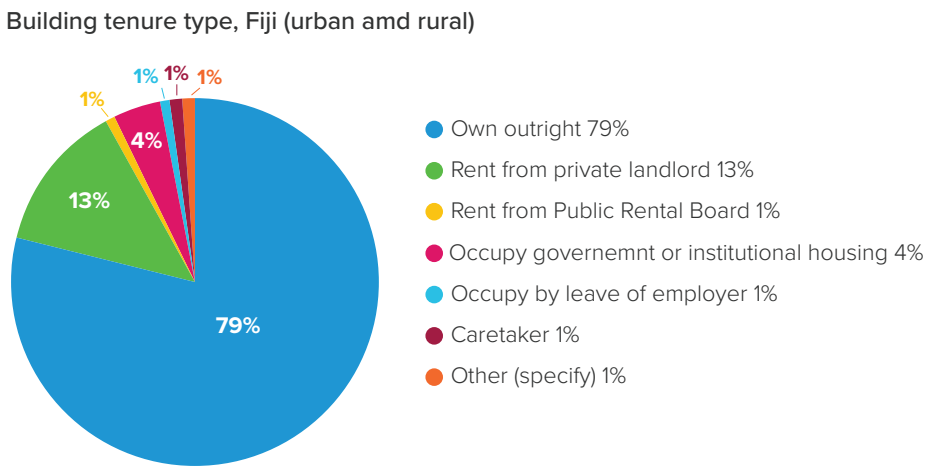
Figure 6 shows the different waste disposal systems that exist in Fiji. The figure shows that 28 percent of household burn their waste. The PDNA team should study whether the waste-burning process is safe and if there are any environmental issues that should be addressed in the recovery strategy.

Figure 7: Different building types in Fiji (urban and rural)



Majority of the houses (77 percent) in Fiji are one-family houses detached from any other house. This type of information will help in exploring the possibility of adopting implementation systems such as owner-driven housing recovery.

Figure 8: Different building types and building tenure types in Fiji (urban and rural)



In Fiji, 18 percent of the buildings are rental accommodations. After a disaster, if a percentage of this group of buildings are damaged or destroyed, and if the occupants have to relocate temporarily, the PDNA team should calculate the loss due to the disaster.

Appendix 2: Basic information on housing

The following information/data would form the premise of understanding the context of housing in Fiji.

1. Definition of a housing unit: Minimum standard	**Registered iTaukei villages** Approximately 34.31 m^2 (including kitchen, excluding bathroom/latrine requirement). Predominantly rural areas. As per provincial iTaukei village by-laws under the iTaukei Affairs Act 1944: [19, 205] Requirements for dwelling houses: A kitchen is not less than 4.6 metres in length and 2.7 metres in width = 7.3 metres squared (m^2) [19, 215] Minimum dimensions: 7(1) – A dwelling house is not less than 7.3 metres in length nor less than 3.7 metres in width in the case of an iTaukei style house, or not less than 5.5 metres in length nor less than 3.7 metres in width = not less than 27.01 m^2 **National Building Code (NBC) of Fiji specifications** No less than approximately 15 m^2 (one bedroom, one kitchen and a washroom) Predominantly enforced in urban areas. As per NBC: DF3.4 floor area/draft FBC F3 room dimensions The minimum floor area of any habitable room, excluding a kitchen must be 6 m^2. The minimum floor area of a toilet must be 1.5 metres x 0.75 metres = 1.125 m^2. The minimum floor area of a shower cubicle must be 0.74 metres x 0.74 metres = 0.5476 m^2. Note: Actual house sizes usually far exceed these minimum standards.
2. Required minimum water consumption per household (drinking and water): Water storage	As per sphere minimum requirement per person: 15–20 litres per day Average household size: 4.6 Estimated minimum water consumption per household: Approximately 70–100 litres per household.
3. Type of sanitation system	As defined in Census 2017: • Flush to piped sewer system • Flush to septic tank • Flush to pit latrine • Water sealed • Shared
4. Energy requirement in kilowatt-hour (kWh) per household	Data not available

5. Minimum plot size per household	**Urban areas** As per the general provisions of the Town Planning Act. Standard minimum plot sizes: 240 m^2 Residential upgrading zone: 210 m^2 (for areas of existing informal settlement upgrading) Standards may be further "relaxed" by consent of the regulatory authority, namely the Ministry for Local Government. **Rural areas** Varies depending on nature of tenure and the regulations and conditions attached to that tenure (customary village tenure, leasehold, etc.). No dwelling house shall be constructed at any distance less than 5.5 metres from any other dwelling house.
6. Expected building life	Formal: Constructed to code = >50 years – estimated at 65 years on average Informal: <50years – varies 5 to 35 years?
7. Housing typology (Note: Outlined below is a broad categorization of the housing stock rather than an official typology [e.g. Census])	
Formal/ contemporary	Houses of a more permanent nature that are largely influenced by Western design and contemporary construction using purchased materials. Usually constructed to the building code and/or in accordance with related guidance.
Informal/transitional	Informal house structures are often erected by families until they can afford more formal houses. These makeshift/lean-to structures are usually constructed using wood and corrugated iron.
Traditional	Traditional Fijian *bure* construction represents approximately 1 percent of the total housing stock. Many transitional, traditional and village houses still have external kitchens (in a detached small building) and toilets located outside.
8. Data on housing condition	The 2017 Census provides data regarding "condition of walls". As these responses are based on the enumerators' subjective and non-expert assessment of the wall conditions, this indicator of housing condition should be used and interpreted with some care. Broadly, the results may suggest that just less than half of the total building stock may not be in the "best" condition.
9. Data on the category-wise distribution of existing housing stock by age	Data on the age of the existing housing stock is not available. In some areas of Fiji, particularly some islands, much of the housing stock could often be dated to the time of post-cyclone reconstruction activity, any time over the last 50 years or so. Based on urbanization rates, more than 20 percent of the total housing stock would have been constructed in urban areas over the last 40 years.
10. Data on women-led households	The 2019–2020 Household Income and Economic Survey (HIES) indicated that on average, 19 percent of households were headed by women. Majority of the households in Fiji were headed by males, especially in the rural areas (86 percent) compared with urban areas (77 percent).

