PacPlan Resilience Project 2022-25

Circular Economy Workshop: A Circular Approach to Waste Management in the Pacific – Creating Resources from Waste and Pollution

Port Vila, Vanuatu

30 September – 4 October 2024

-

Report

ACKNOWLEDGEMENTS

The preparation of this Circular Economy Report was made possible through the collaborative efforts of numerous individuals and organisations. As such, the SWAP Project Management Unit extends its sincere gratitude to all the participants and stakeholders whose contributions were instrumental in the success of the Circular Economy Workshop. Their engagement played a key role in fostering productive discussions and achieving meaningful outcomes.

Special thanks go to the distinguished speakers and contributors to the opening remarks:

- Ms Rolenas Tavue Baereleo - Acting Director, Department of Environmental Protection and Conservation, Vanuatu
- Mr Sefanaia Nawadra - Director General, Secretariat of the Pacific Regional Environment Programme, SPREP
- Mr Sebastien Jaunâtre - Deputy Head of Mission, French Embassy in Vanuatu
- Mr Naohisa Okuda - Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Vanuatu
- Ms Bénédicte Alsac - AFD Representative in Vanuatu

Their leadership and support set the foundation for a successful workshop.

We also extend our gratitude to the French Government for its financial support through the Fonds Pacifique. This support was contributory in delivering the workshop at a regional level, enabling the participation of representatives from all Pacific Island countries and territories.

Additionally, we appreciate the session leaders and panellists for sharing their expertise on key topics, including circular economy principles, waste-to-energy technologies, hazardous waste management, disaster waste management, composting and sustainable financing.

A special acknowledgment goes to our colleagues and partners from SPREP's Waste Management and Pollution Control (WMPC) Programme, including the PacWastePlus Programme, the PAWES and PacPlan Projects, as well as the J-PRISM III project. Their expertise and commitment have been invaluable in advancing sustainable waste management across the Pacific region.

Finally, we would like to thank all workshop participants for their engagement and contributions, which ensured the workshop's success. The insights and outcomes from this

event will play a vital role in strengthening circular approach in waste management practices across the Pacific Islands and beyond.

ACRONYMS

AFD	Agence française de Développement
ARF	Advanced Recovery Fees
ARS	Advanced Recovery Scheme
BSF	Black Soldier Fly
DDT	Dichlorodiphényltrichloroéthane
DEPC	Department of Environmental Protection and Conservation - Vanuatu
DRS	Deposit Refund Systems
DS	Deposit Systems
DWM	Disaster Waste Management
DWTWG	Disaster Waste Technical Working Group
EIA	Environmental Impact Assessment
EMV	Environmental Management Vanuatu
EPR	Extended Producer Responsibility
ESWG	Environment Sector Working Group
EU	European Union
FESRIP	Framework for Energy Security and Resilience in the Pacific
FRDP	Framework for Resilient Development in the Pacific
GEF	Global Environment Facility
JICA	Japan International Cooperation Agency
J-PRISM	Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management

MSW	Municipal Solid Waste
NCPIP	National Chemical Policy and Costed Implementation Plan
NDMO	National Disaster Management Office
NHWPIP	National Hazardous Waste Policy and Costed Implementation Plan
OES	Ocean Environmental Services
PAWES	Pacific Adoption of Waste-to-Energy Solutions
PCB	Polychlorobiphényle
PDNA	Post-Disaster Needs Assessment
PIC	Prior Informed Consent
PICTs	Pacific Island Countries and Territories
POMF	Pacific Regional One-Maritime Framework
“PPRR" Framework	Prevention/mitigation, Preparedness, Response, and Recovery Framework
PRP	Pacific Resilience Partnership
PRS	Pacific Resilience Standards
PSS	Product Stewardship Scheme
P&I Insurance	Protection and Indemnity Insurance
RMI	Republic of the Marshall Islands
SDG	Sustainable Development Goals
SPREP	Secretariat of the Pacific Regional Environment Programme
SPC	Pacific Community (SPC)

SRWMA	Samoa Recycling and Waste Management Association
STE	Service Territorial de l'Environnement de Wallis et Futuna
SWAP	Committing to Sustainable Waste Actions in the Pacific
SWOPM	Samoa Waste Oil Management Programme
TDU	Thermal Desorption Unit
USP	University of the South Pacific
WAL	Waste Authority Ltd
WTE	Waste-to-Energy

CONTENTS

Appendix D: Power Point Presentations - Session #2: Circularity in Waste Management vs landfill

Appendix D: Power Point Presentations - Session #3: Waste-to-Energy

Appendix D: Power Point Presentations - Session #4: Emergency Response to Oil or Chemical Spillage

Appendix D: Power Point Presentations - Session #4: Disaster Waste Management

Appendix D: Power Point Presentations - Session #6: Organic Activities

Appendix D: Power Point Presentations - Session #7: Sustainable Financing for Waste Management

I. INTRODUCTION

The **Circular Approach** to Waste Management is a sustainable model of production and consumption that emphasises **sharing, leasing, reusing, repairing, refurbishing and recycling** existing materials and products for as long as possible. By extending product life cycles, this approach minimises waste and ensures that materials remain within the economy through recycling, thereby creating **further value**.

This marks a significant departure from the traditional **linear economic model** of production, consumption, and disposal—often summarised as **take-make-consume-throw away**. The linear model depends on large quantities of cheap, easily accessible materials and energy, leading to excessive resource use and environmental degradation.

1.1. Benefits of Circularity in Waste Management

Unlike the traditional economic model, integrating circularity into waste management offers key advantages:

- **Environmental Protection** – Reduces the use of natural resources, greenhouse gas emissions, energy use, landscape and habitat disruption, energy consumption, and waste generation while preserving ecosystems.
- **Reduced Dependence on Raw Materials** – Lessens reliance on raw material imports and mitigates risks such as price volatility and supply chain disruptions.
- **Economic Growth & Job Creation** – Stimulates local industries by fostering opportunities in repair, remanufacturing, recycling, and waste processing.

1.2. Circular Economy in the Pacific: A Critical Turning Point

The Pacific is **at a critical crossroads in its efforts to manage waste sustainably**. With increasing waste generation, and a growing urgency to protect the environment, it is crucial to move beyond linear waste management models. **These models have led to rising environmental, economic, and social challenges** across Pacific Island Countries and Territories (PICTs).

To address these challenges, PICTs can **embed circular economy principles into legislation and decision-making**, including:

- **Importation bans and quality restrictions** to control waste at the source.

- **Sustainable financing mechanisms** such as deposit/return schemes.
- **Organic waste management and composting programmes** to reduce landfill waste.
- **Investment in local repair, remanufacturing, and recycling infrastructure** to enhance resource recovery.

1.3. Regional Collaboration for Sustainable Waste Solutions

In response to these challenges, and to explore sustainable solutions, the **Secretariat of the Pacific Regional Environment Programme (SPREP[1])**, through initiatives such as:

- **Committing to Sustainable Waste Actions in the Pacific (SWAP[2]) Project – AFD**
- **PacWastePlus Programme[3] – EU**
- **PacPlan – Australia**
- **ISLANDS[4] – GEF**
- **PAWES Programme[5]**

in collaboration with the **J-PRISM III (JICA) Project and the Department of Environmental Protection and Conservation (DEPC[6]), Vanuatu,** hosted **a Regional Workshop on Circular Approach to Waste Management in the Pacific**.

1.4. Workshop Goals & Key Discussions

This workshop **brought together waste management practitioners** from across the Pacific to explore how circular economy strategies can **minimise waste, reduce raw material dependency, create jobs, and enhance economic resilience**.

Key thematic sessions included:

- **Hazardous waste management**;
- **Improved landfill practices**;
- **Waste-to-energy solutions**;
- **Emergency response to chemical spills**;
- **Disaster waste management**; and

[1] https://www.sprep.org/
[2] https://swap.sprep.org/
[3] https://pacwasteplus.org/
[4] https://www.gefislands.org/
[5] https://gem.spc.int/projects/pacific-adoption-of-waste-to-energy-solutions
[6] https://environment.gov.vu/

- **Sustainable financing mechanisms**.

These discussions provided **valuable insights** into how the **circular economy can turn waste into valuable resources,** driving sustainable and resilient communities across the Pacific.

II. WORKSHOP CONTENT

2.1. Workshop objectives

The workshop aimed to:

- **Introduce** participants to the **concept of the Circular Economy** and its relevance to waste management.
- **Examine** the **implications and benefits** of adopting a **Circular Approach** to waste management in the Pacific.
- **Explore** key aspects of **Circular Economy initiatives**, including **policy development, regulatory frameworks, and sustainable financing mechanisms.**
- **Share lessons learned** and experiences from **existing and planned Circular Economy projects** across the region.
- **Strengthen** networking and collaboration among **waste management professionals** to enhance regional cooperation and knowledge exchange.

2.2. Agenda

This regional workshop was structured into 7 sessions as follows:

- **Opening session: Overview of Circular Economy**
  - Changing the narrative – from Linear to Circular Waste Management
  - Circular Approach for Waste Management: Changing the Narrative
- **Session #1: Circular Approach to Hazardous Waste Management**
  - Setting the scene
  - Regulations, Policies and Plans
  - Used Oil Management
  - Leveraging the Basel and Waigani Conventions to Foster a Circular Economy in the Pacific
  - Hazardous Waste and Used Oil Management - Experience sharing from Wallis and Futuna
- **Session #2: Circularity in Waste Management and Landfill**
  - How circularity in Waste Management can extend the lifespan of landfill
  - Side visit to Bouffa landfill
- **Session #3: Waste-to-Energy**
  - Waste-to-Energy options for a sustainable future

  - Waste-to-Energy options for promoting Circular Economy
  - Pyrolysis Technology for Plastics and Used Oil Processing
  - Technology (Pyrolysis) demonstrations for Innovative Technologies in Waste-to-Energy
  - SWAP Used Oil Management Pilot Project in Vanuatu
  - Used Oil Reprocessing Project in Vanuatu
  - Presentation of a business-scale pyrolysis technology
  - Design of a Used Oil Storage and Reprocessing Facility
  - Biogas Technology
  - Circular Economy & Animal feeding: Experience sharing from New Caledonia
- **Session #4: Emergency response to oil or chemical spillage**
  - Experience sharing from Ocean Environmental Solutions on Oil Spill Response in the Solomon Islands
  - Spillage Management Plan: cleaning / temporary storage / final disposal
  - Oil management / Oily waste management
  - Insurance
  - Landfarming in Samoa
- **Session #5a: Disaster Waste Management and Circular Economy**
  - Setting the Scene: Overview of Disaster Waste and Impacts
  - Framework for Resilient Development in the Pacific (FRDP)
  - Mainstreaming Waste Management into National Disaster Management Office Framework
  - 4Practitioner's Guideline on Drafting National Disaster Waste Management Plan
  - Overview of Disaster Waste Management in Fiji
  - Practitioner's Guideline on Establishing Environment Sector Working Group
  - Case Study: Vanuatu's experience on the need to establish Environment Sector Working Group
  - Practitioner's Guideline on Estimating and Recording Disaster Waste
  - Tonga's Journey through Disaster Waste
- **Session #6: Organic activities in the Pacific**
  - Introduction to how composting supports the circular approach
  - Presentation of existing or ongoing composting projects in the region - progress / lessons learned / results

- **Session #7: Sustainable financing for waste management**
  - Introduction to how sustainable finance schemes support the circular approach
  - Presentation of various existing or ongoing sustainable financing projects in the Pacific: progress / lessons learned / results
  - Experience sharing from New Caledonia
  - Recap on how sustainable finance schemes support the circular approach
  - Sustainable Financing for waste management: Experience sharing from Niue regarding financial modelling

The agenda including name and position of the speakers is included in Appendix 1.

2.3. Participants

A total of **72 participants** attended the **week-long Circular Economy Workshop**, representing a diverse range of organisations from across the **Pacific region**. Participants came from various **Pacific Island countries and territories**, including the **Cook Islands, Fiji, Kiribati, Nauru, New Caledonia, Niue, Palau, Papua New Guinea (PNG), the Republic of the Marshall Islands (RMI), Solomon Islands, Tonga, Vanuatu, and Wallis and Futuna**, as well as **Australia and New Zealand**.

The workshop brought together **SPREP and JICA staff**, alongside **waste management practitioners** and key stakeholders from **government ministries, local authorities, universities, and private sector businesses**. This diverse representation fostered **rich discussions and knowledge sharing**, offering multiple perspectives on **waste management systems** across the region.

A full list of participants as well as their organisations and contact details (when authorised) is included in the appendix C.

III. OPENING REMARKS

3.1. Ms Rolenas Tavue Baereleo - Acting Director of the Department of Environmental Protection and Conservation (DEPC), Vanuatu

Ms Rolenas Baereleo, Acting Director of the Department of Environmental Protection and Conservation (DEPC) of Vanuatu, warmly welcomed all participants to the **Circular Economy Workshop in Vanuatu**. She expressed her appreciation for the collaborative efforts of **SPREP projects**, including **SWAP, PacWastePlus, and J-PRISM III**, along with key partners such as **GEF ISLANDS and the PacPlan Resilience Project**, which made the event possible.

Ms Baereleo emphasised the **importance of integrating circularity** into **waste management practices** across **Pacific Island Countries and Territories (PICTs)**. She encouraged participants to share their experiences, lessons learned and explore strategies such as **turning waste into valuable resources, fostering local remanufacturing, and improving access to recycling markets**.

Drawing from **Vanuatu's experience**, she highlighted key findings from the **Vanuatu Waste Audit (2020)**[7] conducted under **PacWastePlus**, which revealed that **organic waste constitutes a significant portion of waste at Bouffa landfill**. She expressed enthusiasm about applying **circular economy principles** to **transform waste into resources**, particularly through **composting and other waste diversion initiatives**.

Ms Baereleo also addressed the **Pacific's vulnerability to natural disasters** and stressed the need for **effective disaster waste management**. She underscored the importance of **developing community disaster waste management plans** and establishing a **national working group** to oversee disaster waste management activities. These efforts, she noted, align with a broader goal of **adopting circularity in disaster response** to **minimize environmental impacts**.

Additionally, she highlighted the **SWAP Project's role** in managing **used oil waste in Vanuatu**, as well as **ongoing collaborations with the maritime sector** under the **PacPlan and Moana-Taka Partnership**[8] to **reduce pollution and position the sector as a key player in the circular economy**.

[7] https://pacific-data.sprep.org/system/files/Vanuatu-Landfill-Audit-Report.pdf
[8] https://www.sprep.org/sites/default/files/documents/publications/moana-taka-partnership.pdf

In closing, Ms Baereleo underscored the **critical role of circular economy initiatives** in **addressing waste challenges, protecting biodiversity, and mitigating climate change impacts** in the **Pacific region**. She called for **collective action** and urged participants to reflect on how they can contribute to **advancing the circular economy** for a more **sustainable** future in the Pacific.

