

## Article

# Strengthening Capacity in Disaster Waste Management in Vanuatu

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**Abstract:** This paper explores the effectiveness of a training program in strengthening the capacity of disaster waste management (DWM) in Vanuatu, drawing on an action research project undertaken during the delivery of a Training of Trainers (ToT) program in Port Vila and Ifira Island. The researchers gathered feedback through questionnaires, host group discussions, and park sheets from the participants. This feedback was used to inform revisions of the Disaster Waste Management Handbook to be provided to participants, and to understand the potential benefits for similar programs in other countries across the Pacific Region. The ToT proved to be well-received by participants with 64.7% of the participants giving a rating of “Excellent” and the remaining participants rating it “Good”. It demonstrated to be a cost-effective mode of training with scalability and promoted self-reliance and empowerment of the community. Key challenges in the delivery included time management, and internet connectivity disruptions. By addressing these key challenges and with further research to ensure that it is context-specific, the ToT model could be used effectively to strengthen DWM capacity in other Pacific Island nations.

**Keywords:** disaster waste management; disaster preparedness; training of trainers; Vanuatu



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## 1. Introduction

Pacific Island developing states are disproportionately impacted by the increasing effects of climate change and weather-driven natural hazards, such as tropical cyclones and flooding due to their location within the tropical climate system in the Pacific Ocean. In the 2021 World Risk Report [1], which ranks countries according to the potential for disaster risk, three Pacific Island nations ranked first, second and third-respectively Vanuatu, Solomon Islands and Tonga. Papua New Guinea is ranked ninth and Fiji ranked fourteenth. A major consequence of natural hazards, which further exacerbates the potential for a hazard to become a disaster, is disaster waste. While significant attention has been given to predicting the impacts of climate change and building resilience in Pacific Island nations, the management of debris after disaster events (disaster waste) is often overlooked, undervalued, ad hoc and uncoordinated [2]. It is also a key consideration in meeting sustainability goals, with disaster waste impacting several Sustainable Development Goals (SDGs). For example, disaster waste can negatively impact life on land (SDG 15) and life below water (SDG 14). Furthermore, through responsible consumption and production (SDG 12), waste can be better managed during disasters and non-disaster times.

Overcoming the adverse environmental, health, economic and social impacts of disaster waste is a challenge for Pacific Island nations, which often do not have the financial and human resources or infrastructure capacity to be able to effectively address and manage these impacts. However, recently, more attention is focused on enhancing the capacity of Pacific Island nations’ disaster preparedness measures and timely post-disaster response

for effective management of disaster waste, with the aim to help countries recover and restore disaster-affected islands and communities more quickly, making the islands more resilient to waste generated from future disasters. This is in line with the Framework of Resilient Development for the Pacific 2017–2030 [3].

In 2021, the Pacific Island nation of Vanuatu, the most risk-prone country on earth [1], with a risk index rating of 47.73% compared to the USA risk index rating of 3.9% (ranking 126th out of 171 countries), was the site of a training of trainers (ToT) in disaster waste management (DWM). This initiative was conducted by waste advisors at the international non-government organization, the Secretariat of the Pacific Environment Programme (SPREP) and Japan's Regional Technical Cooperation Project on Promoting Regional Initiatives on Solid Waste Management in Pacific Islands (JPRISM II), and academics from the University of Newcastle, Australia (all authors on this paper). The focus of this paper is to examine the opportunities and barriers of disaster waste management ToT training, based on the findings of the action research undertaken at the time, and provide lessons learned and examples of best practice. The aim is to provide a model for strengthening disaster waste management that may be duplicated across the region, building Pacific Island nations' resilience to the impacts of disasters and climate change.

Disaster waste refers to the overwhelming waste matter generated from the direct impact of natural hazards to the natural and built environment. It also includes the waste from emergency and recovery operations during and after a disaster event [4]. Disaster waste impacts human and environmental health. Delayed responses to the generated disaster waste means longer exposure times to unmanaged wastes for affected communities, posing higher risks to human health from the generated bad odor, smoke (when people burn waste as a quick solution), sharp materials (e.g., broken glass, iron roofing and metals), hazardous substances (e.g., asbestos, used oil, poisonous chemicals) and direct or vector-induced exposure (e.g., rats and mosquitoes). Environment and ecosystem health and biodiversity are at risk from the impacts of disaster waste which include the contamination of waterways, agricultural areas, and urban communities [5]. There is also the potential for waste management facilities to be damaged and waste management services disrupted because of disaster impacts, further exacerbating the impacts of disaster waste. Together with the public health and environmental issues related to the breakdown of waste services, the amassing of excessive quantities of wastes can hamper post-disaster recovery efforts by restricting access to affected communities [2].