11. Multi-hazard map	High-level hazard mapping for landslide risk and coastal flooding/tsunami risk is available. Some site-specific finer grain community-based hazard and risk mapping has been done for specific communities. However, such granularity does not exist comprehensively for all populated areas.
12. Building codes	The National Building Code of Fiji (NBC) is currently under review. The NBC was developed in the late 1980s under an Australian aid programme and published in 1990, and has not seen any updates since then. The NBC is regulated under the Public Health (National Building Code) Regulations 2004 and administered by the Central Board of Health as per the section 39 of the Public Health Act 1934.

13. Costs of different types of houses (unit cost/square metre [m^2])

Basis of costing: Government schedule and market rate

A combination of data points has been used to estimate the costs above as no readily available cost estimates have been found. The Government, namely the Ministry of Public Works, Transport and Meteorological Services, does not appear to maintain a regular schedule of cost, but they do provide costings for projects of their own design on request.

These cost estimations should be further validated before adoption as Post-Disaster Needs Assessment (PDNA) assumptions. Housing type and costs in Fijian dollar (F$). All costs are just before the disaster.

Typology	**Average size (m^2)**		**Pre-disaster unit cost (F$ per m^2)**		**House value (F$)**	
	Urban	Rural	Urban	Rural	Urban	Rural
Formal – mainly wood	120	70 (60–80)	$2,100	$2,200	$252,000	$154,000
Formal – concrete	120	70 (60–80)	$2,300	$2,400	$276,000	$168,000
Informal – wood and corrugated iron	90	70	$400	$450	$36,000	$31,500

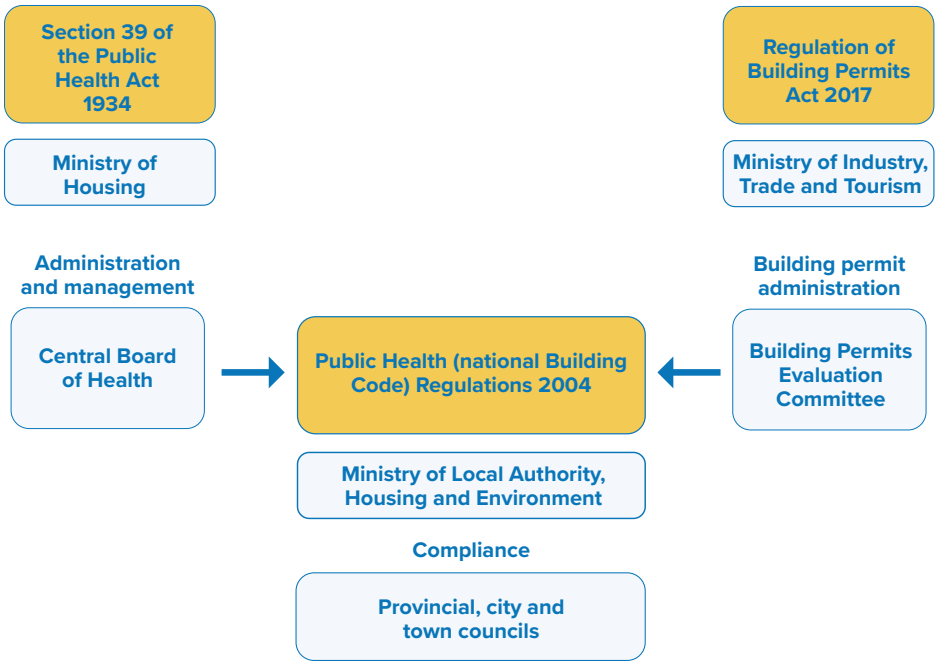
Median floor areas of Fiji's houses are large; dwellings may be originally constructed with a smaller footprint however are incrementally extended by homeowners over a number of years.

Data sources and notes:
Average size: Analysis of the comprehensive yet outdated Pacific: Catastrophe Risk Assessment and Financing Initiative data, long-run building consents data (formal construction) and available surveys of informal settlement dwelling sizes (small samples). Technical Assistance has reanalysed the data and proposed some variation from the assumptions used in the Tropical Cyclone Winston PDNA.