3.2. Mr Sefanaia Nawadra, Director General of the Secretariat of the Pacific Regional Environment Programme (SPREP), Samoa

Mr Sefanaia Nawadra, Director General of the Secretariat of the Pacific Regional Environment Programme (SPREP), highlighted the **urgent environmental challenges facing humanity, particularly climate change, biodiversity loss, and pollution.** He drew attention to **plastic pollution as a growing threat,** echoing French President Macron's warning that plastic pollution is a **"time bomb" with long-term environmental and health consequences for future generations.**

Mr Nawadra emphasised that while the **full impact of plastic pollution, particularly microplastics, is still emerging,** their presence in ecosystems—including food sources and even human organs—**raises serious health concerns.** These pollutants have been associated with **endocrine disruption, cancer, and reproductive health issues.**

He called on **leaders, policymakers, waste management professionals, civil society, and individuals** to take responsibility for **combating all forms of pollution** that jeopardise the well-being of future generations. While **behavioural changes to reduce waste are crucial,** he emphasised the **transformative potential of a Circular Economy model.** This approach, which focuses on **sharing, leasing, reusing, repairing, and recycling materials,** extends the lifecycle of products, **reduces environmental damage,** and fosters economic benefits by **decreasing reliance on raw materials while stimulating local job creation and economic growth.**

Mr Nawadra pointed out **significant opportunities for Pacific Island Countries and Territories (PICTs) to integrate Circular Economy principles** into their waste management strategies. He highlighted key areas such as **policy development, import controls, sustainable financing mechanisms, and improving recycling infrastructure.** He expressed hope that these themes would be explored throughout the workshop, enabling participants to **exchange knowledge and regional experiences.**

In closing, Mr Nawadra **reaffirmed SPREP's commitment** to supporting the Pacific's **transition to a Circular Economy.** He acknowledged that this workshop, organised in collaboration with

Vanuatu's Department of Environmental Protection and Conservation, marked the **first major event on this topic,** but assured participants it would **not be the last.** He wished them a **productive workshop** filled with **insightful discussions and valuable networking opportunities.**

3.3. Mr Sebastien Jaunâtre, Deputy Head of Mission at the French Embassy in Vanuatu

Mr Sebastien Jaunâtre, Deputy Head of Mission at the French Embassy in Vanuatu, expressed his enthusiasm for participating in the **Regional Workshop on Circular Economy.** He envisioned a **future Vanuatu with pristine beaches free of plastic waste, sustainable communities, and a resilient economy.**

He outlined **three key benefits** of a circular economy:

- **Environmental Benefits:** Vanuatu's islands are **highly vulnerable to climate change,** but adopting a circular economy can **reduce its ecological footprint, protect marine ecosystems, and mitigate rising sea levels.**
- **Economic Advantages:** A circular economy can **create new industries and jobs, particularly in waste management and recycling,** contributing to Vanuatu's **economic growth.**
- **Social Impacts:** This approach **empowers communities** by encouraging **local production and consumption** while fostering a **sense of responsibility toward natural resources.**

Mr Jaunâtre commended Vanuatu's ongoing efforts, highlighting initiatives such as the **SWAP Used Oil Management Pilot Project, Marine Litter Cleanups, and waste audits.** These projects **demonstrate a strong commitment to sustainability,** with **plastic collection and recycling playing a key role** in the circular economy. He emphasised that **partnerships between government, businesses, and civil society organisations** are essential to **accelerating progress toward a circular economy.**

In closing, **Mr Jaunâtre encouraged collaboration** to help **Vanuatu become a global leader in sustainable development.**

3.4. Mr Naohisa Okuda - Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Vanuatu

In his opening remarks, **H.E. Mr Naohisa Okuda, Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Vanuatu,** emphasised **Japan's long-standing commitment to supporting waste management and circular economy initiatives** in the Pacific. Since the **1990s, Japan has contributed through JICA and government-led initiatives.**

Japan's contributions include:

- **Dispatching experts to the Pacific**
- **Introducing the "Fukuoka Method" for waste disposal** in seven countries
- **Establishing recycling associations** in five Pacific Island nations

A key initiative, the **J-PRISM project (launched in 2011 in collaboration with SPREP),** has played a vital role in **landfill development, human resource capacity building, and disaster waste management.**

Mr Okuda underscored the **importance of regional cooperation** and highlighted the **"3Rs + Return" concept** as a strategy to integrate waste management with **climate change and biodiversity conservation.**

He concluded by **expressing hope that the workshop would strengthen regional cooperation** and serve as a critical step toward **realising a circular economy in the Pacific.**

3.5. Ms Bénédicte Alsac - AFD's representative in Vanuatu

Ms Bénédicte Alsac, AFD's representative in Vanuatu, shared remarks on behalf of **Agence Française de Développement (AFD),** highlighting key achievements of the **SWAP project.** These include:

- **Conducting beach cleanup surveys**
- **Rehabilitating access roads** to the Bouffa and Luganville landfills
- **Supporting the collection, storage, and disposal of used oil**
- **Testing pyrolysis technology** for waste management

She also announced that **SWAP will receive a second phase with an increased budget of 4.3 million euros.** This new phase aims to **build on past successes, apply lessons learned, and scale up efforts** for greater impact. **SWAP 2 will focus on marine litter, used oil, solid waste management, and circular economy initiatives.**

In closing, she reaffirmed **AFD's commitment to stronger coordination with other SPREP waste programmes** and emphasised the **importance of sharing best practices among Pacific States.** She wished all participants a **successful workshop.**

IV. CIRCULAR ECONOMY WORKSHOP OUTCOMES

4.1. Opening session: Overview of Circular Economy

4.1.1. Changing the Narrative – From Linear to Circular Waste Management

Speaker: Ms Tania Hyde - Circular Economy Lead - Beca, New Zealand

Ms Tania Hyde, Circular Economy Lead at Beca[9], gave an **insightful presentation** on the **transition from a linear economy to a circular economy**, particularly in **waste management**. She started by emphasising the importance of **shifting to a circular economy** due to the **overconsumption of Earth's resources**, illustrated by **"Earth Overshoot Day." Many countries**, including Australia and New Zealand, **are consuming more resources than the planet can regenerate** within a year.

In the **linear economy, natural resources are extracted, used briefly, and often disposed of in landfills, leading to pollution and environmental degradation**. Recycling, while beneficial, **only partially addresses the issue**, as it still contributes to waste generation. Globally, **only 7-9% of materials are recycled**, a number too low to close the gap on **resource depletion**.

The concept of a **circular economy** focuses on **keeping resources in use for as long as possible by repairing, reusing, and redesigning products**. The **key principles** of this approach are:

1. **Designing out waste and pollution**, addressing **carbon emissions and other pollutants**.
2. **Keeping products and materials in use** for extended periods, emphasising **asset management and maintenance**.
3. **Regenerating natural systems,** actively **restoring the environment** rather than just minimising damage.

In the **short term**, several **circular economy strategies** can be implemented in practice to **upcycling existing manufactured products**, such as reusing car tyres for playground equipment and biochar production from rice hulls for sustainable agriculture. There are excellent examples of repurposing waste into high-value products that contribute to the local economy. For instance, Critical.[10], a New Zealand-based company, transforms plastic waste into Cleanstone—a beautiful, low-carbon, and endlessly recyclable material used in construction and design. By turning discarded plastic into durable and aesthetically appealing

[9] https://www.beca.com/
[10] https://criticaldesign.nz/

surfaces, this company not only reduces waste but also promotes a circular economy, empowering the next generation of sustainable buildings.

However, with in **long-term perspective**, the priority is to **rethink product and infrastructure design** for **multiple uses**, offering a model where **circularity is integrated into all aspects of the lifecycle**.

Circular design principles can also be inc**luded in work, considering indigenous and local perspectives** when implementing circular economy strategies. This can go through the establishment of "**Living Labs**," which are spaces **for collaboration and experimentation to address local challenges**, particularly relevant in Pacific Island contexts, where closed-loop systems can test circular solutions. Indeed, we must first examine system levers that facilitate change. These include education and behaviour change, but more critically, collaboration, procurement, and investment. Living Labs and Circular Hubs are typically established to help **overcome persistent barriers** and **scale solutions**, ultimately **supporting local businesses**.

Here is an example of **a 'Living Lab' designed to address food waste challenges:**

- A 'Living Lab' Approach to Managing Food Waste: https://bioenergy.leeds.ac.uk/wp-content/uploads/sites/51/2018/12/food-waste-poster.pdf

Given **current and future environmental challenges,** Ms Hyde urged a **shift from consumption-based models to performance-based, circular solutions. Collaboration and innovative design** are **critical** to addressing **global sustainability challenges.**

4.1.2. Changing the Narrative – Circular Approach for Waste Management

Speaker: Ms Hilary Boyes - PacWastePlus Technical Waste Project Officer – Resource Recovery - SPREP, Samoa

Ms Hilary Boyes, PacWastePlus Technical Waste Project Officer at SPREP, specialising in Resource Recovery, emphasised the **need to apply a circular economy lens** to **waste management in the Pacific.** She stressed that this is **not just a theoretical exercise** but a **practical approach** to **rethinking waste management decisions.**

Based on **national waste audits from 2021,** while **65% of households receive waste collection services,** there is a **significant gap in waste recovery.** Of the total **416,000 tons of waste generated, only a small portion is recovered.** The **data highlighted that organics** make up a **significant portion of waste,** making it a **"low-hanging fruit"** for change. However, a **circular**

approach to waste management requires **rethinking waste collection, processing, and recovery.**

As an example, **organic waste** can be used for **composting and biogas production. Home composting** is a **viable solution,** and with **investment, awareness, and education,** communities can **turn organic waste into valuable resources** instead of sending it to **landfills.**

Similarly, **better recycling of beverage containers**—such as **glass bottles**—is possible, but it **requires investment in collection systems, recycling infrastructure, and promoting recycled content** in imported products.

To **incorporate circularity into waste management,** key actions include:

- **Setting up sustainable financing mechanisms** through **Extended Producer Responsibility (EPR)** to support **waste collection, segregation, processing, and recovery.**
- **Implementing import controls** to prevent the entry of **non-repairable and non-recyclable products.**
- **Raising awareness and educating communities** to **change waste habits.**

In conclusion, **enabling a circular economy in the Pacific** requires **stronger policies, improved infrastructure, education, and sustainable finance.** If managed correctly, **this transition can lead to significant savings and a cleaner environment.**

4.1.3. Q&A/ Comments

✓ *The first question addressed the key challenges and obstacles in scaling up circular economy initiatives and strategies to overcome them.*

Ms Hilary Boyes acknowledged that **many countries face similar issues.** Often, **pilot programmes receive initial investment,** but **scaling them up, especially in community education, is a challenge.** She noted that **there isn't a single solution** but emphasised the **importance of having a clear strategy and a targeted approach.**

Accurate data collection is **crucial** to understanding **what goes into landfills** and making **informed decisions**—such as purchasing the **right equipment.**

Behaviour change is one of the **biggest challenges.** It is **difficult** to ask **communities to adapt to one system** and then **change their behaviour again** shortly after. While **investing in**

infrastructure is easier, the real challenge lies in altering behaviour and ensuring collection systems are effectively used.

Additionally, Ms Tania Hyde emphasised that scaling system levers—such as education and awareness, collaboration, procurement, incentives, regulations, and measurable standards—requires integrating these elements into the strategy. She highlighted that a 'Living Lab' approach **is the** best way **to** engage all stakeholders **and** drive meaningful change.

- ✓ *The second question was about the Pacific Islands' limited role in the design and production of goods they consume. Products like televisions, cars, and ships are designed and manufactured in places like Europe, Japan, and the U.S. and are later imported into the Pacific Islands. Circular economy models don't fully acknowledge the unique challenges the Pacific Islands face. Since the region is at the tail end of the product lifecycle, the question focused on how the Pacific Islands can have a stronger voice and influence in the design and production stages of these goods.*

Ms Hilary Boyes agreed that the Pacific is indeed at the **tail end of the product chain**, but this **doesn't mean there aren't opportunities to make a difference.** While the Pacific **may not be involved in raw material extraction or large-scale production**, it can **influence global manufacturing through policy**, especially in international discussions like the **INC (Intergovernmental Negotiating Committee on Plastic Pollution).**

Moreover, the **Pacific Islands can control what enters their borders** by:

- **Banning products that have no recycling value**
- **Encouraging consumers to choose recyclable materials** like PET, aluminium, and glass
- **Implementing quality standards on imports** (e.g., vehicles) to **prevent low-quality products from turning into waste too quickly**

For example, **plastic bag bans have encouraged local industries to produce reusable bags from waste materials.**

Ms Tania Hyde provided additional ideas for increasing influence:

- **A unified voice in international forums** discussing product design and manufacturing standards
- **Partnerships with manufacturers and designers** from producing countries

- **Research collaborations** that incorporate **indigenous knowledge and sustainable practices**
- **Investment in local capacity-building programmes** focused on **technology, design, and circular economy principles**
- **Encouraging small-scale, local manufacturing** using **sustainable materials and designs**
- **Promoting entrepreneurship in upcycling and repair sectors** to **influence broader sustainable design trends**

Most of these challenges **could be addressed in a regional 'Living Lab'** to unlock potential solutions.

4.2. Session #1: Circular Approach to Hazardous Waste Management

4.2.1. Session #1a: Setting the scene

Speaker: Mr Joshua Sam – Hazardous Waste Management Adviser - SPREP, Samoa

Mr Joshua Sam, Hazardous Waste Management Adviser at SPREP, emphasised the **importance of integrating circularity into hazardous waste management.** While much of the content had been discussed in broader circular economy discussions, he specifically addressed the **unique challenges posed by hazardous waste in the Pacific.**

There are several sources of hazardous waste in the region, including:

- **Industrial activities –** Where limited large-scale industries exist, but **mining and other operations** generate hazardous **byproducts.**
- **Household items – Batteries, paints, and toys** contain hazardous materials that are often overlooked.
- **Thermal power generation sector –** Contributes **significantly** to hazardous waste**,** including **used oil**, which is a significant hazardous waste output.
- **Marine and aviation sectors –** Produce **fuels and lubricants** that contribute to hazardous waste.
- **Healthcare and medical waste –** Biohazard risks, particularly pharmaceuticals.
- **Agriculture – Pesticides and fertilizers** generate hazardous waste.
- **Electric vehicles – End-of-life waste poses new challenges** while the region moves toward EV**.**

The key challenge in managing hazardous waste includes:

- **Lack of proper infrastructure and facilities.**
- **Costly disposal due to geographic isolation** (many waste streams must be exported).
- **Environmental risks** – The Pacific's unique environment, particularly its **groundwater sources** make proper waste management even more urgent.
- **Limited influence over product design,** since the region does not produce most of the hazardous materials it uses, making circular economy integration difficult.

Regional cooperation and the **adoption of circular economy principles in hazardous waste management** are essential, as well as the **reinforcement of national policies** that **reduce the import** of hazardous products and **improve transparency and traceability of chemicals**. By providing better **information**, consumers could make more sustainable choices, **encouraging demand for durable products** over those that are short-lived and hazardous.

In conclusion, **regional collaboration and policy interventions are crucial** for **sustainable hazardous waste management in the Pacific.**

4.2.2. Session #1b: Regulations, Policies and Plans

<u>Speaker:</u> **Mr John O'Grady – Director - Araspring Ltd, New Zealand**

John O'Grady, Director of Araspring Ltd, addressed **critical issues related to hazardous waste management,** including its **health and environmental impacts, challenges, and the necessity for effective regulations.**

Hazardous waste poses serious **health and environmental risks**, noting that exposure to **harmful chemicals** is linked to a range of **severe health conditions, including cancer and Parkinson's disease**. These diseases are becoming more prevalent worldwide as a result of such exposure. It is estimated that these chemicals contribute to approximately **1.3 million deaths annually** around the world. As **chemicals are increasingly used** in everyday products like electronics and furniture, the risks associated with their disposal continue to grow.

Circular economy in the context of hazardous waste is a complex issue, noting that while the **circular economy encourages recycling**, it is **not always effective for hazardous waste**. Many hazardous materials, such as expired **pesticides and asbesto**s, require **safe destruction** rather than reuse. Indeed, **recovering materials from hazardous waste is often limited**, safe **treatment and disposal** are therefore necessary.

To include hazardous waste into the circularity approach requires to **revise waste hierarchy** for hazardous waste management to include:

- **Eliminating hazardous substances at the product design stage.**
- **Reducing hazardous materials** by substituting them with **safer alternatives**. Although substituting hazardous chemicals with safer alternatives can be difficult due to resistance based on performance concerns, highlighting the trade-off between safety and efficiency.
- **Minimising hazardous waste volume.**

To **address the heightened risks** posed by hazardous waste, and avoid it **contaminating the environment**, which is **more damaging than the chemicals** themselves, **robust legislative frameworks and enforcement** in managing hazardous waste must be the priority.

For example, the Vanuatu's National Chemical Policy and Costed Implementation Plan (NCPIP) and National Hazardous Waste Policy and Costed Implementation Plan (NHWPIP) aim to create comprehensive legislation for hazardous waste management. Such **legislation should be simple, effective, and feasible** for developing countries.