## 2. Overview of Disaster Waste Management

Managing disaster waste is a critical problem around the world, especially as climate change has ushered in more frequent and intense hazards and resulting devastation. In addition to financial resources, the capacity of organizations and individuals requires strengthening to adequately address disaster waste. While the terms "capacity building" or "capacity development" are more widely used, the concept of capacity strengthening stems from the understanding that there is already an existing level of capacity in at the individual or community level, and so it does not need to be built up from scratch, rather improved and augmented, that is strengthened (see for example [6]). In this way it is a more respectful and less patronizing term, and therefore has been used in this paper. Indeed, communities around the world have been managing disaster waste without outside support, indicating existing capacity, although there are gaps in this capacity that need to be addressed through a strengthening process.

In terms of resources, Global North countries are better able to invest financial resources for DWM and also invest in training people in this field. For example, a DWM guide produced in Geneva more than a decade ago [4] reflects the high level of capacity in such a context. In Australia and New Zealand, there are extensive DWM guidelines and established practices (see for example [7,8]). However, in the Asia-Pacific region where many Nations are low income nations, one of the earliest guides was produced as recently as 2018 [5]. In the Pacific, *the Pacific Island Countries Regional Disaster Waste Management*

*Guideline* was published in 2021 [2]. While disaster waste management guidelines are beginning to emerge, existing capacity and knowledge in this field is not yet commensurate with the scope of these guides. There is thus a strong need for capacity strengthening on DWM, which is reflected in this paper's theme and contents.

### 3. Disaster Waste Management Frameworks in the Pacific Region

The Secretariat of the Pacific Regional Environment Programme (SPREP) and the Japanese International Cooperation Agency (JICA) through JPRISM II work with Pacific Island governments to support disaster waste management in the Pacific Region. The Framework for Resilient Development in the Pacific (FRDP 2017–2030) [3], with the overall goal of improving the Pacific Islands' resilience to climate changedriven environmental impacts and disasters, is the overarching guiding framework for disaster waste management. The Cleaner Pacific 2025 strategy [9] also discusses disaster waste in the Pacific by highlighting the importance of planning within national and local governments to ensure effective management of disaster waste. However, up until recently, there was no dedicated disaster waste management guideline.

The *Pacific Island Countries Regional Disaster Waste Management Guideline* [2] is based on accepted and adapted international DWM practices and was launched in the region in early 2022. It aims to help Pacific Island governments prepare for and manage waste during and after disaster events. Hence, building resilience by supporting National Disaster Waste Management Plans and promoting disaster waste management measures and practices suitable for the Pacific Islands. The guideline, with the primary focus on DWM, complements the Asia-Pacific DWM Guideline [5]. Both the documents provide a comprehensive suite of useful information, which can assist responsible agencies and officials in the Pacific region to make improvements on DWM. The guidelines are founded on two main international principles—the Waste Management Hierarchy (WMH) and Disaster Management Cycle (DMC), which are also the basis of the existing regional and national plans for waste and disaster management in Pacific Island nations. This underscores the importance of proper planning of the delivery of waste management provisions in accordance with the different stages of the disaster management cycle. Aligning waste management measures with disaster management stages can improve coordination of DWM at all levels and more importantly, improve the delivery of DWM operations.

In addition to these frameworks, SPREP, in collaboration with JPRISM II is strengthening the capacity of the region in DWM through regional training and the development and subsequent promotion of the Regional DWM Guidelines. It is expected that improving disaster waste knowledge and practice at the national, provincial and community levels will help in dealing with future disaster waste and avoid negative environmental and health consequences.

Figure 1 from the *Regional DWM Guideline* captures the essence of the processes of handling and treatment of disaster waste. The principle of the waste management hierarchy is demonstrated here. The initial process involves the separation of hazardous waste from all the other waste, with the remaining waste materials sorted to maximize the reduction, reusing, and recycling of waste. These stages form the basis of cost recovery, sustainability, and public hazard prevention. Earmarked disposal sites are part of the process of preparedness for effective DWM and are expected to be integrated with the wider waste management system.