	Cost dynamics will differ between rural and urban areas. Rural village housing is often constructed with less internal partition than urban houses and can often be completed with less expensive finishes, thereby lowering the overall cost. Cost, however, will increase in rural areas as additional transport/cartage costs will be required due to increased distances from suppliers. Labour cost is likely to be higher in urban areas as village housing will often draw on assistance from local labour at little to no cost (sweat equity and community volunteers). Pre-disaster cost: Estimated from various data points including the Ministry of Housing as well as the Ministry of Rural and Maritime Development and Disaster Management house project costings and earlier survey of estimated cost of informal settlement construction. These will still likely need some further validation and refinement. Note: Beyond the like-for-like estimated replacement costs outlined above, there may still be a further resilience premium, which may be required to upgrade many of these structures to NBC standards – a premium of 10 percent to 20 percent is suggested. While it is assumed that many of these dwellings are fairly well-constructed, they may not be fully compliant with the building code or further maintenance and upgrade may be requires to strengthen the reliance of these structures.
Detailed cost analysis of a typical house for the households that are below the poverty line and one for the households that are above the poverty line	As illustrated in the table above, there is a huge gap between the relatively affordable cost of an informal structure compared with a more formal structure based on more permanent materials and likely to have been constructed either to the code or using proper construction methods. This affordability gap between the cost of a makeshift low-cost structure and the full cost of a house built to code (likely five times costlier) is insurmountable and out of reach for at least 35 percent of the population. Fiji, Bureau of Statistics (2021). ***2019-20 Household Income and Expenditure Survey: Main Report***. Suva. https://www.statsfiji.gov.fj/images/documents/HIES_2019-20/2019-20_HIES_Main_Report.pdf.
14. Information on the banks and financial institutions that can provide loans to the people affected by a disaster	
	The Government, donors and NGOs have historically often assisted with at least some of the reconstruction costs. Insurance companies offer house insurance (e.g. Sun Insurance offers “roof cover” [no code compliance required] and Tower offers full house insurance [code compliance required]). It is estimated that less than 10 percent of buildings in Fiji are insured. Many of the commercial banks may provide loans to those who still retain sufficient capital after a disaster; this is not the case for most people. Institutions (e.g. SPBD Microfinance) may also offer small housing construction-related loans to established clients. Fiji National Provident Fund (FNPF) allows early withdrawal for home repairs: • Quick repairs with a maximum amount of F$5,000.00. May reapply after a period of three years from the last payment date. • See https://myfnpf.com.fj/early-partial-withdrawal/ for more information.

15. Damage assessment categories and format	Fiji used to broadly categorize building damages into two: 4. Partly damaged 5. Destroyed A recent assessment has introduced the following scale: • <25% • >25% to < 50% • >50% to <75% • >75% to 100% There is opportunity this year for the national Shelter Cluster to review and further define and harmonize these damage categories.
16. Organizational structure of the Ministry of Housing	The Ministry of Housing is the lead government agency for strategy, policy, funding assistance and monitoring of Fiji's housing system. The Ministry plays a lead role in promoting and facilitating the provision of accessible and adequate housing for low- and middle-income households, particularly for people living in urban areas and informal settlements. The Ministry takes the lead in administering the available housing grant programme and managing the informal settlements upgrade projects. The Ministry of Rural and Maritime Development and Disaster Management is responsible for administering the Rural Housing Assistance programme. This assistance is managed via the provincial and district administrative structure.
17. Who would carry out damage assessment and recovery for the housing sector in a post-disaster situation?	The National Disaster Management Office leads the shelter damage assessment with the assistance of the Ministry of Housing, the Ministry of Rural and Maritime Development and Disaster Management and other national Shelter Cluster members.
18. National Housing Policy	Fiji's existing National Housing Policy was launched in 2011 and is currently under review. See https://www.housing.gov.fj/housing-policy-development.
19. Role of the municipality/ corporation/housing departments/urban local body, etc. in the domain of building permit	The Ministry of Health's Central Board of Health is responsible for administration of the Public Health Act 1934 and the 2004 NBC regulations. The Ministry of Industry, Trade and Tourism is responsible for administration of the Regulation of Building Permits Act 2017 and establishing a Building Permits Evaluation Committee. The Ministry of Local Authority, Housing and Environment, through provincial, city and town councils, is responsible for building permits approval, inspections, compliance enforcement and issuing completion certificates. Fiji is divided administratively into four divisions plus the self-governing island of Rotuma. The divisions are subdivided into 14 provinces, 10 town councils and 2 city councils (Suva and Lautoka). The links between the three building control acts/regulations, the assigned ministries, and the agencies responsible for administration, management and compliance are illustrated in Figure 9.

Figure 9: Link between building control acts/regulations and agencies



20. Engineering colleges working in the field of housing	The Construction Industry Council is the umbrella organization for the: • Fiji Association of Architects • Fiji Institute of Engineers • Fiji Master Builders Association • Fili Institute of Quantity Surveyors • Fiji Building Design Association Members of these organizations are responsible for applying the NBC.
21. Consulting architects and engineers	
22. Contractors	Data not available
23. Construction workers' certification system, if any	Data not available
24. Traditional builders	Data not available

Responsibility matrix: Different stakeholders in housing and their responsibilities

The PDNA housing team should have a comprehensive idea on how the housing system works in Fiji (who does what in the housing sector). The following responsibility matrix was prepared by the personnel of the Government of Fiji in August 2023.

	Ministry/ department/ NGOs/ INGOs etc. led by*	Roles and responsibilities in the housing sector	Strength/weakness
PROVINCES	• Commissioner's Office: Provincial Administrator. • Contractors	Coordinates construction of public buildings. Construction of the buildings	The Commissioner's office coordinates at province level as contractors are closely monitored in terms of their project delivery.
	• Ministry of Health	Ministry of Health Health inspectors ensure that construction activities adhere to the National Building Code's water, sanitation and hygiene (NBC–WASH) priorities.	The Ministry of Health needs to ensure that data on housing is also captured, particularly on adherence to the National Building Code (NBC).
	• Municipalities	Approval for design and construction works, to adhere to NBC	Takes too long to get approval for basic construction work on a property. Need to streamline the process of approval.
DISTRICTS	• Commissioner's office: District Officers	Assist in the approval process for construction.	More transparency is needed in the process. Needs to be better coordinated.
	• Health inspectors	Health inspectors ensure that construction activities adhere to NBC–WASH priorities.	Health inspectors cannot comment on the structural safety of the buildings. There is a need for better coordination with rural housing to ensure NBC compliance.
	• Individual builders	Build homes in rural districts that meet minimum requirements in terms of the NBC.	Need to have a system of checks and balances. Most structures built in rural districts do not have engineers' certificates. This raises the risk level, and the Government needs to find ways to ensure adherence to the NBC.