Ownership and responsibility for hazardous waste management are also key priorities. It is important to **clearly determine who is responsible** at each stage of hazardous waste management, from **generation to transport, storage, and disposal**. The management, transport and disposal of hazardous chemicals can be regulated based on classifications used by the UN GHS7 and the UN's dangerous goods system for transport. it is also recommended to set up a system with **licensed transporters** and to ensure **proper documentation** for **safe handlin**g. Moreover, considering that disposal options in the Pacific are limited, it is often required for waste to be exported unless it is low-hazard and can be safely landfilled. As such, **proper identification of chemicals** is crucial to enable **appropriate treatment methods** to be used, such as neutralisation. Lack of knowledge presents challenges, and unknowns are a large problem when labels go missing.

In conclusion, the **complexity of hazardous waste management in the Pacific** highlights the **urgent need for clear and comprehensive regulations, effective policies, and sustainable management practices** to address the **significant health and environmental risks** associated with this material.

4.2.3. Session #1c: Used Oil Management

Speaker: Mr John O'Grady – Director - Araspring Ltd, New Zealand

John O'Grady, Director of Araspring Ltd highlighted **used oil as a successful example** of hazardous waste management that can be **integrated into the circular economy** to **prevent improper disposal and mismanagement**, which are common in the Pacific, leading to **significant environmental harm**.

To address these issues, effective management plans for used oil have been established in Vanuatu and other countries, featuring **collection and storage systems** for used oil and the establishment of **processing plants**. They also include '**best practices**' recommendations for **collection, transportation, storage and handling** of used oil:

- To prevent contamination, **used oil must be collected and stored in appropriate containers** that are **correctly labelled and covered**, especially if the oil is to be exported. **Secondary containment or bunding** is essential to prevent spills.
- Used oil must be handled by **licensed transporters and practitioners** who **comply with relevant regulations**.
- **Bulk-storage areas** must be **properly designed and built** to withstand environmental challenges, such as heavy rainfall, which is common in the Pacific. These bulk-storage areas must be **spill-proof**, preferably **covered**, and **well-maintained** to prevent contamination.
- In terms of **recycling and reuse**, there are **several existing options** within the region including the **pyrolysis plant** being installed in Vanuatu.
- Additionally, **staff handling used oil should be trained** to ensure **safe and efficient transportation and storage**. Safe storage systems, such as **double-skinned containers** as an alternative to **bunding**, are essential to **prevent leaks and contamination**
- **Emergency response measures (**e.g., **fire extinguishers)** should be **readily available.**
- Finally, **successful management** of used oil requires a **comprehensive approach**, including **training, education, protection, monitoring, and evaluation**.

One key point discussed within this session was the need for a **stewardship mechanism** for used oil management, where **responsibility is** shared among stakeholders. This could involve collecting an **Advanced Recovery Fee (ARF)** when oil is brought in and ensuring **that funds are used appropriately for proper management**. **Governments should play a leadership role** in setting up **waste management frameworks, promoting shared responsibility, and amending legislation as needed**.

In conclusion, **managing used oil effectively** involves **proper infrastructures, training, monitoring, awareness and government leadership**, along with **collaboration from all involved stakeholders**.

4.2.4. Session #1d: Leveraging the Basel and Waigani Conventions to Foster a Circular Economy in the Pacific

Speaker: **Mr Joshua Sam – Hazardous Waste Management Adviser - SPREP, Samoa**

In his second presentation, Mr Joshua Sam, Hazardous Waste Management Adviser at SPREP, emphasised that **effective waste management strategies** - such as **reuse, pre-processing, and the export of recyclables** - are **essential for contributing to the circular economy in the Pacific**.

In an **import-dependent region** like the Pacific, **circularity primarily occurs through post-consumption activities**, through **reuse, recovery, and recycling**. The **priority is to extend product lifecycles through repair, refurbishment, collecting and exporting recyclable materials** to **prevent their accumulation in landfills**. However, **maximising the benefits of a circular economy** is **challenging** due to **limited local manufacturing capabilities** and **infrastructure for full-scale recycling**.

Nevertheless, there are **opportunities for Pacific Island countries** to **develop strategies** that **optimise the collection and treatment of materials for export to global recycling facilities**. In regard of **Hazardous Waste**, the **transboundary movement** of such materials **is governed by the Basel Convention**, established in 1989 **to protect human health and the environment** and to **avoid the exploitation of poorer countries as dumping grounds** for hazardous waste by wealthier nations.

The key aspects of the Basel Convention is the **Prior Informed Consent (PIC) procedure**, which:

- Mandates that hazardous waste cannot be **transported across borders** without the **explicit consent of all parties** involved.
- **Prohibits hazardous waste exports to non-party countries** that lack responsible management capabilities.

Currently, **11 out of 14 Pacific Island countries** are **parties to the Basel Convention**, with ongoing efforts to bring the remaining countries on board. **Mr Joshua Sam expressed willingness to assist** these countries **in joining the convention** to **enhance hazardous waste management and circular economy practices**.

The Basel and Waigani Conventions are crucial for promoting a circular economy in the Pacific by **ensuring that exported waste for recycling** is managed **according to international standards**. For example, as part of the GEF Islands project, 12 tons of DDT and nearly 600,000 litres of potentially PCB-contaminated transformer oils will be shipped to a specialised facilities in Australia for destruction, facilitated by these conventions.

Without the **Basel and Waigani frameworks**, **recyclables such as used oils, plastics, and electronic waste** could **end up in landfills**, leading to **environmental degradation**, **pollution**, and **loss of valuable resources**. This situation would also result in **economic costs**, including **lost revenue** from recycling and **increased greenhouse gas emissions**. Without these frameworks, the region therefore risks **remaining trapped in a linear economy**, where **resources are discarded after a single use** instead of **being reused or recycled**.

4.2.5. Session #1e: Hazardous Waste and Used Oil Management - Experience sharing from Wallis and Futuna

Speaker: **Mr Didier Labrousse - Futuna Office Director - Department of Environment (STE), Wallis and Futuna**

Mr Didier Labrousse, Futuna Office Director of the Department of Environment, started is presentation by outlining the specific geographical context of Wallis and Futuna. This French Territory consists of two main islands:

- Wallis: 78 km² of land, a 200 km² lagoon with 4 passes, and a population of 8,088.
- Futuna: 46 km² of land, no lagoon, and fringing reefs, and a population of 3,063.
- Neighbouring Alofi Island: (18 km²) is uninhabited.

The **historical context of waste management** including hazardous materials in Wallis and Futuna highlights the **establishment of critical infrastructure and policies**:

- **1997:** The **Department of Environment (Service Territorial de l'Environnement - STE)** was **created to oversee environmental protection.**
- **2003:** The **Vailepo dumpsite in Wallis** was **rehabilitated into a regulated landfill.**
- **2006:** The **Moasa landfill on the Peka plateau in Futuna** was established under **STE management.**
- **2007: The Territorial Code of Environment** was **adopted, providing a regulatory framework** for **sustainable waste management.**
- **2008:** Agreements were **established for oil and battery sorting,** introducing **new hazardous waste handling practices** in garages and setting the stage for **better hazardous waste handling.**

Key lessons have been **learned** over time:

- **Export networks for hazardous waste** have been **established**, connecting Wallis and Futuna to New Zealand and benefiting from **expert exchanges with New Caledonia.**
- **Staff training has been prioritised** to ensure **regulatory compliance, improved health and safety, and enhanced technical capacity.**
- **Political commitment has played a vital role** in **preserving water resources and improving waste management** through specific agreements and initiatives**.**

Significant achievements have been made between 2016 and 2023:

- **First hazardous waste export (2016-2018)** and **second export (2022-2023),** which included:
  - **63 tons of batteries**
  - **115 tons of used oil**
- **Infrastructure improvements:**
  - Acquisition of **depollution plants for End-of-Life Vehicles (ELVs) on both islands**
  - Establishment of **hazardous waste storage areas** that **comply with export regulations**
- **Partnerships with** organisations such as **SOCADIS** (New Caledonia) to **facilitate hazardous waste treatment** and **ensure compliance with Basel Convention** for transboundary movements**.**

- **Waste Management Plan (2022-2030)** that aims to **reduce pollution** caused by waste, including:
    - **Enhancing waste collection, sorting, and recovery systems.**
    - **Modernising landfills.**
    - **Strengthening technical and administrative capacities.**
    - **Promoting regional cooperation** with **neighbouring Pacific countries**

Regional cooperation with **neighbouring countries** is also being promoted **to improve waste treatment and recovery**. Indeed, the **region would benefit** from **greater collaboration** between the Pacific countries and territories to **develop Local and/or Regional Circular Economy System(s)**.

Hazardous Waste Management in Wallis and Futuna reflects **significant progress** in addressing environmental challenges through **strategic investments**, **partnerships**, and the implementation of **robust policies.** These **efforts align with regional and international environmental goals,** contributing to a **more Sustainable and Circular Economy** within the Pacific Region.

4.3. Session #2: Circularity in waste management and landfill

4.3.1. Session #2a: How circularity in waste management can extend landfill lifespan

<u>**Speaker:**</u> **Mr Amano Shiro - JICA Advisor, J-PRISM III, Japan**

Mr Shiro Amano, JICA Advisor, presented on the importance of **appropriate waste management** to **extend landfill lifespan**, emphasising **waste minimisation and recycling** to **prevent landfills from filling up too quickly**. He explained that, especially in the Pacific, where **islands rely on imported goods with limited land space**, waste is often disposed of on-island, leading to **sustainability challenges**. To address this, JICA advocates for the **"3R Plus Return" approach**, which includes **reducing, reusing, and recycling materials**, as well as **returning of recyclables** to the outside markets and of organic materials to the soil.

To illustrate the benefit of the above approach, Mr Amano shared an example from a small city in Japan that successfully reduced waste disposal by 80% in seven years through collaboration between the government, community, and private sector. This led to a significant reduction in landfill use and an extended lifespan of the landfill by 40-50 years.

JICA has been working with Pacific countries to improve landfills over the past 20 years. However, **despite efforts, many landfills still face operational challenges**, often due to

insufficient funding and **lack of technical knowledge**. Amano highlighted that **improved landfill operations require more resources and trained personnel**, which many Pacific nations struggle to provide.

He discussed a case where, despite improvements to the landfill in Samoa with JICA's assistance, there were still issues related to lack of funding and technical expertise. **The key factors for successful landfill management include securing operational funds and technical resources, alongside continuous on-site training**.

In conclusion, Mr Amano emphasised the need for **collaboration**, both **locally and in**ternationally, to address these challenges. He advocated for developing **local expertise**, applying **economic instruments for funding**, and **raising additional resources** for sustainable waste management. By doing so, small island nations in the Pacific can overcome challenges in waste management and protect the fragile island environment.

4.3.2. Session #2b: Side visit to Bouffa Landfill

Bouffa Waste Disposal Facility Handout developed by: Mr Jason Andrew - Waste Management Manager - Port Vila City Council, Vanuatu

- **BACKGROUND**

The Bouffa Waste Disposal Area started operations back in 1994 after the disposal of waste was relocated from the City Center due to increasing population around the area.

The entire area allocated for waste disposal purposes is 48 hectares.

The facility is managed by the Port Vila City Council under the Waste Management Division (Landfill Unit).

The unit comprises of 9 staff: 1x Foreman, 2x Heavy Equipment Operators, 2x Gate Keepers and 4x Laborers.

There are 2 heavy equipment on site (25-ton excavator, 13-ton Bulldozer (not operational) and 1 small dump truck (not operational).

- **CURRENT SITUATION**

a) Gate Keepers Office

- Checking of all vehicles for directions on areas to dispose waste.
- Recording of waste information / data
- Receiving payments – gate fees

b) <u>Cell 1 – For Solid Waste</u>

- Built according to the Fukuoka Method with the support of JICA
- Currently receives all household waste.
- Area is over 1 hectare
- Constructed in 2006 – 2008

c) <u>Recyclable Stock yard</u>

- Area designated for recyclables and bulky waste.
- Waste pickers can come and collect recyclable materials to sell or reuse

d) <u>Leachate Treatment System</u>

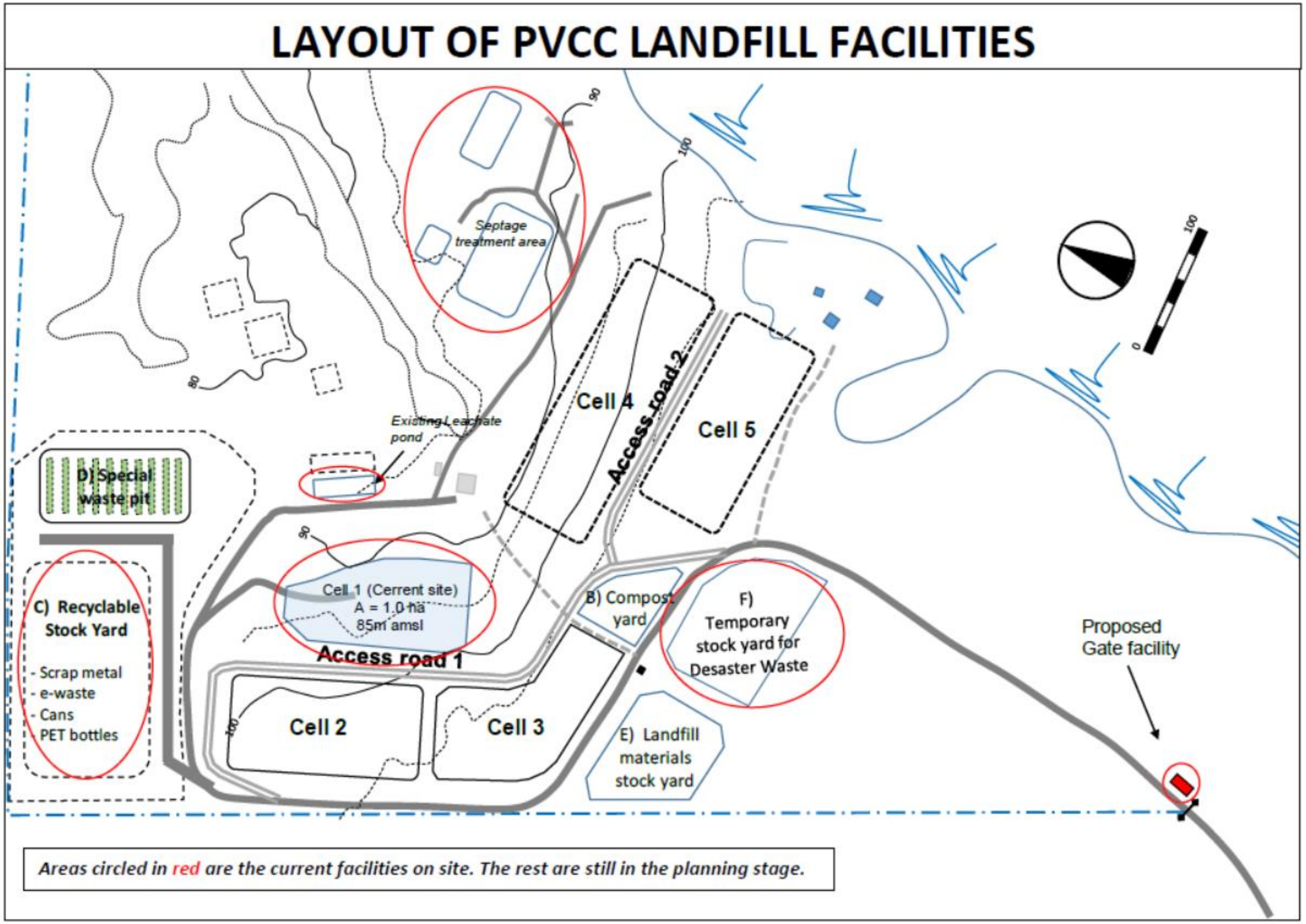
- Built together with Cell 1
- Leachate receiving pond
- Leachate regulation pond
- Collects leachate from Cell 1 and stores it in the leachate regulation pond