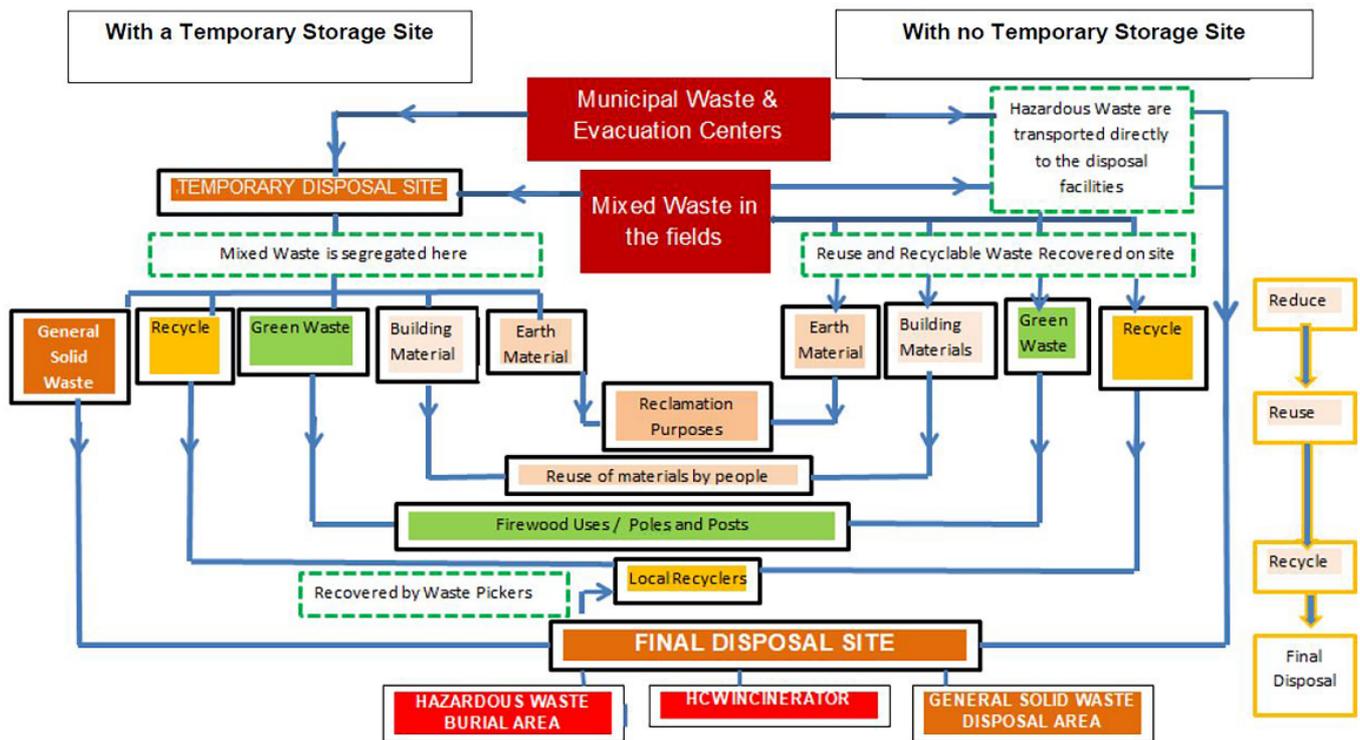


Figure 1. A typical process of disaster waste handling and treatment [2].

#### 4. Alignment of DWM with Disaster Management (DM)

The disaster management (DM) cycle, conceptualised in the four stages of prevention & mitigation, preparedness, emergency response, and recovery, is followed in most Pacific Island countries' National Disaster Management Plans [2]. Therefore, DWM planning needs to be aligned with the DM cycle to ensure the inclusion and integration of DWM National Disaster Management Plans. Drawing from the *Pacific Island Countries Regional Disaster Waste Management Guideline* [2], this is important for the overall coordination of DWM along with the other DM operations, as discussed below:

- **Stage 1-Prevention and Mitigation:** This is an important stage of the DM cycle for implementing DWM activities that prevent and reduce the generation of DW and associated adverse impacts to the environment and human health. DW is often overlooked in risk assessments undertaken during the development of National DM Plans. For this reason, specific DWM preventive and mitigation measures in the Pacific region are mostly absent.
- **Stage 2-Preparedness:** Since DWM is not a cluster in National DM Plans in the Pacific, the specific DWM activities to be implemented at this stage are often overlooked. This contributes to the inability of Pacific nations to respond to the generated DW when disasters strike, delaying the post-disaster recovery. Strengthened preparedness will lessen a disaster's impact, meaning communities and the environment will recover more quickly and effectively.
- **Stage 3-Emergency Response:** This stage of the DM cycle deals mainly with specific lifesaving operations and provides immediate support to people affected during the disaster. There are vital DWM operations that can be implemented during this stage to assist in the rapid delivery of lifesaving operations, for example, clearance of fallen trees on the road to allow movement of vehicles for relief provision and search-and-rescue activities.
- **Stage 4-Recovery:** Finally, the recovery stage is an important part of the DM cycle for the resumption of disrupted services, restoration of lifestyle and affected services as well as the reconstruction of damaged physical infrastructure. All these recovery oper-

ations generate waste and must therefore be considered for planning and preparation of the necessary waste collection and disposal services.