VILLAGES	• *Turaga-ni-Koro* (village head)	Coordinates construction of homes in the villages	Not all *Turaga-ni-Koro* are trained builders. Training can be done for *Turag-ni-Koro* to identify the key standards that need to be met in rural home construction.
	• *Matai* (mason) • Builder	• Skilled carpenter who coordinates construction work	These are carpenters who have been building homes in rural areas for some time. Some of them do not have academic accreditation, but have built structures that are sound and have withstood major disasters. The Government can devise a way to give accreditation to rural builders and recognize their work and talent. This will give recognition to traditional builders. Their traditional knowledge should be used to build resilience in the housing sector.

* Related to land, building design, construction, materials, skills, building permit, etc.

Appendix 3: Stakeholders' consultation

Respondent 1: Top-level management – responses from the Director of Department of Building and Government Architect (DBGA)
Mr. Andrew Pene, DBGA

	Key questions/ issues	Observation of respondent	Suggestions of respondent
1	National Housing Policy and resilient housing	Current 2004 Building Code has some areas that need to be updated.	The current review of the 2004 Building Code needs to ensure this. The review is ongoing at the moment.
2	Land use plan and hazard map	DBGA's masterplans allow for category structures and selective construction hazard areas.	The ministry responsible for flooding mapping and flood alleviation needs to urgently clear this big backlog of work.
3	Energy and emission handbook	Not yet developed.	This is required to fully address the reduction of carbon emission and climate change requirements in Fiji's 2021 Climate Change Act.
4	**Housing regulation** based on multi-hazard map?	DBGA's government quarters are placed on selected areas of non-fragile land masses.	This requirement is well-founded. The revised building code needs to facilitate this.
5	**Integration of climate change** and DRR/disaster risk management policies/strategies		The National Building Code (NBC) of Fiji is where the **high-level integration** needs to happen.
6	**Town planning provision** for rising sea levels	Please check with the Director of Town and Country Planning for town planning provisions.	The revised building code **requires** buildings to be 1 metre above the highest flood levels as it is more expensive to relocate existing towns (e.g. Nadi and Ba) compared with improving flood mitigation activities in those areas.

7	Provision for insurance of buildings based on risk of exposure	Insurance is currently a choice of the houseowner and is based on the exposure of the building to risks. Government and DBGA reduce their need for insurance by delivering resilient structures in low-risk sites.	Registered architects and engineers need to be **more stringently legislated** to ensure that proposed constructions are compliant with the building code (i.e. disaster-resilient) before building permits are issued. Funding institutions **should make it compulsory** for properties to be insured to be able to recover the funds that they have lent to the developer.
8	**National policy** to address climate change and resilience in housing	2021 Climate Change Act: The majority of Fiji's population does not know what, when and how the targets are to be met.	All organizations need to **urgently align** with the requirements of that act. The NBC **needs to be very clear** on how to achieve the targets.
		Subsequently, insurance is not a precondition for DBGA's construction of government properties.	

Respondent 2: Middle-level officials from the government – architects/engineers (design and structural safety)
Ms. Jioje Tigarea, Architects/Engineers, jiojetigarea@gmail.com

	Key questions/issues	Observation of respondent	Suggestions of respondent
1	Is the National Building Code (NBC) adequate for multi-hazard safety of buildings? NBC's technical guidelines for retrofitting of buildings.	The current version of the NBC does not provide sufficient retrofitting guidelines.	The existing NBC is currently being reviewed and should include these standardized retrofitting guidelines for different classes of buildings.
2	NBC and non-structural mitigation measures	The existing NBC – yes to some extent.	This can be improved in the revised NBC.
3	NBC's conformity with the BBB guidelines and techniques	The existing NBC falls short in some areas.	These issues should be addressed in the new FNBC.
4	Landslide-safe building location –distance from edge, safe slope, type of soil, etc.	There are insufficient guidelines for protection from landslides.	The revised NBC should provide adequate and reasonable guidelines for siting buildings on localities with potential high risks due to landslide.

5	Compliance with building regulations by the architects, engineers and contractors/builders	Regulations are guiding documents for architects and engineers – these are standard operating procedures. However, the contractors and builders are not regulated to comply. There are gaps in regulation capacity for contractors and builders.	The revised NBC must adequately set the minimum required level for safety, health, amenity, accessibility and sustainability for different classes of buildings.
6	Resilient of traditional buildings	Traditional type buildings (refer to *bure*) are resilient, if properly constructed.	The practice of traditional buildings can be engineered to withstand Category 4 and Category 5 cyclones.
7	NBC's guidelines for rainwater harvesting	Existing NBC does not provide adequate guidelines for rainwater harvesting.	This can be improved on in the new FNBC.
8	Options for alternative sources of energy	Hydropower, etc. There are many methods for sourcing energy supply (short-term and long-term).	Incentives could be used to encourage alternate sources of energy.
9	Other issues/points	For public buildings – all design and construction follow Australia and New Zealand standards.	Fiji could benefit from creating/making its own standards that reflect its severe climatic conditions and use of locally sourced materials for construction.