e) <u>Workshop area</u>

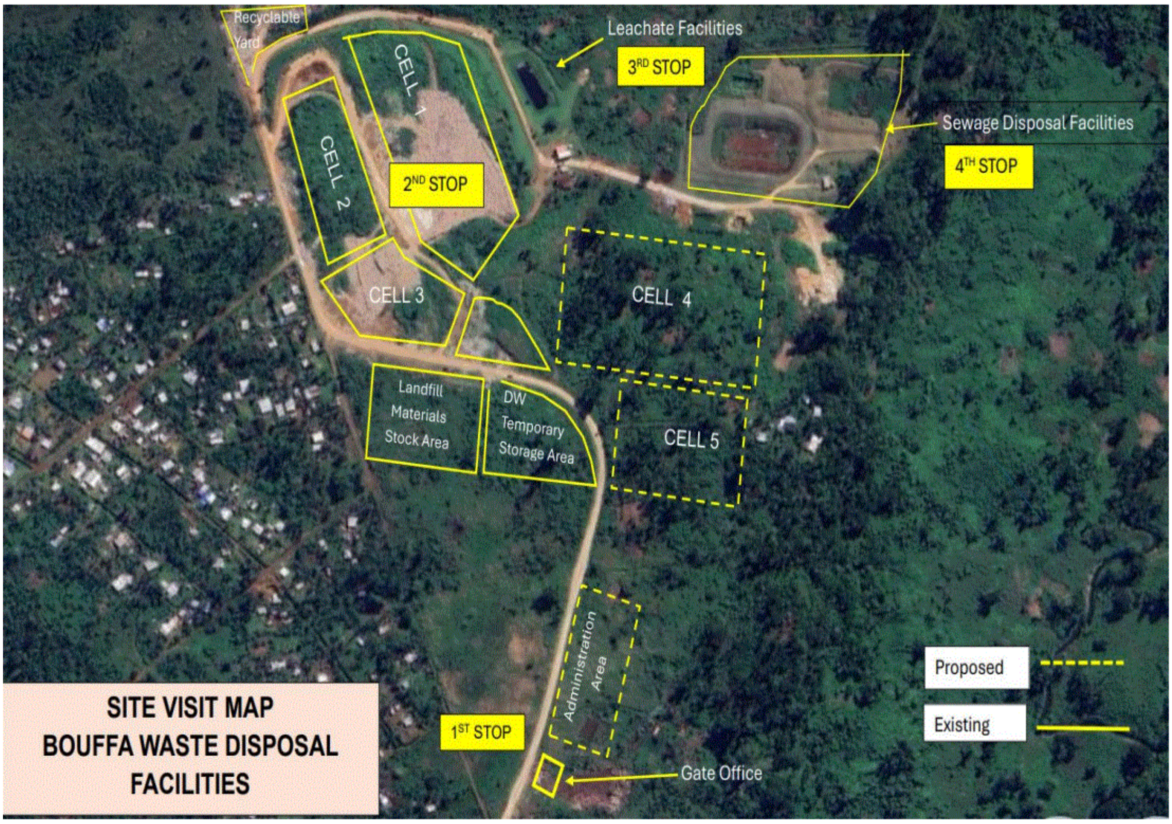
- For storage of all heavy and light equipment, including supplies of materials for maintenance

f) <u>Septage Treatment Facility</u>

- Constructed in 2016 with the support of the Australian Government and ADB
- 2x receiving wells
- Receives all septage waste collected around the island


LAYOUT OF PVCC LANDFILL FACILITIES
Septage treatment area
Existing Leachate pond
D) Special waste pit
C) Recyclable Stock Yard
- Scrap metal
- e-waste
- Cans
- PET bottles
Cell 1 (Cerrent site)
A = 1.0 ha
85m amsl
Access road 1
Access road 2
Cell 2
Cell 3
Cell 4
Cell 5
B) Compost yard
F) Temporary stock yard for Desaster Waste
E) Landfill materials stock yard
Proposed Gate facility
90
100
80
0
Areas circled in red are the current facilities on site. The rest are still in the planning stage.

SITE VISIT MAP



ISSUE AND CHALLENGES

- **Financial constraints**: limited funds to cover major and costly unforeseen equipment breakdown; to fund extension of disposal cells; to repair damaged facilities including roads during cyclones and heavy rains; to fund proposed important developments (Administration Area near the entrance gate; recycling facilities including composting; e-waste facility, etc.).
- **Regular Breakdown of equipment**: affecting daily operations – maintenance, etc.
- **Manual Data Recording Method** – time consuming to enter again in the computer; possibility of losing the data when the filled forms are misplaced, etc.
- **Rainy & Cyclone season**: Affects the access roads conditions – overflow of side drainages; slippery conditions, cracks of the main road formation, damages of facilities, etc.
- **Security of facilities** – vandalism and thefts due to the increasing nearby settlements.
- **Staff and workers turnover** – trained staff and workers leaving for seasonal overseas working schemes, or for other career paths.

- **WAY FORWARD**

- Looking for interested partners to support - extension of disposal cells for solid waste; recycling facilities, waste management administration office with proper staff facilities; e-waste facility, improving and upgrading the access roads, etc.
- Discuss with potential donors for the supply of new heavy equipment to replace the faulty ones for improve maintenance operations.
- Improving the waste recording system using an appropriate modern application to improve the availability of data and accuracy for management purposes.
- Ongoing training of staff and workers to maintain the level of knowledge and skills needed for the ongoing management and operation of the disposal facilities.
- Discussion on the suitability and feasibility of a security fence along the boundary of the area to protect the facilities from the nearby settlements, and ensure such a fence is the appropriate solution to the associated problems.

- **LANDFILL GATE FEES**

TYPE OF VEHICLE	*FEES (VT) per Trip*
1. SINGLE CAB/DOUBLE CAB	1,200
2. SMALL CAMION	1,500
3. BONGO	2,500
4. BONGO WITH SIDES/CAGE:	3,500
5. CAMION (3.5 ton)	4,000
6. DUMP TRUCK (>3.5 ton)	8,500
7. TOURIST BOATS/FOREIGN VESSELS	50,000
8. CONDEMNED/EXPIRED GOODS & Construction Waste	20,000

**** RUBBISH DELIVERED TO THE LANDFILL IN THE "PVCC YELLOW BAG" IS "FREE OF CHARGE".***

- **SEWAGE SLUDGE FEES**

TYPE OF VEHICLE	*FEES (VT) per Trip*
Volume < 6,000 L	3,750
Volume > 6,000 L	6,900

4.4. Session 3: Waste-to-Energy

4.4.1. Session #3a: Waste-to-Energy Options for a Sustainable Future

Speaker: Mr Inia Saula - Energy Officer - The Pacific Community (SPC), Fiji

Mr Inia Saula, Energy Officer at the Pacific Community (SPC[11]) presented **key initiatives and challenges** related to **energy security and Waste-to-Energy (WTE) solutions** in the Pacific. He highlighted the **Framework for Energy Security and Resilience in the Pacific (FESRIP[12]) 2021-2030**, which was **endorsed by Pacific Leaders** and launched at COP27. This framework aims to strengthen partnerships for coordinated actions in energy security.

Additionally, he discussed the **Pacific Regional Energy and Transport Ministers Meeting** (**PRETMM[13]) and the 2023 Efate Outcome Statement**, both of which stress the **urgent need for funding** from donors and the private sector to support **WTE and sustainable energy initiatives**. Technologies such as **ocean energy, green hydrogen, bioenergy, and WTE** are recognised as essential for **decarbonisation** efforts in the region.

Mr Saula also provided an overview of **WTE technologies,** including **anaerobic digestion, combustion, gasification, and pyrolysis,** emphasised their role in both **waste reduction and energy production.** He also outlined the **Pacific Adoption of Waste-to-Energy Solutions (PAWES) project,** which involves five Pacific countries and focuses on **waste data collection and key achievements,** such as baseline assessments and postgraduate research involvement. As a success story, he highlighted **Tuvalu's biogas project,** which has helped **reduce CO2 emissions and lower household energy costs.**

Despite these achievements, several challenges remain, including **the lack of WTE policies, unreported waste data, and logistical difficulties, particularly in atoll nations.** Mr Saula

[11] https://www.spc.int/
[12] https://www.spc.int/resource-centre/publications/framework-for-energy-security-and-resilience-in-the-pacific-fesrip
[13] https://gem.spc.int/meetings/5th-pacific-regional-energy-and-transport-ministers-meeting-2023

emphasised that **addressing these challenges is crucial for advancing WTE solutions** and **ensuring a more sustainable energy future for the Pacific**.

4.4.2. Session #3b: Waste-to-Energy Options for promoting Circular Economy

Speaker: Dr Ravita Prasad - Assistant Professor - Fiji National University, Fiji

Dr Ravita Prasad, Assistant Professor at the Fiji National University[14]**,** explored various types of waste, including **Municipal Solid Waste (MSW), industrial, electronic, agricultural, medical, and hazardous waste,** while discussing **Waste-to-Energy (WTE) technologies** for energy generation. She highlighted the **growing global waste problem**, noting that waste generation is expected to **rise significantly**, with **food and green waste comprising a substantial portion**. In the **Pacific Region**, waste generation exceeds **2 million tonnes annually**, with **plastic waste accounting for 13%** of the total.

Dr Prasad emphasised the importance of **WTE in reducing landfill use and contributing to the circular economy**, transforming waste into waste into **valuable products like energy, fuels, and fertilizers**. She shared successful applications of anaerobic digesters in which are used to generate **clean cooking energy for households and institutions.** However, she also pointed out challenges such as **feedstock supply limitations and high technology costs.**

Focusing on key research areas, Dr Prasad outlined work on **biogas digesters, emissions control, and renewable energy systems.** She stressed that **stakeholder engagement, supportive policies, and capacity-building** are essential to overcoming **implementation barriers** and advancing **sustainable WTE solutions in the Pacific.**

4.4.3. Session #3c (Virtual): Pyrolysis Technology for Plastics and Used Oil reprocessing

Speaker: Mr Leigh Ramsey – Director – Nufuels Ltd, New Zealand

Mr Leigh Ramsey, Director of the Zealand-based company Nufuels[15], presented on **energy recovery from waste**, with a particular focus on projects in the Solomon Islands. Specialising in **pyrolysis technology,** NuFuels converts waste, especially **plastics and waste oils**, into **usable energy**. This technology plays a crucial role in **promoting circular economies**, particularly in **remote island communities** where large-scale waste management solutions are often impractical due to **geographical and logistical challenges**.

[14] https://www.fnu.ac.fj/
[15] https://www.nufuels.biz/

A central theme of the presentation was the **application of pyrolysis**, an ancient process that **heats waste without oxygen to break down hydrocarbons** like plastics into usable fuels like **crude oil, diesel, and gas**. This method not only recovers **useful resources from waste** but also **reduces environmental impact** and supports **local economies** by providing sustainable energy solutions.

In the **Solomon Islands**, NuFuels has partnered with local organisations, including the Design Technology Centre, Caritas Aotearoa[16], and the New Zealand Ministry of Foreign Affairs and Trade to develop **small-scale, decentralised energy recovery systems**. These systems process **plastics and waste oil into fuel**, addressing both **environmental concerns and energy shortages** in remote communities. Given the high costs and transportation challenges associated with **large-scale waste management,** NuFuels focuses on **economically viable, scalable solutions** tailored to local needs. Their systems, designed to process **10-20 kilograms of plastic per day,** generate usable fuel while being adaptable to different community contexts.

Mr Ramsey explained that **pyrolysis differs from incineration** as it occurs in a **closed, oxygen-free environment**, producing **wax, diesel, and gas** from waste. This process can also treat **used lubricating oil,** further enhancing fuel production and energy returns.

The technology offers significant **environmental benefits**, such as cleaning up plastic waste from local and marine environments, with **each system capable of processing up to five tons of plastic annually,** significantly reducing plastic pollution in both **local and marine environments.** Furthermore, converting **used lubricating oil into fuel** decreases reliance on imported fossil fuels and lowers **carbon emissions.**

However, Mr Ramsey acknowledged that while demand for these solutions is strong, **economic viability remains a challenge**, particularly when dealing with waste that lacks **material value**. NuFuels is committed to **building local capacity** for constructing and operating these systems, reducing reliance on external expertise and ensuring long-term sustainability.

Looking ahead, the company is exploring **larger systems, gas storage solutions, and applications in disaster management and ecotourism.** NuFuels is also developing a **corporate**

[16] https://www.caritas.org.nz/hot-solomonislands

social responsibility model in collaboration with industries such as **Coca-Cola and Tetra Pak,** which contribute significantly to **plastic waste generation.**

Mr Ramsey acknowledged the **difficulties in establishing a self-sustaining business model** for waste recovery, particularly in **island communities,** and stressed the importance of **donor funding** to support system deployment. Such funding would not only enable **local job creation** but also provide **affordable, renewable energy** to underserved communities.

In conclusion, **Mr Ramsey's presentation underscored the importance of small-scale, decentralised energy recovery solutions for remote communities,** highlighting the environmental and economic benefits of **pyrolysis technology.**

4.4.4. Session #3d: Technology (Pyrolysis) demonstrations for Innovative Technologies in Waste-to-Energy

<u>Speaker:</u> **Mr Lindsay Teobasi - General Manager - Design Technology Centre, Solomon Islands**

Mr Lindsay Teobasi, General Manager of the Design Technology Centre in the Solomon Islands, presented on **clean technologies for plastic recycling**, highlighting the importance of practical, hands-on solutions to tackle waste management challenges. A key component of this initiative is a **partnership with NuFuels,** aimed at pioneering innovative **waste management technologies**. The project's primary objective is to develop **effective plastic waste management solutions** while promoting **sustainable practices** across the Solomon Islands, with a focus on **reducing plastic waste and establishing a national recycling hub** to serve the country's nine provinces.

A significant aspect of the project involves **Waste-to-Energy initiatives**, where plastic waste is converted into **butane gas and crude oil** through **pyrolysis technology.** This practical approach not only helps **reduce waste accumulation** but also **addresses environmental and energy concerns** in local communities.

The initiative places **strong emphasis on community engagement**, incorporating **awareness campaigns** to educate people on the **dangers of plastic pollution,** including the harmful effects of **microplastics in fish.** To further this effort, **mobile pyrolysis systems** have been introduced in communities, enabling them to **recycle plastic waste** while simultaneously producing **energy for cooking.**

Another key innovation is the **integration of rocket stove technology,** where **crude oil derived from plastic waste** fuels stoves that assist **women with cooking.** These stoves are **locally fabricated,** ensuring they are user-friendly and tailored to community needs.

Despite project's achievements, Mr Teobasi highlighted several **challenges**, including the **overwhelming amount of plastic waste**, the **lack of proper waste management systems**, and the **need for more vibrant industries** to handle waste. He stressed the importance of raising **public awareness**, conducting **further research**, and working collaboratively with government agencies and international partners to improve waste management practices.

Looking ahead, the team aims to **expand their efforts** through **advocacy, education, and practical waste solutions** such as **used oil recycling and nutrient gas bottling**. **Collaboration with government institutions and other partners** is seen as essential for achieving **long-term, sustainable waste management solutions** in the Pacific Islands.

In conclusion, Mr Teobasi emphasised that **solving the waste management issues** in the Solomon Islands and across the Pacific region will require **collective action, community engagement, and a shared commitment** to creating a cleaner, more sustainable future.

4.4.5. Q&A/ Comments

✓ *Scalability and Adaptability of Pyrolysis*

Mr Stalini Naufahu from Tonga Waste Authority Limited inquired about the feasibility of pyrolysis technology for smaller nations like Tonga and the Cook Islands, which have limited waste volumes. In response, Mr Lindsay Teobasi explained that **pyrolysis systems can be customised to match the specific waste generation** of each country, **making them adaptable to various scales**.

✓ *Sharing Success Stories*

Ms Roselyn Bue from the Vanuatu's Department of Environmental Protection and Conservation emphasised the importance of **documenting and sharing success stories** to inspire other nations to adopt similar waste management solutions. She expressed her interest in participating in future projects. Mr Teobasi agreed with the importance of showcasing success stories and using them as motivation for other countries to embrace waste management technologies.

- ✓ *Pyrolysis and the Circular Economy*

Ms Claytoncy Taurarii from the Cook Islands' Ministry of Infrastructure, asked if there is a contradiction between promoting a circular economy, which focuses on clean waste and recycling, and using pyrolysis, which processes unclean plastics. Mr Teobasi clarified that pyrolysis is a transformation process rather than a linear one. **Unlike conventional recycling, it does not require perfectly clean plastics, making it a practical and complementary solution within the broader waste management strategy**. As such, pyrolysis still aligns with waste management goals by converting plastic waste into usable products like gas or crude oil.