## 5. DWM Capacity Strengthening in Vanuatu

Vanuatu is an archipelago of over 830 islands. The largest island is Espiritu Santo, while the island of Efate is the main island and home to the capital, Port Vila Capital City, and the Vanuatu Government administration as well as the main commercial and business center. Both islands have populations of over 40,000, with the rest of the 234,023 national population residing in the other 63 outer inhabited islands, where there is difficult and limited access. The Vanuatu population relies largely on subsistence agriculture with exports of cocoa, copra, coffee, and Tourism, timber, seafood, and recently, mineral extraction propelling the country's economy [10]. Currently, regular management of solid waste in the dispersed islands is a significant challenge, which is magnified after a disaster. In the islands of Vanuatu, solid waste littering is widely prevalent; there is no public waste service, residents must pay private operators to transport waste to urban disposal centers.

Vanuatu experiences, on average, 20–30 tropical cyclones per decade, with most occurring in January and February, with 3–5 of these causing significant damage [11]. The management and coordination of disaster events as well as overseeing and regulating waste management at the national level in Vanuatu are the main legal functions of the Ministry of Climate Change Adaptation, Meteorology & Geo-Hazards, Environment, Energy and Disaster Management based at Port Vila. However, the actual management of any disaster waste generated during disaster events is handled at the provincial level by the six provincial councils: Malampa, Penama, Sanma, Shefa, Tafea and Torba. Most of these provincial councils do not have official designated staff for waste or disaster management and therefore have not been provided the specific skills and knowledge to plan, prepare and respond to disaster events. This, in turn, affects the provision and sharing of adequate information to members of the public and communities on appropriate actions in the management of disaster waste.

The experiences and lessons learned from past disasters in Vanuatu demonstrate limited resources and absence of effective coordinating mechanisms at all levels, indicating capacity at the regional, national and community levels needs to be strengthened to adequately respond to the large quantities of solid and liquid wastes generated by the impacts of natural hazards [2]. At the local level, findings suggest a significant proportion of trees felled by cyclones are wasted because they cannot be harvested on time for timber, bamboo, and thatch, contributing to delays in recovery because of building material shortages [12].

In light of past experiences such as those in Vanuatu, and with requests from their member countries, SPREP and JPRISM II developed DWM guidelines to improve the Pacific region's preparedness, response, and recovery during disasters, which include promoting opportunities to recover useful resources such as steel, timber and concrete rubble for recycling and rebuilding efforts, and to harvest organic materials for composting. In Vanuatu, these opportunities can be capitalized to reduce the legacy of disaster wastes and prevent spikes of wastes disposed at the main landfill in Port Vila and other urban centers, and reduce the associated costs and expenses to the government, provincial councils, and communities.

### 5.1. Training of Trainers (ToT) Concept

As part of efforts for capacity strengthening in Vanuatu and the Pacific, a training of trainers (ToT) course on DWM was developed by SPREP and JPRISM II, in collaboration with the University of Newcastle, Australia. The project was supported by the Canadian Fund for Local Initiatives (CFLI), and conducted in Port Vila, Vanuatu, at the end of 2019, with representatives from SPREP, JPRISM II and the University of Newcastle providing the training. The aim of the training was to improve regional, national, and local coordination of DWM as well as develop appropriate approaches and guidance in line with the Regional DWM Guide. The project consisted of two main elements: first, the ToT itself and second,

using the ToT as the basis for action research on the opportunities and barriers relating to the ToT process for DWM capacity strengthening. The ToT involved 23 participants consisting of representatives from the Government of Vanuatu (Department of Environmental Protection and Conservation, National Disaster Management Office, Port Vila City Council, Ministry of Health), Civil Defense Services (police and fire brigade), NGOs (World Vision), CSOs (women, youth, people with disability), private sector (recycling company), and the media. Out of 23, 13 participants were women.

ToT is characterised by “*expertise conducting the training of individuals (trainers) with ties to the community for whom the knowledge is intended*” [13] (p. 26). According to the implications of developing and implementing a ToT suggested by Fuchs [14], the structure of a ToT is determined by:

1. Identifying the specific needs of the people to be trained.
2. Establishing the criteria for satisfactory and effective performance of the trainers.
3. Producing the training guide or manual for the trainers and associated resource materials.
4. Determining the mode of training, for example seminars, workshops, short courses, in-service training, self-directed study programs, and/or practical experience.
5. Preparing the trainers to run training course using the guidelines and resources provided.
6. Evaluating the ToT and the trainers.

From the experience of implementing ToT in the medical discipline, Makanjuola et al., [13] suggest that the trainers should be trained in such a way so that there is very little variability in the way knowledge is transmitted to the trainers. However, ToTs for DWM should be specific according to the local culture and community and based on the type of local hazards. Hence, significant variations may arise in the way the DWM ToT is run according to the context. Following similar guiding principles, the training resources need to be adapted to the context according to a case-by-case basis. The agility of the trainers is therefore crucial, requiring flexibility and adaptability.

Cost-effectiveness is an important advantage of a ToT because the main resources required are to train people (that is, trainers) within an organisation. When these organisations are locally based and are part of the community, the capacity developed is retained and owned by the community and hence sustainable over the long term. Furthermore, the ToT model provides knowledge by trainers who belong to the community, and thereby enhancing empowerment and self-reliance of the community [13].