Respondent 3: Building Inspectors and other officers – building division (municipality/urban local body)
Mr. Navnit Narayan, Inspectors, navnit.narayan@govnet.gov.fj

	Key questions/ issues	Observation of respondent	Suggestions of respondent
1	Building inspectors' regularity of checking during the construction. Any difficulty?	Yes, timely checks. When required (in stages). Transportation and funding issues.	Increase in funds and improvement of transportation needed for inspections. Effective communication from divisional representatives to provide updates.
2	Checking system on non-engineered buildings. Is the quality checking done at present? Is there any gap?	Routine maintenance – maintenance cycle every four years. Special maintenance – make good building defects based on need. Urgent maintenance – plumbing and electrical works (minor). Yes, quality checks are done.	Based on the number of public buildings (4,000+), there is a definite need to increase the budget so the four-year cycle can be carried out with ease.

3	Does the municipality/ urban local body/ building department have the mechanism to ensure that multi-hazard retrofitting needs are assessed for existing buildings and appropriate corrections are made? Are people willing to retrofit their buildings?	Yes, all maintenance is done within the standards of the building code, which requires strapping, bracing, etc.	Not all buildings can be upgraded to Category 5 as the internal members would need to be changed. Retrofitting can only be done to an extent.
4	Process of issuing completion certificate?	Once works are completed as per the scope of works, the building inspector then checks and gives the approval for practical completion. Practical completion is given one year before final completion. There is defect period of one year. Once the defect period is over and defects are rectified (if any), then the completion is handed over. Signing off is done by parties involved in the project (Divisional Engineer, Structural Engineer, Technical Assistant and Construction Foreman)	Effective communication between people to minimize variations and extension of time. Faster processing.

Respondent 4: Practicing architects/engineers – NGOs/INGOs

Mr. Iliesa Wise (Architect), Programme Manager Builders (RISE Programme Fiji), esalovo@gmail.com

	Key questions/ issues	Observation of respondent	Suggestions of respondent
1	Do the architects/ engineers find it easy to use the existing National Building Code (NBC)? Is there any gap? How to mend them?	Current NBC is archaic, and needs to be revised. There is a draft – the review team from the Fiji Architect Association and the Fiji institute of Engineers rejected the draft. Unrealistic demands in the draft – Minimum Qualification Requirement to be above Category 3; affordability will be an issue for the majority of the population.	Minimum requirement to be Category 3 – design and build (129 metres/per hour). The NBC needs to be reviewed, and it should include the latest building materials.
2	Need for capacity-building of architects and engineers on how to use the NBC?	The NBC is outdated and is under review. The local architects and engineers have to be part of the review of the NBC. What is the bare minimum for a strong house? Category 3. Needs wider consultation based on the needs and affordability of the consumers.	Every firm has a copy, and building applications are strict in terms of compliance.

3	Any weakness of the NBC? Omission of any safety norms/ issues?	The NBC is not weak, it just needs to take into consideration the different context on the ground. Affordability is one of the main issues when it comes to the NBC. The recently amended draft was not approved because it fails to consider the socio-economic context of the Fijian society.	Have a wider consultation on the review of the NBC to consider the views of everyone in the community.
4	Adequacy of the NBC's guidance on retrofitting? Any gaps?	Retrofitting guidelines are in place, but the monitoring of extensions of homes needs to be improved. Sometimes, homeowners do not reapply for approval of extensions.	The newly updated NBC needs to consider the latest retrofitting technology/designs and materials.
5	Any need to strengthen the municipalities? Is there a policy gap?	Absolutely, there needs to be alignment in terms of the approval process with municipalities. Clear demarcation of roles and responsibilities.	The Government needs to determine the best fit for the NBC in terms of where it is housed. As of now, it sits with the Ministry of Health under the Public Health Act.
6	Any accountability of the architect/ engineer if a building fails in any kind of hazard?	Yes, engineers and architects are liable if a building fails. That is if the engineering certificate is still valid.	Governments through the municipality councils should ensure that homeowners possess an engineering certificate for their property and it is valid.

Mr. Wise is the Programme Manager for the build component of Revitalizing Informal Settlements and the Environment (RISE Fiji), an NGO that is co-funded by the New Zealand Official Development Assistance and the Government of Fiji.

RISE is a research-centred project at the intersection of ecology, environment and human development. The projects sites are located along the Lami Nausori corridor. Sites are intentionally picked according to the level of difficulty (faecal contamination). The high exposure of children under five years of age to newborn babies living in these areas ranks them as difficult sites. The programme looks at faecal contamination levels and draws up sanitation improvement plans to revitalize the environment and improve sanitation conditions. Makasa in Indonesia and Suva in Fiji are the two initial research sites.

The objectives are to improve WASH in the target area, to improve waste management and to improve drainage in low-lying areas. The programme consists of two teams, i.e. the assessment team and the build team.

Assessment team: Consists of environmentalists, health and social scientists who collect soil samples and stools (babies), use acoustic recorders and assess contamination.

Build team: Map out the site as it is and design solutions (geographic information system [GIS], topography, hazard) and tender out the construction. They work with the housing sector on priorities.

Paving the way on how to work with informal settlements, the key difficulty lies in the tenancy agreement given that these recipients live in informal settlements.

Suggestion: The Government to develop guidelines for parties coming in to do any work in informal settlements.