- ✓ *Alternative Feedstocks for Pyrolysis*

Ms Sainimili Bulai, from the PacWastePlus Programme, SPREP, inquired about **alternative feedstocks for pyrolysis**, particularly in light of **efforts to phase out plastics**. Mr Teobasi noted that **pyrolysis can process a various type of plastics (classes 1-7)** and has **potential applications** for materials like **end-of-life tires** and **used oil**. Furthermore, emphasised that **even with plastic bans**, residual **plastic waste will remain**, and **pyrolysis** can provide an **effective way to manage it**.

- ✓ *Pyrolysis as a Transitional Solution*

Mr Paul Irving from the PacPlan Project at SPREP pointed out that **pyrolysis** should be seen as a **transitional technology** rather than a long-term solution, as the machines have a lifespan of 5-10 years. He suggested shifting **focus toward sustainable, long-term alternatives** such as **solar and geothermal energy**. Mr Teobasi acknowledged this but stressed that **pyrolysis** remains a **valuable tool in addressing the region's immediate waste management challenges**.

- ✓ *The Role of Pyrolysis in a Realistic Circular Economy*

Mr Leigh Ramsay emphasised the need for a holistic and realistic approach to the circular economy, particularly concerning plastics. He highlighted that **global plastic production is expected to increase** by 50% by 2030, meaning Pacific nations, as well as New Zealand and Australia, will continue to face **challenges with ocean plastic pollution** for decades. Mr Ramsay argued that **Waste-to-Energy technologies** like pyrolysis are essential because they provide a **means of recovering energy from non-recyclable plastics**, which aligns with the circular economy.

Using a practical example, Mr Ramsay noted that Mr Teobasi's recycling facility requires energy to operate its equipment. If pyrolysis could generate even 15-20 kilowatts of power, it could sustain the facility while simultaneously managing plastic waste and supporting circular economy. He reiterated that **Waste-to-Energy technologies do not encourage plastic production** but instead **offer a pragmatic way to deal with existing waste**. Calling pyrolysis "thermal composting," he stressed that n**o single solution can fully resolve the problem of fossil fuels** and their byproducts. Instead, **collaboration** and a **balanced approach** between **repurposing** and **Waste-to-Energy solutions**, he concluded, are key to making meaningful progress.

✓ *Conclusion*

The Q&A session highlighted the adaptability of pyrolysis technology for different national contexts, the importance of practical waste management solutions, and the need to balance short-term solutions with long-term sustainability. It also underscored the necessity of a realistic approach to addressing plastic waste and energy needs in the Pacific region.

4.4.6. Session #3e: SWAP Used Oil Management Pilot Project in Vanuatu

Speaker: Ms Roselyn Bue - Senior Officer (Chemical and Ozone) - Department of Environmental Protection and Conservation (DEPC), Ministry of Climate Change & Adaptation – Vanuatu

Ms Roselyn Bue, Senior Officer (Chemical and Ozone) from DEPC, Vanuatu, highlighted the **significant challenges** faced by **Pacific Island nations**, especially Vanuatu, in **managing waste**. She acknowledged the **crucial role** of **donor partners** and **technical experts** in **addressing these issues**.

A key focus of her presentation was the **growing environmental threat posed by used oil**. For years, the government had taken **little action** to address this issue. A private company had previously collected and shipped used oil for disposal, but with the cessation of this service, Vanuatu was left without a formal management system. Reports of **irresponsible dumping** further underscored the **urgent need for proper collection**, **storage**, and **treatment infrastructure**.

Ms Bue outlined **several challenges in managing used oil**, including:

- The **absence** of a formal **collection system**.
- **Inadequate** infrastructure for **storage, recycling** and **treatment**.

- **Limited data** on used oil imports due to poor customs tracking.
- A **lack of knowledge** and **capacity** for effective management.

In response, the government, following consultations and a **Feasibility Report**[17] **on Used Oil Management** under the SWAP project, recognised the **need** to **establish** a **structured system for used oil** collection, transport, storage, and recycling. The government also planned to enhance **local capacity** by engaging the **private sector**, such as garages and businesses that generate used oil, to take an **active role** in waste management efforts.

Additionally, Ms Bue discussed the **possibility of on-site processing of used oil** to **create economically viable products**. **To sustain these efforts**, the government is exploring economic instruments such as **Advanced Recovery Fees (ARF)** or **Deposit Systems (DS)**. Another initiative involves developing a **customs tracking system** to monitor the flow of used oil more effectively.

She also highlighted a collaboration with Ocean Environmental Services (OES), a **private company** assisting in setting up a **storage and reprocessing facility** as part of the SWAP project's first phase. The system is expected to expand in the coming year, aiming to establish a long-term, sustainable used oil management solution in Vanuatu.

In summary, Ms Bue's presentation emphasised the **pressing challenges of used oil management**, the government's strategic plans for addressing them, and the **importance of private sector collaboration** to develop sustainable waste management solutions.

4.4.7. Session #3f: Used Oil Reprocessing Project in Vanuatu

Speaker: Mr Andrew Bohn - Chief Executive Officer - Ocean Environmental Solutions (OES), Vanuatu

Mr Andrew Bohn, CEO of Ocean Environmental Solutions (OES)[18] shared how his company, a subsidiary of Ocean Logistics in Vanuatu, encountered significant **challenge** in m**anaging used oil** from its **fleet of diesel-powered vessels**. With limited disposal options available, the oil was being stored, which **posed environmental risks**. This issue, widespread across Vanuatu, has led to improper disposal practices that contaminated soil, water, and marine ecosystems.

[17] https://library.sprep.org/content/contract-conduct-feasibility-study-develop-national-used-oil-management-plan-vanuatu-samoa
[18] https://www.facebook.com/oceanenvironmentalsolutions/

Initially, the company explored **burning the oil for heat generation** but found this **solution commercially unviable**. It was at this stage that Mr Paul Irving, Manager of the PacPlan Project at SPREP, introduced the concept of **pyrolysis**, a process that **converts waste oil into reusable products**. Following extensive research and planning, OES decided to acquire pyrolysis equipment and, with assistance from the Department of Environmental Protection and Conservation through the **SWAP** project and consultants, began setting up a **storage and reprocessing facility**.

Despite the progress, the project faces key challenges:

- **Site Selection** – The facility must be **accessible but isolated** to prevent disturbances to neighbouring communities.
- **Regulatory Hurdles** – Vanuatu currently has **no regulations for oil reprocessing**, meaning the project must pioneer an **Environmental Impact Assessment (EIA)**.
- **Supply Uncertainty** – The **availability of used oil** remains uncertain, raising concerns about the project's financial viability.
- **Funding Constraints** – The company is relying on **internal group funding**, an approach that may not be feasible for other organisations.

Looking ahead, the project aims to establish a **sustainable, scalable, and profitable business model** for processing used oil, with the potential to expand into other waste streams such as plastics and rubber. Mr Bohn envisions the project this initiative serving as a **model for other Pacific Island nations**, addressing climate challenges and advancing sustainable waste management practices across the region.

4.4.8. Session #3g: Presentation of a Business-scale Pyrolysis Technology

Speaker (Virtual): Ms Ally Wang – Project Consultant - BESTON Group, China

Ms Ally Wang, Project Consultant from the BESTON Group[19], introduced **pyrolysis** as a **low-oxygen process that breaks down large molecular compounds into smaller, usable products**. The presentation focused on **waste oil** and its various types, including **oil sludge, tank bottom sludge, and refining oil sludge**, all of which can be effectively processed using pyrolysis. The technology also extends to handling **used rubber, tires, and plastics**.

Ms Wang emphasised the **environmental risks** posed by waste oil and sludge, can contain between **5% to 50% oil content**, making urgent processing necessary. Compared to

[19] https://www.bestongroup.net

alternatives like **solvent extraction and chemical washing**, pyrolysis was highlighted as a **mature and effective waste management solution**, offering several advantages:

- **No chemical additives**,
- **Lower energy consumption**,
- **Cost-effectiveness**,
- **Reduced environmental impact** (minimal emissions, noise, water, and solid waste).

BESTON's **BLJ-16 Thermal Desorption Unit (TDU)** was showcased as an advanced pyrolysis plant that efficiently processes various types of oil sludge while ensuring **safe disposal of non-hazardous solid waste**. The company shared **successful case studies**, including:

1. **Libya** – A company processes **oil field and tank bottom sludge,** reducing pollution and generating profits.
2. **Malaysia** – A waste management company processes **sludge and plastics**, receiving **government subsidies** for environmental protection.
3. Other projects were also mentioned in **Inner Mongolia, Hu Bei, and South Sudan**.

Founded in **2013**, BESTON Group is a leading manufacturer of **waste processing equipment**, serving global markets and providing comprehensive technical support. While the presentation featured BESTON's work, Mr Paul Irving clarified that **the company was selected** based on its **technical expertise** and that the presentation was **not an exclusive promotion of its products**.

4.4.9. Session #3h: Design of a Used Oil Storage and Reprocessing Facility

<u>Speaker:</u> **Mr Paul Mooney - Principal Consultant - Environmental Management Vanuatu**

Mr Paul Mooney, Principal Consultant of Environmental Management Vanuatu (EMV[20]) discussed the **challenges of managing used oil** in Vanuatu. His team has been assisting the Department of Environmental Protection and Conservation in assessing the amount of oil entering the country, with estimates showing that **280,000 to 380,000 litters** remain annually. A significant portion is used in **two-stroke engines**, but **public awareness** of the **environmental risks** associated with improper disposal is **low**.

[20] https://www.linkedin.com/company/environmental-management-vanuatu-emv/?originalSubdomain=vu

Unsafe disposal practices include:

- Using **waste oil** on **roads, timber, or as a rust preventer**, leading to environmental contamination.

Mr Mooney recommended a **circular economy approach**, emphasising the need for an **Advance Recovery Fee (ARF)** on oil to **fund collection and storage systems**. This would help sustain waste oil management efforts, including:

- Supporting projects like **OES's pyrolysis initiative**, which converts **waste oil into fuel**.
- Establishing **a structured collection and storage system** to prevent environmental hazards.

As part of the initiative, two **72,500-liter double-skinned shipping containers** have been **procured for oil storage**, ensuring safe containment. The containers are designed to minimise oil transfers, reducing spill risks. Additionally, the site infrastructure includes concrete pads and ramps for easy handling of oil drums. Mr Mooney explained that oil collection systems could follow models used in Australia and New Zealand, where **trucks extract oil from smaller collection points** and transfer it to **larger storage facilities**.

Mr Mooney also stressed the importance of **conducting Environmental Impact Assessments** (EIAs) and **engaging with stakeholders** to ensure **community buy-in**. He shared insights on planning for **natural disasters**, like cyclones and earthquakes, which are common in Vanuatu. The focus is on **designing safe and secure storage systems** that can withstand such risks.

In conclusion, **Mr Mooney highlighted Vanuatu's opportunity to lead the Pacific region** in **best practices for waste oil management**. By implementing **advanced technologies like pyrolysis** and establishing **effective regulatory frameworks**, **Vanuatu could become a model for sustainable waste management in the region**.

4.4.10. Session #3i: Biogas Technology

<u>Speaker:</u> **Dr Ravita Prasad - Assistant Professor - Fiji National University, Fiji**

Dr Ravita Prasad, Assistant Professor at the Fiji National University[21] presented the role of **biogas technology** in **sustainable development**, particularly in the Pacific region. She introduced the **anaerobic digestion process**, where **organic waste decomposes without oxygen**, producing **biogas** as an **alternative energy source**. This **Waste-to-Energy technology**

[21] https://www.fnu.ac.fj/

reduces **methane emissions** and provides **renewable energy** for cooking, electricity, and industrial use.

Dr Prasad emphasised how **biogas technology** contributes to several **Sustainable Development Goals (SDGs)** by:

- **Reducing reliance on traditional energy sources** on firewood, preventing deforestation.
- **Improving household energy access**, especially in rural areas.
- **Enhancing public health** by reducing smoke inhalation from open-fire cooking.
- **Lowering household energy costs** and **saving time** spent collecting firewood.
- **Creating economic opportunities** by generating jobs in biogas system installation and maintenance.

Dr Prasad highlighted **various organic substrates** that can be used for **biogas production**, with **high-yield sources** such as algae, sugar beet, elephant grass, and agricultural residues. Other materials, such as **rice straw** and **sugarcane bagasse**, yield **less biogas** but remain viable. **Biogas** primarily **consists** of **methane** (30–80%) and **carbon dioxide** (20–45%), and the **residue**, known as digestate, can be **used as fertilizer**. She also outlined the factors that affect **biogas production**, including **temperature**, with optimal conditions ranging from 25°C to 40°C, and the need for a **pH** level between 6.8 and 7.2. The **carbon-nitrogen ratio** of feedstock should ideally be between 20:1 and 30:1 and maintaining a proper **feeding frequency** is crucial to steady biogas production.

Dr Prasad described the **three main types of biogas digesters** used in the region:

1. **Fixed-Dome Digesters** – Durable but **expensive** to install.
2. **Floating-Drum Digesters** – Affordable but prone to **gas leakage**.
3. **Prefabricated Digesters** – **Easy to install** but **vulnerable to damage** from cyclones and sharp objects.

Despite its potential, **several barriers** hinder the **widespread adoption** of biogas technology:

- **Inconsistent supply of organic waste** (e.g., food scraps, manure).
- **Limited access to freshwater** for dilution (rainwater harvesting can help).
- **High upfront costs** for installation.
- **Durability issues** with prefabricated digesters**.**

- **Lack of awareness and training** on biogas system use and maintenance.

To overcome these challenges, Dr Prasad suggested:

- **Exploring business models**, possibly with subsidies to make biogas technology more **affordable**.
- **Expanding research** on **optimal dilution ratios** for enhanced efficiency.
- **Investing in education and training** to empower communities with **technical skills**.

In conclusion, Dr Prasad emphasised that **biogas technology** offers a **renewable, cost-effective, and environmentally friendly energy solution** for the **Pacific region**. However, challenges related to **cost, feedstock supply, and community awareness** must be **tackled through research, policy support, and innovative financing models**. With **proper implementation**, biogas could play a **key role** in the Pacific's **transition to sustainable energy**.

4.4.11. Session #3j: Circular Economy & Animal Feeding: Experience sharing from New Caledonia

<u>Speaker:</u> **Ms Chloé Saglibene - Coordinator - Valorga Cluster, New Caledonia**

Ms Chloé Saglibene, Coordinator of the Valorga[22] Cluster in New Caledonia shared her experience **in converting organic waste into animal feed products**, three key initiatives.

1. **Slaughterhouse Waste Management** – New Caledonia has **two slaughterhouses** that process approximately 12,000 cattle, 24,000 pigs, and 3,000 deer annually, generating around **1,863 tons of waste** each year. Currently, **40% of this waste** is **recycled** into products such as meat and bone meal (covering **20%** of local feed needs for pigs, poultry, and aquaculture), tallow, and blood meal. However, Chloe pointed out that the **system** is **economically unprofitable**. To address this, a **composting project** for the remaining waste will **launch in 2025**, and efforts are underway to **expand the use of blood meal** as **fertilizer**.
2. **Fishery Waste Processing** – New Caledonia generates **1,400 tons of fish waste annually**, primarily from **deep-sea fishing**. A **processing plant**, operational since December 2023, converts this **waste into 300 tons of fish meal and 50 tons of fish oil**. These byproducts are used for **animal feed** and potentially as **fertilizer**. Despite this

[22] https://www.valorga.nc/#:~:text=Valorga%2C%20pour%20valorisation%20locale%20des,l'ensemble%20de%20la%20fili%C3%A8re

progress, New Caledonia still imports large quantities of fish meal and oil. As such, **trust needs to be built** in locally produced products to **reduce reliance on imports**.

3. **Agricultural & Agri-Food Waste – Black Soldier Fly (BSF) Bioconversion** – A startup launched in 2021 is using **Black Soldier Fly (BSF) larvae** to **process organic waste** from **agriculture, breweries, and food industries** into **proteins, lipids, and fertilizers**. By 2027, the company aims to produce **500 tons of insect-based flour, 150 tons of insect oil, and 2,000 tons of organic fertilizer**. However, the startup faces key challenges, including **high transportation costs**, **regulatory barriers**, and ensuring **consistent product quality**.