### 5.2. Method: Action Research Process

Action research is a type of practice-based inquiry where action and consequent reflection are fundamental elements of the design of the research process [15]. A single action research case study was conducted in Vanuatu. The project team was affiliated to SPREP and the University of Newcastle, and the team worked with key local stakeholders in Vanuatu to provide a DWM ToT course. The aim of the research was to explore the drivers and constraints of the ToT process for disaster waste management. This was measured by the value gained by the participants throughout the 5-day process. The feedback (value) given by participants allowed the ToT team to identify and analyse areas of possible improvement and replicability.

A five-step process took place to develop this action research: stakeholder consultations, design and development of training resources, training team preparation, delivery of TOT and evaluation of ToT, as shown in Table 1.

**Table 1.** Framework of the action research process.

	Research Process	Intended ToT Process
1.	Consultations with key local stakeholders to understand their needs and to develop the training strategy.	(a) Establishing the needs of the people who will be trained. (b) Building a network to develop social capital. (c) Identifying the criteria for satisfactory and effective performance of the trainers.
2.	Development of the contextual ToT package.	(a) Producing the training guide and associated resource materials. (b) Determining the mode of training, for example seminars, workshops, short courses, in-service training, self-directed study programs, and/or practical experience.
3.	Training team preparation.	(a) Going through materials and guidelines developed with the trainers. (b) Preparing and assisting trainers to run demonstrations in appropriate venues using the materials and guidelines.
4.	Delivery of the ToT with documentation and evaluation.	(a) Evaluating training resources and trainers. (b) Identifying effective training methodologies for DWM.
5.	Evaluation of ToT	(a) Evaluate effectiveness of module through daily park sheet. (b) Evaluate effectiveness of training package through final survey.

## 6. ToT Overview

Consultations were undertaken by SPREP with key stakeholders to identify agencies and individuals for the ToT in Port Vila, Vanuatu.

The ToT in Disaster Waste Management Handbook for Vanuatu was designed and developed following these consultations. A comprehensive literature review was undertaken to collect and assemble information to develop the handbook consisting of training modules and instructions for training facilitators. Given the limited information on DWM in the Pacific, the draft guidelines produced by SPREP served as a key reference for producing the ToT DWM handbook. Documents from the wider Asia-Pacific region were also consulted to inform the production of the handbook.

The handbook comprises two separate components. The first consists of notes for the ToT facilitators to run the six different modules in the ToT. The second is the compilation of the PowerPoint presentations for the ToT modules.

A draft DWM ToT handbook was produced prior to the ToT and sent for feedback to other team members, and subsequently, following the ToT training, to the ToT participants. All feedback was incorporated, and the final handbook was produced.

### 6.1. ToT Modules

The ToT handbook on DWM includes six modules organised in a logical sequence of complexity so that training participants can gradually build their knowledge by successively completing each module. An introductory section at the outset provides an overview of the project, the purpose of the ToT and clarifies the expectations of the training participants. All the modules include practical exercises to be conducted in break-out groups

with reporting and feedback after completion of the exercises (see Figure 2). The handbook also includes a template for evaluation of the ToT at its end.



**Figure 2.** ToT participants reporting after a break-out group exercise.

The six modules included in the handbook are:

- **Module 1-Disaster Resilience Concepts:** An overview of the key terms and concepts associated with disaster resilience. It is essential to develop a common understanding of the concepts as a foundation for the subsequent modules.
- **Module 2-Disaster Waste Management Overview:** Foundation module for participants to gain an understanding of the key concepts of disaster waste management in the context of specific disasters as discussed in the previous module.
- **Module 3-Disaster Waste Management Implementation:** Core module where the implementation of DWM in real-life situations is discussed. This module includes structured break-out group exercises to role play the opportunities and challenges of implementation.
- **Module 4-Gender and Social Inclusion in Disaster Waste Management:** Highlights the gender, disability, and social inclusion considerations required in the design, implementation and evaluation of disaster waste management.
- **Module 5-Field Assessment:** A field simulation module to provide knowledge on assessing DWM options. It draws on the lessons learned from previous modules and asks participants to apply their new knowledge in a real-world setting. See Figure 3 from one of the ToT field assessments conducted on Ifira island where participants carried out transect walks to examine the extent of waste issues that require intervention/management.
- **Module 6-Action Planning for Disaster Waste Management:** The final module brings together all the learning from the previous modules to produce an action plan for the participants' specific work/country context.