Respondent 5: Contractors/builders – NGOs/INGOs
Rasaubale Builders (Builders), rasaubalejekope343@gmail.com and Mr. Setareki Loco (Fijian contractor), exoduspacific@gmail.com

	Key questions/ issues	Observation of respondent	Suggestions of respondent
1	How does one become a contractor?	One needs to have accreditations in terms of a business license and evidence of having certified builders. In Fiji, there is no criteria or basic education needed to become a contractor. Anybody can start a construction business with the minimum of having a secondary school education. However, some big names in construction only reached primary education level. Sound knowledge and experience in this field helps in the setting up of construction businesses. All contactors should register with the Registrar of Companies. Once you are issued with a business licence, you are eligible to operate as a builder or contractor.	There needs to be a standard registration board for contractors. Some small contractors operate without a licence; the government to decentralize services for business licence. Most iTaukei contractors are always on the losing end since they do not have a licence to operate. The issue of capital is an obstacle to thrive in this industry. The Government should implement policies to safeguard starters.
2	How do they ensure that the building they are constructing is safe against earthquakes, cyclones, floods and landslides?	Build according to the National Building Code (NBC). For Fiji, it is cyclones and floods that we are worried about. In terms of risk assessment, a geotechnology analysis of the site must be carried out. A certified engineer will need to inspect the house and see that there are no defects and the project is built as per the approved drawings. All buildings should comply with the NBC that is currently being used by engineers.	Government to regulate the designated site for construction through the rural local authority. An independent engineer should inspect all phases of the projects. Defects are to be rectified before the project resumes. Engineers' certificate should be renewed every five years.
3	Is there a need for awareness- and capacity-building of contractors/builders for enhanced compliance with the NBC?	Yes, this should be ongoing. Newcomers into the construction sector and even seasoned ones need reminding of the NBC. Training is needed for compliance purposes.	The NBC needs to be revised to be on par with new building techniques, new materials, etc. Not enough training facilities, and the current NBC is weak and favours only a few.

4	Do they think that the municipality needs to strengthen itself for a better partnership? Is there a policy gap? What are the suggestions to improve the present situation?	There is always an opportunity for a better partnership. Municipalities need to clarify their roles and how they interface with other agencies such as the Ministry of Health, the Fire Department, and the Water and Sanitation Department. Strongly agree that there is room for improvement in all municipalities as well as other stakeholders involved in construction projects. In-house engineers have little to no experience in the construction sector. Most of the senior engineers have migrated or joined large companies that offer lucrative packages.	Streamline processes in terms of approval of building permits, extensions and demolitions.
5	Do they construct traditional buildings? Is it profitable and easy for them? If not, then why? Is it easy to get permission to build a traditional building from the buildings department?	Traditional buildings are constructed by traditional builders who have been building traditional homes for generations. It is tedious work and labour-intensive as the materials are nature-based. Traditional builders do not build for profit as it is more a customary obligation rather than a commercial one. The only village in Fiji to only have traditionally built homes is in Navala in the interior of the Ba Province. Traditional buildings can be assessed in terms of compliance by engineers. Full report: Miyaji and others (2016) Traditional building methods are easy and cheap to construct compared with modern building methods.	The current generation have opted for modern building methods. Houses are built to withstand cyclones and other natural disasters. Materials used are graded and of quality.
6	Any training system for the contractors?	Training on the job. Many contractors were once leading hands in government-funded projects before they ventured out on their own. At the moment, no training system, only construction conferences are held yearly and dominated by large contractors, mostly foreign contractors. Levies are imposed to discourage small contractors from attending.	A registration board for contractors may include a Minimum Qualification Requirement. Treatment of workers should be valued.

Respondent 6: Construction workers
Rasaubale Builders (Builders), rasaubalejekope343@gmail.com and Mr. Setareki Loco (Fijian contractor), exoduspacific@gmail.com

	Key questions/ issues	Observation of respondent	Suggestions of respondent
1	Do they get work year-round? What are their daily wages? How many days a year do they get work?	Depending on who they are working for, construction workers are always in short supply. Daily wages: Lowest will be around F$4.00 per hour. F$160 per week. Technical Officers: F$17,000 to F$24,000 per annum. Depends on the project duration; some projects could go on for a year or more while some could go on for weeks only. Wage rate in Fiji for labour workers ranges from F$3.30 to F$4.50. Tradesman wage rate: F$4.00 to F$5.00. Tradesman with experience ranges from F$5.50 to F$10.00.	
2	Which are the lean months when they do not get work? What do they do during the lean months to earn their livelihood?	Farming or work in other sectors. Overseas employment schemes. Some may continue their education, taking technical and vocational education training (TVET) courses. January – March. Some of them save up to sustain themselves during these lean periods. Some get employed by large corporations that are labour-intensive (food processing plants, supermarkets and hardware stores) with low wage rates. The construction field requires a lot of teamwork and teams care for each other during difficult times. For example, if someone managed to find employment, they would inform the rest of the team who are out of jobs.	Government to make the apprenticeship scheme operational again. Training be provided on how to sustain themselves during down periods.