Ms Saglibene emphasised that these **waste management initiatives** are essential for:

- **Reducing reliance on imports**
- **Improving waste management**
- **Developing sustainable and economically viable solutions**

By promoting **local feed production** and **innovative waste recycling methods**, New Caledonia is taking important steps toward **a more sustainable and self-sufficient future**.

4.5. Session #4: Emergency response to oil or chemical spillage

4.5.1. Session #4a: Experience sharing from Ocean Environmental Solutions on Oil Spill Response in the Solomon Islands

<u>**Speaker:**</u> **Mr Andrew Bohn - Chief Executive Officer - Ocean Environmental Solutions, Vanuatu**

Mr Andrew Bohn, CEO of Ocean Environmental Solutions (OES) provided an overview of the **oil spill response** in **Rennell Island**, a remote and picturesque and ecologically significant area in the **Solomon Islands**. The spill resulted from a **grounding incident** in **February 2019**, exacerbated by **bauxite exportation** and **logging activities**.

The oil spill response faced **key challenges** due to:

1. **Heavy Fuel Oil Contamination** – The **oil clumped upon contact with water**, forming **large, difficult-to-remove patches** on the shoreline and ocean surface.
2. **Delayed Response Time** – Mr Bohn's team, in collaboration with the American Salvage Company, arrived 3-4 weeks after the incident. They deployed approximately 30 oil spill responders, primarily local workers, to begin the cleanup.

3. **Cleanup Techniques** – The team **used skimmers** and **absorbent materials** to **remove oil from the water and shoreline**.

Local involvement was critical to the response effort. Over a hundred islanders participated in the response effort, gaining **valuable hands-on experience** in oil spill response operations. Despite the active participation of the community, waste management proved to be a significant challenge. The **cleanup generated a substantial amount of oily waste**, which the Solomon Islands' **inadequate infrastructure** struggled to handle.

The remote location of Rennell Island presented additional **operational challenges**, particularly related to **logistics**. **Transportation of equipment** and **sustaining personnel** proved difficult. Furthermore, the salvage operation reportedly cost **up to $20 million**.

Based on lessons learnt, Mr Bohn emphasised the importance of **preparedness** for **future oil spills**, noting that such incidents are not uncommon in the Pacific. He pointed out that proactive steps have been taken by U.S. authorities, including the **development of a national response plan** and **partnerships** aimed at **improving coastal response readiness**. To highlight this, he presented a recent success in Port Vila, where nearly 10,000 litres of diesel were successfully contained after a fishing boat incident. This quick response prevented further environmental damage.

In conclusion, Mr Bohn stressed the importance of:

- **Maintaining a skilled workforce** for future oil spill responses.
- **Improving waste management infrastructure** in the Pacific.
- **Enhancing early response strategies** to reduce environmental damage.

4.5.2. Session #4b: Spillage Management Plan: cleaning / temporary storage / final disposal

Speaker: Mr Paul Irving - Marine Pollution Project Officer – PacPlan Project - SPREP, Samoa

Mr Paul Irving, Marine Pollution Project Officer from the PacPlan Project at SPREP highlighted the **critical importance of waste management**, particularly in the context of **maritime incidents** such as oil spills and shipping disasters. He emphasised how effective preparedness, as demonstrated by Vanuatu's recent oil spill response, is essential in mitigating environmental and economic damage.

Shipping incidents pose serious environmental risks, with around 3,000 containers lost annually in the Pacific, contributing to **marine pollution**. The disposal of hazardous waste, such as electronic waste and lithium batteries, further complicates maritime responses, requiring **comprehensive management strategies**.

Oil spills arise from **various sources**, including **maritime accidents**, **pipeline failures**, and **land-based activities**. Using an oil spill in Australia's Great Barrier Reef as an example, Mr Irving illustrated the long-term environmental and economic consequences of such incidents. While nearly half of the oil in the ocean originates from natural sources, human activities, particularly shipping, significantly contribute to pollution. **Managing oil spills** effectively requires **expert guidance**, as **different types of oil demand specific response strategies**.

To address these challenges, Mr Irving advocated for the **enforcement of international frameworks**, such as the **Basel Convention** on hazardous waste management and the **Waigani Convention** on waste disposal in the Pacific. He also introduced the **Pacific Regional One-Maritime Framework (POMF)**, which aims to enhance maritime safety and pollution control through stronger regional collaboration.

Beyond cleanup efforts, **successful oil spill response** must include **long-term environmental recovery** and **community support**. Compensation and legal frameworks often complicate these efforts, making coordinated response teams essential. Mr Irving stressed that **response strategies** should not focus solely on **oil removal** but also on **restoring ecosystems** and **assisting affected communities**.

He concluded by emphasising the importance of an integrated waste management strategy, using the **Prevention/Mitigation, Preparedness, Response, and Recovery (PPRR) model**. This framework promotes **risk reduction**, **readiness**, **rapid containment**, and **long-term rehabilitation**. He called for stronger regional cooperation, improved waste handling systems, and continued legal and policy advancements to address maritime pollution in the Pacific effectively.

4.5.3. Session #4c: Used Oil Management / Oily Waste Management

<u>**Speaker:**</u> **Mr Paul Irving - Marine Pollution Project Officer - SPREP, Samoa**

Mr Paul Irving's focused on the complexities of managing maritime waste, particularly oil spills. He stressed that the best way to manage waste is to prevent it from being released in the first place.

Mr Irving underscored the importance of i**nterdisciplinary and intergovernmental collaboration**, particularly for smaller Pacific nations with limited resources. In oil spill response, local capacity is often overwhelmed, making external assistance essential. He outlined practical cleanup techniques, including shoreline booming and skimming, while cautioning that removing contaminated sand increases waste volume and creates additional challenges.

Cultural perspectives on wildlife conservation also played a role in his discussion. He used turtle conservation as an example, noting that attitudes toward rehabilitation vary across Pacific communities. This highlights the need for **culturally sensitive approaches** to **environmental protection** and **disaster response**.

Addressing oil spill management complexities, Mr Irving discussed the **controversial use of dispersants**. While effective in some regions, their use in the Pacific is limited due to concerns over **chemical pollution** and a **lack of local capacity**. Instead, he pointed to natural processes, such as **microbial oil degradation**, as essential to long-term recovery, noting that microorganisms in the ocean can break down oil. However, he warned that **human intervention in sensitive habitats**, like mangroves and seagrass beds, **may cause more harm**.

Pre-planning is critical in oil spill response. Mr Irving illustrated this with an example of an oil spill management plan, emphasising that **waste generated from a spill can far exceed the spill's original volume**. He also addressed the **legal** and **financial implications** of oil spills, stressing the need for **accountability**. A partnership with the University of the South Pacific is developing oil fingerprinting capabilities, allowing authorities to trace spills back to their source and hold responsible parties accountable.

Financially, **oil spill waste management** poses significant **challenges**, especially in **transporting** and handling **hazardous materials**. Mr Irving called for the **creation of dedicated disaster waste plans** tailored to **maritime incidents, separate** from those designed for natural disasters like cyclones. He concluded by advocating for **comprehensive planning** that includes **legal frameworks, trained responders, and financial mechanisms**, such as upfront levies on shipping companies. These measures would enhance the Pacific's preparedness and resilience, ensuring a more effective response to future maritime pollution events.

4.5.4. Session #4d: Insurance for Maritime Incidents

Speaker: Mr Paul Irving - Marine Pollution Project Officer - SPREP, Samoa

Mr Paul Irving expanded his discussion to highlight the critical role of **international insurance** in waste management, especially for maritime incidents. He underscored the often-overlooked costs associated with insuring hazardous waste shipments, which can significantly affect budgeting and planning for waste disposal.

He outlined **key types of maritime insurance**, including Hull and Machinery Insurance, Protection and Indemnity (P&I) Insurance, Cargo Insurance, and War Insurance. Of these, P&I insurance is especially crucial for **covering liabilities from oil spills**, as required under **international law**. Mr Irving stressed the need for **clearer insurance guidelines** that address both **direct and indirect costs**, such as childcare for workers involved in cleanup efforts. He also called for stronger collaboration between maritime and environmental agencies to enhance oil spill response capabilities.

Mr Irving shared his firsthand experiences with managing oil spill, particularly in Saudi Arabia and Vanuatu. He recounted an incident involving the Western Star barge, which caught fire while carrying fuels and waste oils. This raised serious concerns about **toxic smoke** exposure and potential **contamination of water supplies** in nearby villages, particularly in villages that rely on rainwater collected from rooftops. Mr Irving emphasised the vulnerability of such communities and the importance of **proactive communication with local leaders** to ensure that **response efforts** align with **community needs**. His experiences highlighted the **disconnect** that often exists between high-**level policy discussions** and the **realities of managing environmental disasters on the ground**.

The discussion also addressed challenges in **fostering cooperation** between the **private sector and government agencies**. Mr Irving suggested that informal meetings could help build **stronger relationships** and **improve communication**. He argued that **governments should focus on creating policy frameworks that encourage private-sector involvement** rather than attempting to be the sole provider of waste management solutions.

Ms Claytoncy Taurarii from the Cook Islands' Ministry of Infrastructure further emphasised the importance of **private-sector preparedness**, including having **clear business plans** and **transparent cost structures**.

Mr Irving then proposed a **regional approach to waste management** in the Pacific, highlighting the potential for collaboration among countries to **share resources and expertise**. He advocated for the establishment of a **Regional Waste Management Community of Practice** to promote knowledge-sharing and coordinated responses to environmental challenges.

In conclusion, Mr Irving stressed waste management plans must be implemented effectively, with a focus on continuity, **training**, and **accountability**, particularly during transitions in leadership and personnel. He urged Pacific nations to treat **waste management** as a **shared regional challenge**, calling for **collective solutions** that **strengthen preparedness** for environmental disasters.

4.5.5. Session #4e (Virtual): Landfarming in Samoa

<u>Speaker:</u> Ms Yoko Onuma - Chief Advisor, J-PRISM III, Japan

Ms Yoko Onuma, Chief Advisor of J-PRISM III outlined the **challenges of waste oil management in Samoa** and the ongoing efforts to address the problem. Samoa imports approximately 740,000 litres of oil annually, generating between **200,000 and 350,000 litres of waste oil**. A major issue is **lack of a national legal framework** for waste oil management, resulting in its **accumulation** at wharfs and the need to **export** it to countries like Fiji and New Zealand **for processing**.

In response, the Samoa Waste Oil Management Programme (SWOPM) was launched in 2019 by the Samoa Recycling and Waste Management Association (SRWMA). The programme focused on collecting, storing, and exporting waste oil, charging waste oil generators a fee of around USD 0.07 per litter. However, the programme faced challenges, such as **limited awareness** and **resistance to the waste oil collection fees**, which hinder its effectiveness.

Support for SWOPM was provided through the second phase of the **Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management (J-PRISM2)**. A pilot project, conducted between August and September 2021, aimed to improve waste oil collection, targeting a volume of 4,000 to 45,000 litters. However, Samoa's border closures during the COVID-19 pandemic in 2020 and 2021 disrupted the project and overall waste management efforts.

The pilot project also faced **technical difficulties**, particularly with **waste oil collection equipment**, which led to a **spillage and soil contamination**. In response, the team tested **soil farming** as a mitigation technique for treating contaminated soil. However, the results were **disappointing**; testing showed **no significant decrease in oxygen levels or increase in carbon dioxide**, indicating that microbial activity was insufficient to break down the contamination. While the **odour of the waste oil diminished over time**, there were **no substantial improvements in soil quality**.

Ms Onuma emphasised that **waste oil management in Samoa remains a challenge** due to a lack of **infrastructure, legal systems, and public engagement**. While SWOPM has made progress, it continues to struggle with **awareness, funding, and operational capacity**. The **soil farming experiment**, though unsuccessful, provided insights into the **limitations of locally available remediation techniques**.

To address these challenges, Ms Onuma stressed the need for **continued regional collaboration**, calling for **partnerships** with **local universities and development agencies** to explore more effective solutions. Despite setbacks, the lessons learned from the project will contribute to **developing better waste management strategies** for Samoa and the broader Pacific region.

4.6. Session #5: Disaster Waste Management

4.6.1. Session #5a: Overview of Disaster Waste and Impact

Speaker: Ms Sainimili Bulai - PacWastePlus Technical Waste Project Officer - SPREP, Samoa

Ms Sainimili Bulai, PacWastePlus Technical Waste Project Officer at SPREP discussed the critical **challenges** of **waste management during natural disasters**, particularly in the Pacific region, where **cyclones and other extreme weather events occur regularly**. The session focused on the intersection of **waste management, disaster risk reduction, and resilience**, emphasising the need to **integrate disaster waste management** including **circular economy principles** into disaster response strategies.

Ms Bulai reminded that natural disasters create a significant volume of waste, including:

- **Bulky waste** (damaged infrastructure, household debris)
- **E-waste** (damaged electronics, batteries)
- **Healthcare waste** (contaminated medical supplies)
- **Hazardous materials** (asbestos, chemicals, fuel residues)

One of the key points raised by Ms Sainimili Bulai was the **growing recognition** of **disaster waste management** as an **essential component** of **disaster planning**. However, this presents a **challenge for effective waste management**, as each type of waste **requires a different disposal approach**, and improper handling can lead to **environmental contamination**, such as the **leakage of hazardous substances into local food and water sources**.

The session also aimed to **raise awareness about the importance of planning for disaster waste management**, with a focus on maintaining resilience and circularity. Indeed, Ms Bulai noted that disaster recovery efforts often prioritise **infrastructure rebuilding**, leaving **waste management as an overlooked challenge** despite its critical role in **environmental protection and sustainable recovery**.

The session featured a **technical overview by Mr Faafetai Sagapolutele, JICA Expert in disaster waste management**, who shared **practical strategies for handling post-disaster waste**. Ms Bulai also presented a **case study on Pacific nations most affected by natural disasters**, underscoring the urgent need for **improved waste management strategies** tailored to the region's unique vulnerabilities.

She emphasised the importance of **proactive planning** for disaster waste management, advocating for:

- **Pre-disaster waste audits** to assess potential risks.
- **Circular economy approaches** to maximise waste reuse and recycling.
- **Integrated waste management policies** within national disaster response plans.
- **Regional cooperation and knowledge-sharing** to strengthen disaster resilience.

By prioritising **waste management in disaster preparedness**, Pacific nations can **minimise environmental risks, improve community resilience, and ensure a more sustainable recovery process**.

4.6.2. Session #5b: Framework for Resilient Development in the Pacific (FRDP)

Speaker: Ms Rebecca Polestico - Monitoring and Evaluation Adviser - SPREP, Samoa

Ms Rebecca Polestico, Monitoring and Evaluation Adviser at SPREP outlined the integration of **disaster waste management** into the **Framework for Resilient Development in the Pacific (FRDP[23]) 2017-2030**, emphasising its role in enhancing **regional resilience**. The FRDP aims to **reduce disaster risks** and position waste management within a broader **resilience strategy**, aligning with the **2050 Strategy for the Blue Pacific Continent[24]**, which focuses on Climate Change, Oceans, and Security and highlights the **synergies between disaster risk reduction**, **climate adaptation**, and **waste management**.

[23] https://library.sprep.org/sites/default/files/2021-12/framework-resilient-development-Pacific-monitoring-evaluation-strategy.pdf
[24] https://forumsec.org/2050

The development and implementation of the FRDP has also pushed **National Disaster Management Offices (NDMOs)** to **formally acknowledge waste management**, emphasising its importance in ensuring a resilient response.

Several regional **frameworks guide disaster preparedness** and **resilience efforts**, including disaster **waste management**:

- **Pacific Resilience Partnership (PRP[25])** – A regional mechanism supporting climate adaptation and disaster risk reduction.
- **Pacific Resilience Standards (PRS[26])** – Provides guidelines for **integrating resilience into national policies**, including waste management.
- **Disaster Waste Technical Working Group (DWTWG)** – Established in 2020 to address **disaster waste management challenges** within PRP.

These frameworks **emphasise a community-driven approach**, recognising **local involvement as crucial to sustainability and resilience**.