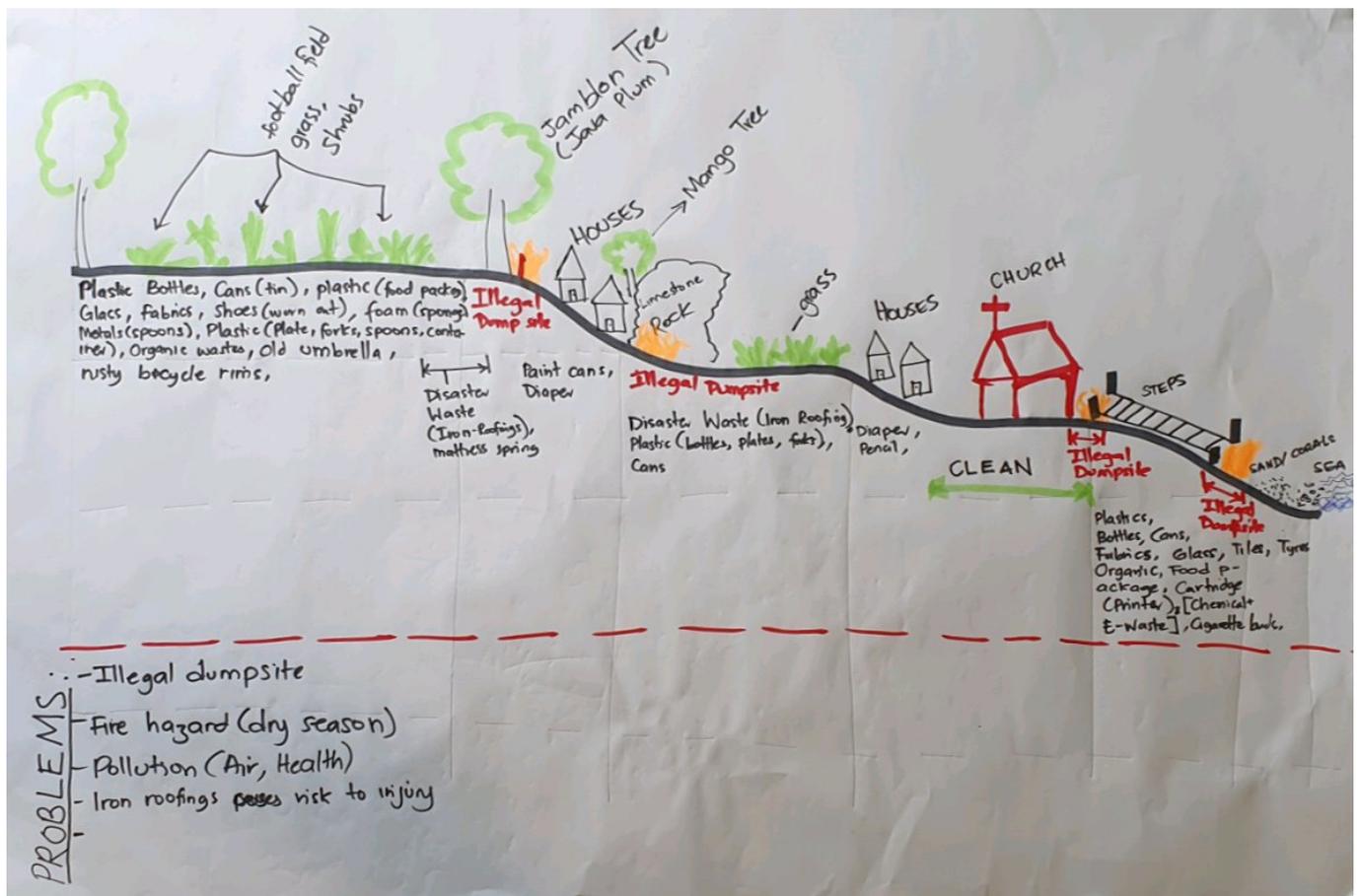


Figure 3. A break-out group output based on a transect walk on Ifira island.

## 6.2. Delivery of ToT

The 5-day ToT on DWM was held in Port Vila and attended by a wide range of participants from government agencies and NGOs. The structure of the ToT was based on the DWM handbook modules (see Section 5.1), and it also included additional activities. A summary of the ToT is provided below:

- **Day 1:** The scene was set for the ToT through presentations by a wide range of organisations including government agencies. Discussions on the different DWM initiatives by SPREP, J-PRISM and PacWaste Plus provided a broader overview of disaster waste management problem in the Pacific. The DWM guidelines produced by SPREP were introduced and a workshop was included. The day allowed introduction of the ToT participants, their roles in their respective organisations, and importantly, discussions on their expectations of the ToT.
- **Day 2:** The key concepts relating to disaster resilience were covered and an overview of DWM was provided. For each of these elements based on modules 1 and 2, structured break-out group exercises were undertaken.
- **Day 3:** A detailed coverage of DWM implementation (module 3) was provided, with structured break-out group exercises for participants to understand the key implementation principles. These exercises were based around applying the regional guidelines to a local context. A session on gender and social inclusion in DWM (module 4) was also included on this day where, upon completion, participants had time to develop a mock gender and social inclusion action plan for their specific work/country context.
- **Day 4:** An online session on spatial analysis for DWM was conducted by UNITAR, demonstrating the application of GIS and remote sensing technologies in this field.