3	How do they ensure: • the roof does not get blown off • the house does not get inundated in flood • which is a safe slope to build a house on • the house does not collapse in earthquake	6. Roof is tied down to the base of the structure. 7. Build on high posts. Anticipate floods and build your floor height above the height of flood water. Raised floor. 8. Earthquake is not common in Fiji, but we must consider this going forward. Site needs to be inspected first by engineers. A Stable site will guarantee that the house does collapse during an earthquake. Type 17 cyclonic screws should be used and modern roof designs emphasized to ensure the roof does not get blown away.	Cyclone-proof materials to be sold at a cheap rate. Value added tax (VAT) to be reduced on cyclone-proof materials.
4	Do they feel that they need training for safe house construction? Is there a demand for training? Will they come for training?	Training for resilience building is good. Builders can be educated on the latest developments. This can be part of the TVET programmes offered by the Australia-Pacific Technical College or other technical colleges, and can be introduced to students. Training is available with limited spaces by the Australia-Pacific Technical College and Fiji National University. Two years ago, the previous government closed off almost all technical colleges. These technical colleges were built to provide a solution for unskilled labour in the construction industry.	Yes, this is a good idea moving forward. The Pacific is prone to natural disasters, and a need for training in safe house construction should be implemented. Currently, there is a huge demand for training since the overseas market opened for the Pacific Labour Scheme. The government and stakeholders should re-open technical colleges as a solution to growing demand for skilled workers.

5	If there is a training system for the construction workers, what trades of training are offered? Course contents? Is hazard-safe construction included in the training?	Basic carpentry, a leading training, is offered in vocational schools such as Monfort Boys Town and Ratu Kadavulevu School. Yes, hazard safety construction is part of the syllabus and young construction workers can find greener, better jobs elsewhere. If Fiji is not careful, it will lose all of its workers to New Zealand and Australia. Some large companies provide training to permanent staff only. Courses that are currently offered are: • Plumbing works • Sheet metal and fabrication works • Carpentry and joinery works • Tiling works • Short courses on electrical wiring works • Quantity surveying • Trade Certificate and Diploma in Drafting and Architectural Studies • Diploma in Civil Engineering and Bachelor of Engineering Other trainings are mostly related to workplace safety. Occupational health and safety (OHS) compliance training.	For large corporations, there are no benchmarks for people to qualify for training. It is mostly based on whom you know, who gets to be selected for proper training. The race card is mostly played by large businesses.
6	How does one learn about traditional buildings? Is there training in traditional building construction?	One learns by imitating the leading hand; you will have to be from the same tribe (*Mataisau* – builders tribe) to be able to be included in the build of a traditional building. Yes, training is offered for traditional building method. Short courses are provided just to get them with insight of construction and handling of power tools	Learn through observation. Traditional building type should be introduced in schools. Get them introduced to the traditional building type at an early age since having a house or a roof on top is a need.

Mr. Setareki Loco, Fijian contractor

The tender bidding and tender evaluation processes only favour large companies. Requirements are made to ensure small companies get eliminated during the tender evaluation process. An example is the Construction Implementation Unit operating under the Ministry of Economy. They have their list of preferred contractors, many of whom are foreign contractors.

Suggestion: Project to be distributed fairly. End result – fair distribution of wealth. The construction business in Fiji is purely a race card business.

Respondent 7: The people
Sainiana Veitata

	Key questions/ issues	Observation of respondent	Suggestions of respondent
1	How do they define a house? How many rooms, room sizes, preferred orientation, preferred materials?	From my observation in the field, a house is usually understood as a dwelling space/building where one sleeps and keep one's belongings.	House has many purposes – kitchen house, sleeping house, bathroom and toilets, which can be in a different building.
2	How much does a typical small, medium and large house cost in Fiji in urban areas and in rural areas? Is it affordable to build a house? Do they invest money for house construction from their savings or do they apply for a bank loan?	In the rural areas, from what I understand in the field and in the areas I have done research in, a small house would be about 3 metres x 6 metres or 25 metres squared. For cost: Habitat for Humanity build houses in the community at 3 metres x 6 metres in size and this would cost F$12,000 to complete. The Koroipita settlement have houses with two rooms, toilets and a bathroom inside the house. This costs F$19,000 to build and complete. This takes into consideration the cost of construction materials now. Note: These houses are built for the very unfortunate in the community who do not have resources to build on their own.	
3	Any difficulty to obtain a loan?	I think this depends on individuals' credit scores and salary brackets.	
4	How do they build their own shelter? By themselves? With the help of a carpenter and mason? With the help of a contractor? Who prepares their designs?	In villages, there is usually a matai (mason) or several masons. They would have some form of technical and vocational education training (TVET) qualification for building or they would have the experience of building from previous carpenters in the village. Through *solesolevaki* (community cooperation), building of houses in the village will be done communally. For rebuilding of houses post-cyclones, house building is often done in an organized manner where the *Turaga-ni-Koro* (village head) would organize the able-bodied men into groups and the women would be tasked with catering for the men's meals.	

5	Do they accept help from an architect/ engineer for the house design and supervision of the construction?	In places within the vicinity of a municipality – yes, an engineer's certificate is needed to pass the house construction. Outside of towns/city boundaries – there is no formal certification needed to standardize the building.	
6	Where do they buy building materials from? Are they manufactured in Fiji or they are imported?	Most of the building materials in Fiji in both the rural and urban areas are sourced from local hardware shops. These are namely: • RC Manubhai • Vinod Patel • Kasabias	
7	What kind of building they aspire to build? Reinforced concrete? Brick? Traditional building?	In villages, traditional houses are very rare. The only village I know where traditional houses (*bure*) are built is Navala village. In Navala, building *bure* is part of their village activity where certain months of the year are dedicated to building. Houses with timber structure and corrugated iron wall and roofing are common.	Communities prefer to build timber or concrete block structures with corrugated iron roofing.
8	Wisdom on hazard-proneness?	Yes, in villages, they will be able to determine this based on experience.	
9	Any do-it-yourself (DIY) manual for house building?	Homeowners Building Manual exists, it is getting renewed with the reviewed National Building Code.	
10	What is the average size of a house and how many rooms do they need?	3-bedroom house: 59 m^2 2-bedroom house: 50 m^2	
11	Importance of obtaining building permit and difficulty to obtain it?	It is very important to have a building permit for all houses, except for those in the village. It can be difficult to get a building permit, e.g. two months minimum.	