The presentation also outlined SPREP's role in implementing the FRDP. Since 2018, **SPREP has been assessing the FRDP's implementation across the Pacific**, focusing on **disaster preparedness, response, and recovery**, where waste management plays a crucial role. Key areas of support include:

- **Tracking country-level progress** and identifying gaps in disaster waste management.
- **Addressing resource and manpower limitations** that hinder waste management efforts.
- **Operationalising disaster waste management** through initiatives like the **Clean Pacific Indicators**.

SPREP's role in **monitoring and evaluating the implementation of the FRDP** is essential for **tracking progress** toward resilience goals through the **Clean Pacific Indicators**, which are critical for ensuring that efforts contribute to healthy oceans and resilient communities. Finally, the presentation discussed the importance of **monitoring and evaluating** progress in waste management efforts is crucial to measure:

- **Relevance** – Ensuring waste management strategies align with resilience goals.
- **Effectiveness** – Assessing the impact of interventions.

[25] https://pacificresiliencepartnership.org/
[26] https://pacificresiliencepartnership.org/pacific-resilience-standards-prs/#:~:text=It%20builds%20on%204%20standards,disabilities%3B%20and%20protect%20human%20rights

- **Sustainability** – Developing long-term solutions for resilient communities.

Finally, Ms Polestico stresses the need for an **integrated approach** that **combines climate change, disaster risk management, and waste management**. A coordinated approach ensures **efficient resource allocation** and meets **community needs during disaster response**. She highlighted **circular economy principles**, such as:

- **Recycling and waste reduction** to turn disaster waste into resources.
- **Sustainable waste management solutions** including circular economy principles to improve resilience and environmental protection.

Ms Polestico concluded by emphasising the importance of **cross-sector collaboration**, involving **governments, NGOs, private sectors, and local communities** to **tackle interconnected challenges** of climate change, disaster risk reduction, and waste management. The goal is to **build sustainable and resilient Pacific communities** by integrating **circular economy practices** and ensuring **effective disaster preparedness**.

➢ **Q&A / COMMENTS**

The Q&A covered key challenges and potential solutions related to disaster response, waste management, and resilience in the Pacific region.

✓ *Challenges in Implementing Disaster Frameworks*

One major concern raised by Mr Stalini Naufahu from Tonga Waste Authority Limited was the **gap between disaster response frameworks** and their actual **implementation**. Institutional barriers were identified as major obstacles to effective disaster response.

In response, Ms Rebecca Polestico emphasised the need for **greater accountability** among those responsible for executing these frameworks. She pointed out that **regional organisations** like the University of the South Pacific (USP) and the Japan International Cooperation Agency (JICA) could **provide technical expertise to countries** to support disaster response, even when financial resources are limited.

✓ *Making Resilience Concepts Accessible to Younger Audiences*

The discussion also explored how **resilience concepts** could be made more accessible to **younger audiences**. Ms Claytoncy Taurarii from the Cook Islands' Ministry of Infrastructure inquired about **simplifying these ideas for children**.

Ms Polestico responded that children learn resilience by **observing adults**, particularly during crises. Mr Faafetai Sagapolutele added that **teaching simple disaster preparedness actions**, such as seeking shelter during a cyclone, is an effective way to build resilience in younger generations.

- ✓ *Distinguishing Between Disaster Waste and Hazardous Waste*

Another topic of discussion was the challenges of integrating disaster waste into the circular economy, particularly given the contamination of disaster waste with hazardous waste. Ms Claytoncy Taurarii from the Cook Islands' Ministry of Infrastructure raised **concerns about cases involving materials like asbestos and e-waste**. This **contamination** makes it difficult to **segregate** or **recycle** waste, and **logistical barriers** further complicate waste management.

Ms Sainimili Bulai, PacWastePlus Technical Waste Project Officer at SPREP clarified that **disaster waste includes all waste generated during a disaster**, some of which may be **hazardous** and **require specialised disposal**.

Mr Paul Irving, Marine Pollution Project Officer at SPREP, noted that **disaster waste** can also **stem from post-disaster relief efforts**, such as waste from **water bottles**, and **waste management strategies** remain consistent regardless of whether a disaster is formally declared.

- ✓ *Challenges in Recycling and Waste Management in Urban Areas*

The session also addressed **challenges in urban waste management**. As such, Ms Violet Vavine Loi, Waste Management Officer at the National Capital District Commission in PNG highlighted the issues of **illegal dumping**, and the **high costs of recycling services for small businesses**.

Mr Paul Irving suggested that **government subsidies or deposit-return schemes** could reduce waste disposal costs, emphasising that **solutions** need to be **tailored to local economies**.

Ms Sainimili Bulai advocated for better integration of small businesses into recycling supply chains through circular economy principles.

Ms Susana Telakau, Solid Waste Management Adviser at SPREP, added that miscommunication between small waste operators and larger companies is a common challenge, and **better communication and integration of stakeholders** into the regul**atory framework** is essential for effective waste management.

✓ *Final Recommendations*

The session concluded with recommendations emphasising the need to **simplify technical knowledge for greater engagement of local communities**, particularly younger generations, establish **clear disaster waste management protocols** for handling both hazardous and non-hazardous waste, address financial barriers through government incentives, and improve collaboration between small businesses, recycling companies, and regulatory bodies. The discussion underscored the importance of **localised solutions**, clear **communication**, and **cooperation** to strengthen disaster response and waste management efforts in the Pacific.

4.6.3. Session #5c: Mainstreaming Waste Management into National Disaster Management Office (NDMO) Framework

<u>Speaker:</u> Mr Faafetai Sagapolutele - JICA Expert in DWM - J-PRISM III, New Zealand

Mr Faafetai Sagapolutele, JICA Expert in DWM, presented on integrating disaster waste management into **National Disaster Management Frameworks** for Pacific Island Countries (PICs). Developed through regional consultations from 2018 to 2020, this initiative aims to incorporate **waste management into disaster response and recovery efforts**. The guidelines emphasise the importance of **waste reduction**, **recycling**, and **effective waste management strategies**.

The guidelines were developed through **consultations** in Samoa (2018) and Palau (2019), bringing together **disaster management officials** and **waste management experts** to bridge the gap between **life-saving disaster actions** and **waste management goals**. A central focus is the 3Rs (Reduce, Reuse, Recycle) ensuring that **disaster waste is managed efficiently** while **minimising the volume of waste** sent to **landfills**.

Aligned with **national disaster plans**, the **disaster waste management cycle** covers **prevention**, **preparedness**, **response**, **recovery**, and **reconstruction**. During response phases, swift action is needed to **manage waste** and **reduce health risks**, while recovery and reconstruction efforts should integrate long-term waste management improvements. The guidelines advocate for a **waste management hierarchy** that prioritises **prevention** and **recycling over disposal**.

A key recommendation is fostering **partnerships** between **local recycling operators** and waste management agencies. These collaborations help collect and **recover recyclable materials** from disaster areas, **reducing waste** while **creating income** for **local communities**. However, **challenges** persist, such as **limited resources**, **land constrains**, and **technical and financial**

capacity in many PICs. Despite these hurdles, successful examples from Fiji, Samoa, Tonga, and Vanuatu demonstrate how local recycling efforts and operational adjustments can effectively manage disaster waste.

To address these challenges, Mr Sagapolutele recommended **strengthening existing recycling infrastructure**s rather than creating new facilities. By **building capacity before a disaster strikes**, countries can better align their waste management systems with circular economy principles, **enhancing disaster resilience**.

Mr Sagapolutele stressed the importance of **each country developing disaster waste management strategies**, with Samoa, the Solomon Islands, Tonga and Vanuatu already making progress in this area. **Strengthening waste management facilities**, **enhancing recycling infrastructures**, and **securing financial mechanisms** are also essential for sustainable disaster waste management. Moving forward, **embedding these strategies into national disaster plans** is crucial to ensuring **long-term resilience** and **sustainability** across the Pacific.

- **Q&A/ Comments**

- ✓ *The Need for a Disaster Waste Management Plan*

In the Q&A session, Mr Stalini Naufahu from Tonga Waste Authority Limited shared insights from a recent national workshop on disaster response, highlighting the absence of a disaster waste management plan in Tonga's framework. This led to discussions on the need to formally **integrate disaster waste** into **national policies** and **budget allocations**.

Mr Sagapolutele responded that **while disaster waste management is often overlooked in official frameworks**, once a **plan is developed and approved**, it can be **incorporated into national budgets** for sustainable financing.

- ✓ *Integrating Disaster Waste Management into National Strategies*

Mr Naufahu further inquired whether integrating **disaster waste into the national waste management strategy** would create a more **unified approach for stakeholders**.

Mr Sagapolutele confirmed that doing so would align all stakeholders under a **common framework**, ensuring **coordinated and efficient responses** during disasters.

✓ *Proactive vs. Reactive Planning in Disaster Waste Management*

The discussion also addressed the challenge of **proactive versus reactive planning**. Ms Taurarii pointed out the common tendency to wait for a disaster before implementing waste management strategies, an approach that often loses momentum once the immediate crisis subsides.

In response, Mr Sagapolutele emphasised the importance of **proactive planning**, urging countries to **anticipate various waste types** and **prepare solutions in advance**. He highlighted the need to:

- **engage stakeholders** early in the planning process
- **identify recycling partners** to manage disaster waste efficiently
- **and address hazardous materials** such as asbestos and waste oils.

By establishing these strategies **beforehand**, countries can ensure a **more effective and coordinated disaster waste management response**, reducing risks and enhancing recovery efforts.

✓ *Collaboration and Inclusivity in Disaster Waste Management*

The session also emphasised the importance of **understanding the disaster management cycle** and **fostering collaboration** across key sectors, such as waste management, disaster prevention, and emergency response. **Strong partnerships** are essential for reducing disaster waste risks.

Additionally, participants highlighted the need for **inclusive disaster waste management plans**, particularly for **outer islands**, ensuring that all communities are considered in national strategies.

✓ *Community Empowerment and Long-Term Environmental Impact*

Ms Sainimili Bulai, PacWastePlus Technical Waste Project Officer at SPREP, stressed the importance of **community empowerment**, citing past instances where local communities, despite training and preparedness efforts, were still **unprepared for disasters**. She emphasised that **engaging and empowering local communities** for **first-hand disaster response** significantly improves recovery efforts.

✓ *Enhancing Rapid Waste Assessment Capabilities*

Another concern raised was how to **improve rapid waste assessment capabilities** following disasters.

Mr Sagapolutele suggested that **disaster response plans** should include **methodologies** for swift **waste assessment and date collection**. He highlighted tools like the **Kobo Toolbox system**, which converts remote data into actionable **information for decision-makers**. This tool allows for efficient **waste mapping**, helping authorities **prioritise safe waste removal** and recycling efforts. While remote locations pose challenges, such technologies can significantly enhance disaster waste management.

✓ *Importance of Practical Implementation and Training*

The discussion also raised the need for **practical implementation and training** in disaster waste management. It was highlighted the importance of having a **clear chain of command** during disaster response, as key personnel may be unavailable in an emergency. **Regular drills** and ensuring that **all personnel understand their roles** are critical for an effective and **coordinated response**.

✓ *Strengthening Disaster Waste Management*

In conclusion, the discussion reinforced the **importance** of **formally recognising disaster waste management in national disaster plans**. Developing and approving **specific response plans** will enable **better coordinatio**n among stakeholders, while innovative tools like **Kobo Toolbox** can strengthen rapid **waste assessment capabilities**, leading to **more effective** and **timely responses** to disaster waste.

4.6.4. Session #5f: Practitioner's Guideline on Drafting National Disaster Waste Management Plan

Speaker: **Ms Sainimili Bulai - PacWastePlus Technical Waste Project Officer - SPREP, Samoa**

The session started with a **video**[27] highlighting the increasing **frequency and severity of natural disasters** in the Pacific and the resulting **waste management challenges**. The video emphasised key concerns such as:

- **Delays in recovery** caused by unmanaged waste
- **Public health risks** due to hazardous materials

[27] https://youtu.be/NSbB1qqay-Q?si=ieXKCAqoJJaXdFzu

- **Disruptions to rescue operations** caused by debris

It reinforced the **urgent need** for structured **disaster waste management plans** to enhance **community resilience and recovery outcomes**.

To address these challenges, the PacWastePlus Programme developed a series of guidelines to assist countries in developing tools and strategies for disaster waste management preparedness.

As such, the session introduced the **Practitioner's Guideline on Drafting National Disaster Waste Management Plan**, developed by SPREP under the PacWastePlus Programme, designed to help Pacific Island countries in establishing effective **national disaster waste management plans**. This guideline aims to **integrate waste management** into **national disaster management frameworks**, particularly in disaster-prone nations like Fiji, Tonga, and the Republic of the Marshall Islands (RMI), which face significant risks from natural disasters.

A key component of the **Practitioner's Guideline** is its **step-by-step approach** for drafting a **National Disaster Waste Management Plan**. The guideline emphasises identifying **key waste management activities** at every stage of the disaster cycle, including:

- **Waste collection**
- **Transportation**
- **Safe disposal**

By following this structured approach, the guideline aims to **streamline the disaster response process** and ensure that **waste management is effectively incorporated** into recovery efforts.

Additionally, the session introduced a guideline for **forming an Environmental Sector Working Group**. This working group would:

- Act as a **technical task force** for implementing the disaster waste management plan.
- Be **formally recognised by the National Disaster Management Office (NDMO).**
- Ensure **coordinated and efficient waste management** during disasters.

The **Estimation Guidelines**, another key resource introduced, help countries **estimate disaster waste volumes** using methods aligned with the **United Nations' data collection methods**. This ensures that waste management is **integrated into Post-Disaster Needs Assessments (PDNA)**, enabling better:

- **Recovery planning**;
- **Infrastructure rebuilding**; and
- **Waste disposal requirements.**

Another important resource shared was the **Template for Planning**, which assists countries in drafting a disaster waste management plan, by:

- Assessing **existing waste management infrastructure**
- Identifying **recycling partners**
- Clarifying **roles and responsibilities** of **local agencies** in disaster recovery

The session concluded with an in-depth discussion on the **Disaster Waste Management Cycle**, covering:

1. **An overview of the disaster waste management process**
2. **A breakdown of key stages** involved in waste handling
3. **A step-by-step guide** for drafting a disaster waste management plan

The key takeaway was the **importance of collaboration** between **governments, local communities, and stakeholders** to ensure **efficient disaster waste management**. A well-coordinated approach helps **communities recover faster** and **strengthens resilience** to future disasters.

4.6.5. Session #5f: Fiji's Approach to Disaster Waste Management: A Case Study

Speaker: **Mr Sakenasa Namisi - Environment Officer - Department of Environment, Fiji.**

In this session, Mr Sakenasa Namisi, Environment Officer from the Department of Environment, Fiji, presented a **case study** on the country's efforts to **integrate waste management** into its **national disaster management framework**. He outlined that **managing disaster** waste is a significant challenge due to **limited funding**, the absence of standardised procedures, and a **lack of reliable data** to support decision-making.

Fiji, an archipelago of over 300 islands, frequently experiences natural disasters such as cyclones and floods that generates disaster waste such as:

- **Bulky waste** – Construction debris such as concrete rubble, corrugated iron, and timber.
- **Household waste** – Damaged furniture, appliances, and personal belongings.

- **Hazardous waste** – Industrial waste, chemical spills, and oil leaks from damaged infrastructure.
- **Relief waste** – Food packaging from emergency supplies and healthcare waste from evacuation centres.
- **Natural debris** – Fallen trees, branches, mud, and silt from floods and cyclones.

Currently, 14 **provinces** and 13 **municipal councils** are responsible for **urban waste management**, and **general waste** management is overseen by the **Department of Environment,** while **disaster waste management** falls under the **NDMO**. However, there is **no dedicated budget** for **disaster waste**, as emergency resources are often allocated to immediate priorities like shelter, water, and food supplies. **Municipal councils** and **district offices** are left to **coordinate waste management efforts without standardised protocols**.

Fiji employs various strategies to manage disaster waste:

- **Urban Areas:** Municipal councils use shredding machines to process organic waste, repurposing it for recovery and rebuilding efforts.
- **Rural and Maritime Zones:** Where disaster waste management is more challenging, local communities are encouraged to handle their own waste Organic waste is often shredded and repurposed for rebuilding homes.
- **Remote areas such as Outer Islands:** Due to logistical challenges, waste is often repurposed locally and used in reconstruction efforts rather than transported to the main islands.