A field visit to the island of Ifira was carried out later that day, where participants undertook transect walks through the island to document and understand waste management issues (module 5). As an exercise, participants collected the widespread waste on the island and transported it by boat for disposal in Port Vila.

- **Day 5:** The findings of the field visit were presented and discussed. An action planning for DWM exercise was undertaken, leading to the development of a DWM action plan for Vanuatu (module 6). All the participants who completed the ToT were awarded UN-badged certificates from CIFAL-Newcastle (a UN training centre hosted at the University of Newcastle). The ToT was evaluated by the participants, the results of which are presented in the next section.

## 7. ToT Evaluation

The ToT handbook includes an evaluation template. This template was used for evaluating the ToT in DWM upon its conclusion. The evaluation was completed by 18 participants. The results indicate a high level of satisfaction of the participants on all the aspects of the ToT (see Table 2 below). Almost 65 per cent of the participants gave the ToT the overall maximum rating of “Excellent” and the remaining participants rated it in the next tier, “Good”; no participant rated it below these two top criteria. Participants rated the knowledge of the facilitators, and the participation and interaction at the ToT very highly. In addition to the quantifiable feedback, the evaluation included qualitative feedback, which also reflected on the training positively. In most of the qualitative feedback, participants strongly appreciated the break-out group exercises and particularly the field visit exercise (Transect Walk). This is important because a key purpose of the ToT was to facilitate learning through the extensive series of structured exercises.

**Table 2.** Outline of the action research process.

Prompt	Strongly Agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %
1. The workshop met my expectations.	50	50	0	0	0
2. I will be able to apply the knowledge learned.	50	50	0	0	0
3. The content was organised and easy to follow.	17.7	58.8	23.5	0	0
4. The materials distributed were pertinent and useful.	27.8	50	22.2	0	0
5. The facilitators were knowledgeable.	72.3	27.7	0	0	0
6. Participation and interaction were encouraged.	70.6	23.5	5.9	0	0
7. Adequate time was provided for questions and discussion.	31.3	18.8	43.7	6.2	0
8. The material will be useful for running my own training session.	66.7	27.8	5.5	0	0
	Excellent %	Good %	Average %	Poor %	Very Poor %
9. How do you rate the workshop overall?	64.7	35.3	0	0	0

There were some reservations regarding the time available for Q&A and for the group exercises, and there was some demand for hard copies of the handbook. This feedback needs to be recognised for the purpose of future ToTs.

Some daily running and ongoing evaluative elements were incorporated into the ToT to supplement the final evaluation. These were followed up during the final evaluation. These elements included:

- A 'Host Team' composed of three ToT participants was formed for each day, ensuring adequate gender balance and organisational representation. The Host Teams reported to the facilitators at the end of each day, highlighting the successes and challenges experienced during that day of the ToT. This allowed feedback from participants to inform the subsequent days.
- A 'Park Sheet', that is, an A1-size flipchart sheet posted on a wall each day where participants were encouraged to write their comments and observations on that day of the ToT. This supplemented the feedback provided by the Host Teams and allowed to successively improve the training by incorporating the feedback.

## 8. Challenges

The ToT was held in one of the best equipped conference rooms in a resort in Port Vila to ensure quality and efficiency. Yet, internet connectivity was a problem. The quality of the online session presented by UNITAR was marred by internet connectivity interruptions, and likewise, some other activities requiring internet connectivity faced obstacles in smooth operation. As an adaptive management measure, all online video clips used in the ToT were converted to MP4 files so as not to depend on the internet during the running ToT sessions. This is a key challenge in the Pacific Island context, not only in Vanuatu, and needs to be taken into consideration in DWM ToTs elsewhere in the region. It is recommended that all video sessions be pre-recorded where appropriate.

The ToT handbook was originally envisioned to be an online document as an environmentally friendly measure, but the ToT evaluation indicated a demand for hard copies because of the lack of widespread and good quality internet accessibility in Vanuatu. This is possibly the case in many other Pacific Island nations, therefore, for future ToTs in the region, hard copy handbooks should be distributed to participants and key stakeholders.

Time management was also a challenge. The main issue to overcome here is flexibility in start time of sessions and the need for longer periods to complete exercises and allow for Q&A. This is a lesson for future ToTs in the region. Adaptive time management and flexibility should be built further into the ToT program.