Appendix 4: Terms of reference template

This is a sample terms of reference for a PDNA, which is based on *Post-Disaster Needs Assessment: Volume A – Guidelines* (European Commission, United Nations Development Group and World Bank, 2013). This will be developed jointly by the Government of Fiji and the United Nations, the World Bank and the European Union as well as other key actors. Concerned departments such as the National Disaster Controller, the NDMO, etc. should be involved in developing the terms of reference. For the success of the PDNA, it is critical to develop the terms of reference with mutual consent of the partners involved.

Background: Provide a brief description of the disaster event, its causes, effects, and the preliminary facts and figures of the impact. The description should include the geographic areas and highlight the most affected locations and people. State the urgent needs and priority areas after a disaster. Include the government and international partners' planned responses to the disaster. Provide information on the ministry responsible for disaster management and the roles of other key ministries in the assessment process. If available, include the historical information on previous disasters in the region.

Objectives of the PDNA: The objectives of assessment would depend upon the type and scale of the disaster. The purpose of a PDNA is to assist the national and local government in assessing the disaster impact and device a strategy for recovery including its financial implications. A PDNA aims at the assessment of damage, effect, impact, cost and strategy of recovery through reconstruction, repair and retrofitting of the destroyed and damaged buildings and services. The recovery should enable a country to emerge with housing stock that is environment-friendly, suitable socioculturally, supports livelihood and is resilient, with adequate human resources for future development and disaster events. The specific objectives of the PDNA could be as follows:

- Estimate the overall impact of the housing and services damage and destruction on the socio-economic development of Fiji at national, province, district and village levels.
- Assess the effects and impacts of the disaster to develop a recovery strategy – the early, medium- and long-term recovery and reconstruction needs, with costs and a timeline.
- Suggest recovery strategies that should integrate DRR and BBB as well as prioritize gender and environmental concerns.
- The recovery strategy should be focused on the needs and priorities of the affected communities.
- Recommend and define a strategy for disaster risk management in Fiji.
- The recovery strategy should recommend appropriate actions at institutional policy levels to support housing recovery that promotes long-term disaster resilience.

Deliverables of the PDNA:

- One consolidated report of the effects and impacts on the housing sector.
- A recovery strategy with early, medium- and long-term needs in terms of costs and timeline for housing.
- Disaster risk management strategy.

Coordination of the PDNA: The Government of Fiji will lead the PDNA exercise with active participation of the relevant ministries, province- and district-level officials, along with development partners. The relevant focal point in the Government of Fiji, supported by housing-related agencies, will provide overall direction, daily guidance and technical supervision. The assessment team will consist of technical experts representing the leading government agencies and its partners.

Methodology for the assessment: The PDNA methodology will be based on the housing guidance notes prepared for Fiji. The methodology will enable the team to carry out a comprehensive assessment of the effects and impacts of a disaster at province, district and down to the village level. The assessment will include the social, economic and financial aspects of the effects of the disaster. The PDNA will take into consideration early recovery requirements as well as longer-term rehabilitation and reconstruction needs. The recovery strategy will recommend disaster risk management measures to mitigate the effect of future disasters.

It is expected that the PDNA housing guidance notes developed for Fiji will enhance the country's preparedness and enable fast-track post-disaster damage data collection by the concerned departments. The PDNA team will also acquire and use secondary sources, including maps, records and media reports. As information requirements make it necessary, primary sources on effects and needs will be generated from surveys, focused group discussions and other data-gathering methods during field visits.

The assessment will have the following phases:

- Organize intensive training for all government officials as well as sector leaders and focal points.
- Desktop review: Assess the baseline information, determine the scope of the housing sector, identify information gaps and prepare data collection templates. Identify various data sources for the collection of both baseline as well as damage and losses data in housing.
- Field visits: The purpose is to validate the data, collect additional data from the affected communities, and hold consultations with the provincial and local government authorities and civil societies. The government will decide the geographic areas for the sector teams' field visits.
- Data analysis and development of housing sector reports: After the field visits, the housing sector team will review and analyse the data and prepare the draft sector reports, including those on impact, damage, losses and needs. Share the draft report with the macroeconomic and human development expert, who will then aggregate the sector-specific results into the macroeconomic analysis and human development impact.
- Final consultations and report writing: The housing sector team will share their findings and go for consultation with the other sectors and key stakeholders to prioritize recovery strategies and costs, and thereafter finalize the report.

	Activities	Date (to be decided by the Government of Fiji)
1	Mobilize sector teams	
2	Orientation training on PDNA methodology	
3	Data collection and field visits	
4	Data analysis and initial findings	
5	Needs assessments and prioritization	
6	Draft sector reports submission	
7	Consultative meeting with the Government of Fiji to finalize the damage and needs figures, data, recommendations, etc.	
8	Presentation of the sectoral findings to the Government of Fiji	
9	Finalization of the sector annexes and full report	
10	Presentation of full report to the national Government	
11	Printing and dissemination of full report