## 9. Conclusions

DWM is a critical area of work not only in the response and recovery stages of a disaster, but also in pre-disaster preparedness and planning, hence the necessity for the integration of DWM with DM. In Vanuatu, as in most other Pacific Island countries, waste management and DM agencies are in separate ministries and hence institutional integration in planning and response requires strengthening. Capacity strengthening of staff is important, not only in terms of gaining individual knowledge and experience, but for ToT participants to further develop the capacity of others by taking ownership of the training and response, and advocating for resources that meet the disaster waste management needs of Pacific communities.

The DWM ToT conducted in Port Vila, Vanuatu, served as a pilot for testing the DWM handbook and implementing the ToT in a real-life setting. This provided a space where lessons could be learned for future ToTs to be conducted in the Pacific region and island nations in other regions that face similar hazards. The training resources could be used in many other countries by localising the case studies and transect walk activities. The feedback received at the ToT helped in revising the DWM guidelines that was launched by SPREP and JPRIM II at the beginning of 2022 [2]. Nonetheless, the DWM handbook

produced for the ToT is a dynamic document and has the flexibility for further improvement by drawing on future ToTs, as well as changing circumstances over the future.

To be able to build on the experience and outcomes of this project, future action research may need to look at ways to facilitate long-term assessment of the ToT outcomes, assurance of quality and sustaining the capacity strengthening initiative through local ownership and growth. Since the ToT conducted in 2019, there have been several major disasters in Vanuatu and elsewhere in the Pacific region such as cyclones and volcanic eruptions, further demonstrating the criticality of DWM and the necessity of replicating such capacity strengthening initiatives on a widespread level.

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## References

- Aleksandrova, M.; Balasko, S.; Kaltenborn, M.; Malerba, D.; Mucke, P.; Neuschafer, O.; Radtke, K.; Prutz, R.; Strupat, C.; Weller, D.; et al. *World Risk Report 2021: Focus—Social Protection*; Bündnis Entwicklung Hilft: Bochum, Germany, 2021.
- SPREP (Secretariat of the Pacific Regional Environment Programme). *Pacific Island Countries Regional Disaster Waste Management Guideline*; SPREP: Apia, Samoa, 2021.
- SPC (Pacific Community); SPREP (Secretariat of the Pacific Regional Environment Programme); PIFS (Pacific Islands Forum Secretariat); UNDP (United Nations Development Programme); UNISDR (United Nations Office for Disaster Risk Reduction); USP (University of the South Pacific). *Framework for Resilient Development in the Pacific: An Integrated Approach to Address Climate Change and Disaster Risk Management*; Pacific Community: Suva, Fiji, 2016.
- UNOCHA (United Nations Office for the Coordination of Humanitarian Affairs). *Disaster Waste Management Guidelines*; Joint UNEP/OCHA Environment Unit: Geneva, Switzerland, 2013.
- Japan Ministry of Environment. Asia Pacific Disaster Waste Management guideline. Available online: <https://www.env.go.jp/en/headline/2383.html> (accessed on 21 June 2022).
- Finn, M.; Gilmore, B.; Sheaf, G.; Vallieres, F. What do we mean by individual capacity strengthening for primary health care in low- and middle-income countries? A systematic scoping review to improve conceptual clarity. *Hum. Resour. Health* **2020**, *19*, 1–13. [CrossRef] [PubMed]
- Grampians Central Waste & Resource Recovery Group. *Guidelines for Preparing for Waste Management during and after an Emergency*; Grampians Central Waste & Resource Recovery Group: Wendouree, VIC, Australia, 2017.
- Green Industries SA. Disaster Waste Management. Available online: <https://www.greenindustries.sa.gov.au/disaster-waste-management> (accessed on 28 September 2022).
- SPREP. *Cleaner Pacific 2025: Pacific Regional Waste and Pollution Management Strategy 2016–2025*; SPREP: Apia, Samoa, 2016.
- Observatory of Economic Complexity (OEC). Vanuatu. Available online: <https://oec.world/en/profile/country/vut> (accessed on 21 June 2022).
- Vanuatu Meteorology & Geo-Hazards Department (VMGD). Tropical Cyclone Information. Available online: <https://www.vmgd.gov.vu/vmgd/index.php/forecast-division/tropical-cyclone> (accessed on 21 June 2022).
- Ahmed, I.; Parrack, C. Shelter self-recovery: The experience of Vanuatu. *Architecture* **2022**, *2*, 434–445. [CrossRef]
- Makanjuola, V.; Doku, V.; Jenkins, R.; Gureje, O. Monitoring and evaluation of the activities of trainees in the ‘training of trainers’ workshop at Ibadan, south-west Nigeria. *Ment. Health Fam. Med.* **2012**, *9*, 25–32. [PubMed]

- 
14. Fuchs, D. Examiner familiarity effects on test performance: Implications for training and practice. *Top. Early Child. Spec. Educ.* **1987**, *7*, 90–104. [[CrossRef](#)]
  15. McNiff, J. *Action Research: Principles and Practice*; Routledge: London, UK, 2013. [[CrossRef](#)]