Looking ahead, Fiji is collaborating with the Secretariat of the Pacific Regional Environment Programme (SPREP) through the PacWastePlus Programme to develop a **National Disaster Waste Management Plan**. Key components of the plan include:

- **Establishment of an Environmental Sector Working Group** to oversee waste management implementation.
- **Improved Data Collection** to support informed decision-making and efficient waste disposal.
- **Development of Standardised Procedures** for waste handling, transportation, and disposal.
- **Capacity Building** to equip local agencies with the skills needed for effective disaster waste management during a crisis.

The **National Disaster Waste Management Plan** encompass **six stages** of the **disaster management cycle**. This **comprehensive approach** will **guide waste management activities** at **every stage** of the **disaster response process**, including:

1. **Prevention & Mitigation** – Reducing waste generation and planning for sustainable waste management.
2. **Preparedness** – Developing strategies and identifying waste disposal sites in advance.
3. **Early Warning** – Assessing potential disaster waste risks based on forecasted events.
4. **Emergency Response** – Implementing rapid waste assessment and debris clearance.
5. **Recovery** – Managing collected waste and restoring waste management services.
6. **Reconstruction** – Incorporating waste reduction strategies into rebuilding efforts.

Moving forward, Fiji aims to:

- Develop **clear guidelines** for waste management, including collection, transportation, and safe disposal to protect public health and the environment.
- Enhance **waste data collection systems** for better tracking and reporting.
- Improve **waste disposal facilities** to manage disaster-related waste more effectively.
- Strengthen **collaboration among stakeholders**, ensuring all agencies are well-equipped for effective disaster waste management.

In conclusion, Fiji is making **significant progress** in formalising **disaster waste management** through **strategic planning**, enhanced **data collection**, and **collaboration** with national and regional partners. These efforts aim to **improve national resilience** to future natural disasters, ensuring that waste management becomes an integral part of the country's emergency response and recovery framework.

➢ **Q&A/ Comments**

✓ *The Scale of Disaster Waste in Fiji*

Ms Sainimili Bulai, PacWastePlus Technical Waste Project Officer at SPREP shared that the volume of **waste generated during a single natural** can be **substantial**, equivalent to 20% of the country's annual landfill waste. Historically, Fiji's **National Disaster Management Office** (NDMO) followed a traditional approach of collecting and landfilling disaster waste. However, this method lacked a circular approach, prompting a shift toward alternative solutions such as **recycling and composting**.

To address disaster-related organic waste, **local councils** have been empowered to use **shredders**, which help process **organic materials for composting**. These shredders are also deployed in communities during disasters to **improve waste management efficiency**.

✓ *Gaps in Technical Expertise and Policy Implementation*

Despite having a legislative and policy structure in place, Fiji faces challenges in technical expertise, particularly in **handling pollution during disasters** within the waste sector under the **Environment Management Act**. Moving forward, the goal is to enhance disaster waste management by bringing **all relevant stakeholders together** to develop more effective disaster waste management strategies.

✓ *Managing Waste in Remote Areas: A Practical Challenge*

Mr Faafetai Sagapolutele highlighted the **practical and logistical difficulties** of handling waste on remote islands. Due to limited access, these locations often **lack proper waste management services**, and **waste collection** is dependent on small boats. Key challenges include:

- **Segregation of waste** – Determining which materials can be recycled or safely disposed of.
- **Limited infrastructure** – Ensuring waste is properly managed when disposal facilities are unavailable.
- **Transportation constraints** – Finding cost-effective and practical ways to move disaster waste off remote islands.

✓ *Funding for Disaster Waste Management: A Key Concern*

Ms Claytoncy Taurarii from the Cook Islands' Ministry of Infrastructure raised the important challenge related to budget allocation for disaster waste management. She asked how the waste sector plans to secure sufficient funding to address disaster waste management, given that financial constraints have been a persistent challenge.

In response, Mr Sakenasa Namisi emphasised the **need for a dedicated waste sector representative** in the **decision-making process**, alongside the **NDMO**. Currently, while the NDMO prioritises sectors like health, schools, and infrastructure, waste management often receives less attention. **Key solutions proposed** include:

1. **Integrating waste management into disaster recovery planning** to ensure it receives **appropriate funding**.

2. **Using data-driven advocacy** – Collecting and presenting **comprehensive waste data** is crucial for decision-makers and can help **allocate the necessary budget** and **resources** for waste management during disasters.

✓ *Themes and Takeaways*

The discussion highlighted several key themes related to disaster waste management:

- **Volume of Waste:** The significant quantity of waste generated during disasters, particularly in remote areas with limited services, poses major management challenges.
- **Circular Economy Approach:** A shift away from landfilling towards **recycling, composting, and reuse** is essential.
- **Cross-Sector Collaboration:** Strengthening coordination among **waste management, disaster response, and environmental agencies** is key to improving resilience.
- **Securing Adequate Funding:** Data plays a vital role in advocating for **increased budget allocations** to ensure effective disaster waste management.

✓ *Conclusion*

Overall, the session underscored the **importance of improving disaster waste management systems** through better **coordination**, **sustainability-focused approaches**, and securing **adequate financial resources**. By addressing these challenges, Pacific nations can enhance their resilience and recovery capacity in the face of future disasters.

4.6.6. Session #5g: Practitioner's Guideline on Establishing Environment Sector Working Group

Speaker: Ms Sainimili Bulai - PacWastePlus Technical Waste Project Officer - SPREP, Samoa

Ms Sainimili Bulai, PacWastePlus Technical Waste Project Officer at SPREP emphasised that while Fiji has developed a **National Disaster Waste Management Plan**, the real **challenge** lies in its **effective implementation**. To address this, an **Environment Sector Working Group (ESWG)** has been established to oversee execution of the plan and ensure that all activities are carried out as intended. The **ESWG** will focus on **building key partnerships**, particularly with **first responders** (agencies recognised by the National Disaster Management Office) and **private recyclers**.

A second working group will **train first responders on waste data collection**, **waste identification**, and **adherence to management guidelines**. This group will also **establish**

agreements with **recyclers** to ensure **proper processing of materials** and **plan for safe waste storage sites** in case landfills become inaccessible after disasters.

A **video**[28] presentation further underscored the **ESWG's critical role** in Pacific countries, particularly as disasters become more frequent. The **ESWG's mission** is to **manage disaster waste before, during, and after a disaster, reducing environmental** and **health impacts** through an **inclusive approach**. It will **coordinate** national disaster waste management plan activities, such as **post-disaster waste assessments**, **response operations**, **public education** and **media communications**.

To support this effort, the PacWastePlus Programme has developed an **operational guide** outlining steps for **establishing and managing an ESW**, including **task force creation**, **role assignments**, and **implementation strategies**. These task forces are essential for addressing urgent waste issues, mitigating risks, protecting local communities, and supporting recovery efforts.

Mr Faafetai Sagapolutele, JICA Expert in disaster waste management, contributed additional insights, noting that many countries struggle to establish an environment sector dedicated to waste management. National policies often prioritise areas like education, health, and agriculture, leaving environmental concerns secondary despite their growing significance. Differences in priorities between environmental and disaster management sectors can create friction and slow progress. Mr Sagapolutele stressed that **alignment and support between both environmental and disaster management sectors** are **crucial for advancing projects effectively**.

Political challenges also play a role, as **decision-making** often involves senior officials, and progress can be **delayed** by political factors or a lack of commitment from high-level leadership. Despite these challenges, Mr Sagapolutele expressed optimism, noting that countries are gradually moving in the right direction. **Collaborative efforts**, such as the development of guidelines in 2018 and 2022, have **strengthened relationships among stakeholders**.

[28] https://youtu.be/9Ug5SwgeEDc?si=ADji00NU5SXqW6oI

4.6.7. Session #5h: Case Study: Vanuatu's experience on the need to establish Environment Sector Working Group

Speaker: **Ms Roselyn Bue - Senior Officer (Chemical and Ozone) - DEPC, Vanuatu**

Vanuatu, a Pacific island nation **highly vulnerable to natural disasters**, is working to establish a **comprehensive system for managing disaster-related waste**. **Ms Roselyn Bue, Senior Officer at the Department of Environment Protection and Conservation (DEPC)**, provided an overview of the country's ongoing efforts and challenges in disaster waste management. While **progress** has been made, Vanuatu continues to face **coordination issues**, **resource limitations**, and **political barriers**.

Despite ongoing waste-related projects and, **Vanuatu is still solidifying its disaster waste management sector**, while facing **challenges** in fully **understanding** and **implementing** an **effective disaster waste management plan**. A **key challenge** is **coordinating the roles of various stakeholders** within the national disaster waste management structure, which is based on the country's contingency plan. **DEPC, NDMO, and local councils** all **play crucial roles**, but their **responsibilities have yet to be fully clarified**.

As a cyclone-prone nation, **Vanuatu** has suffered **significant damage from major cyclones** in 2020 and 2023, generating large volumes of waste. Although **rapid waste assessments** were conducted, **managing the waste** effectively **was hindered by resource shortages and delayed** municipal support.

Ms Bue recounted her involvement in conducting **rapid waste assessments** in areas such as Santo Island after the 2020 cyclone. Using tools from partners like SPREP and JICA, the team employed a to evaluate disaster waste impacts. **International support** provided **essential equipment,** such as **woodchippers**, **chainsaws**, and **toolkits**, which were instrumental in clearing debris and managing waste in affected areas. However, **logistical delays** and a **lack of temporary waste storage sites** hampered the overall response.

In 2022, the government initiated a **composting site to segregate organic waste**, **with local communities** participating in **waste separation efforts**. **Recyclable materials** like bottles and cans **were transported** to **designated sites**. However, Ms Bue noted that **inadequate support** from the NDMO **hindered disaster waste management progress**.

A major challenge was the **lack of support from local municipal councils**. Following the cyclone, councils failed to assist with **waste collection** or provide **designated disposal sites**. **Delays in mobilising resources** due to political issues and **poor coordination** between the

NDMO and DEPC further **slowed the disaster waste management response**. **Limited resources**, including **equipment** and **funding**, **compounded these difficulties** in managing the high volumes of waste generated.

Ms Bue emphasised the need to **strengthen collaboration** between DEPC, NDMO, municipalities, and international partners to **streamline disaster waste management**. **Improved coordination** with NDMO would **ensure a more effective response** before, during, and after disasters. An **integrated approach** could help expedite the implementation of waste management plans and **ensure timely action**.

She also recommended investing in local **capacity-building** through **training programmes** and **securing resources**, both in terms of **equipment** and **funding**, **before disaster events** occur. A **proactive approach** would **better prepare** Vanuatu **to manage future disaster waste challenges**. Additionally, she stressed the importance of continued **community engagement** in **waste segregation** and **recycling**. Initiatives like the **composting site** and **waste separation programmes** have demonstrated the **effectiveness of involving local communities** in disaster waste management.

Ms Roselyn Bue's presentation offered valuable insights into Vanuatu's disaster waste management efforts. While the country has made **significant progress in addressing disaster waste** through **international collaboration** and **community involvement**, **challenges** such as **inadequate municipal support, coordination issues**, and **limited resources** remain. Moving forward, **strengthening coordination among stakeholders**, **enhancing local capacities**, and **ensuring adequate resources** will be crucial to **improving disaster waste management** and better **preparing for future natural disasters**.

- **<u>Q&A/ Comments</u>**

- ✓ *Recognising Waste Management as a National Priority*

Mr Faafetai Sagapolutele emphasised that despite ongoing challenges, the **key to progress lies proactive action**. He stressed that the **waste sector** must be **recognised as a priority** within **national disaster management framework**. While developing a **disaster waste management plan** is crucial, it must also be **integrated** into **broader national planning processes**, even if waste management is not currently a focus for the National Disaster Management Offices.

To address these challenges, Mr Sagapolutele suggested **establishing an environment sector within national disaster planning** and **developing a dedicated disaster waste management**

response plan. Without these structures, effective disaster waste management will remain difficult. He also highlighted the importance of **collaboration between government agencies**, **municipal bodies**, and **NDMO**, noting that misalignment and lack of departmental coordination often hinder progress.

- ✓ *Challenges in Coordination and Response*

Mr Lindsay Teobasi echoed these concerns, pointing out that communication delays and slow responses are common challenges in disaster management. He emphasised that **during crises** such as cyclones, **affected populations suffer from** a lack of shelter and **immediate relief**, but these **issues are not addressed promptly** by higher levels of government. Mr Teobasi advocated for a more **collaborative approach**, **urging decision-makers** to prioritise human lives and health through **timely and coordinated responses**.

- ✓ *Budgeting and Private Sector Involvement*

Ms Claytoncy Taurarii from the Cook Islands' Ministry of Infrastructure shared **insights** into **her country's disaster waste management approach**, particularly its **budgeting for staff** and **ministries involved in disaster response**. However, she pointed out a significant challenge: **if no disaster occurs during the fiscal year, allocated funds are returned to the government, making it difficult to secure future funding**. She also noted that **involving the private sector** has been an **effective strategy**, though **bureaucratic** hurdles often **delay payments to service providers**.

- ✓ *Ensuring Inclusive Disaster Waste Planning*

Ms Rebecca Polestico, Monitoring and Evaluation Adviser at SPREP stressed the need for **inclusivity in disaster waste** management planning, ensuring **NDMO** and **all relevant stakeholders** are **actively involved**. Without their representation, disaster waste strategies risk being less effective and sustainable. She also underscored that **disaster waste management** should not be the sole responsibility of the waste sector or NDMO but rather a **collective effort** across all sectors. **Regular, inclusive dialogue among agencies** is crucial for ensuring **coordinated** and **effective disaster responses**.

- ✓ *Infrastructure and Community Resilience*

Ms Roselyn Bue, Senior Officer from DEPC, Vanuatu, underscored the importance of **close collaboration** and **effective communication** between the **Department of Environment** and **NDMO** to **integrate waste management into disaster response efforts**. She addressed concerns about future **infrastructure** plans, noting that while cyclone shelters in Vanuatu are **built to withstand storms**, many **people cannot afford such standards**, **leaving poorer communities more vulnerable**. However, alternative shelters such as community halls, schools, and churches are commonly used during cyclones, and remittances from workers abroad are helping to improve reconstruction efforts.

- ✓ *Conclusion*

The discussions highlighted the **complexities of disaster waste management**, particularly challenges related to **funding**, **coordination**, and **political commitment**. However, there was a strong **consensus** that **proactive planning**, **stakeholder engagement**, and **leadership** are critical to **improving disaster waste management systems**. Moving forward, establishing **waste management** as a **national priority**, **enhancing coordination** with NDMO, and **ensuring inclusive planning** will be key to **building more resilient waste management frameworks**.

4.6.8. Session #5i: Practitioner's Guideline on Estimating and Recording Disaster Waste

Speaker: Ms Sainimili Bulai - PacWastePlus Technical Waste Project Officer - SPREP, Samoa

Ms Sainimili Bulai, PacWastePlus Technical Waste Project Officer at SPREP, presented on the **Practitioner's Guideline for Estimating and Recording Disaster Waste**, a tool designed to assist Pacific Island nations assess and manage disaster waste effectively, particularly when donor-funded projects and external resources are not available. She emphasised the critical role of **data collection, risk identification, and proactive** waste management **planning** in disaster situations.

Referencing Ms Roselyn Bue's earlier presentation, Sainimili highlighted the ongoing challenge of **dependency on donor-funded equipment** and **resources** for **disaster response**. She stressed the need for countries to be **proactive in identifying and securing waste management resources** ahead of disasters. The Practitioner's Guideline was introduced as a **structured method** for **estimating disaster waste volume and type**, which can then be **integrated into national response frameworks** to **enhance preparedness and resilience**.

The guideline was developed in collaboration in collaboration with the **University of Newcastle** to align with the **Post-Disaster Needs Assessment (PDNA)** process. This ensures that disaster waste estimation is **consistent with national disaster management frameworks**, fostering a **cohesive approach** to disaster response and recovery.

Data collection plays a dual role:

- **Supporting immediate disaster response** by providing accurate waste volume and type estimates.
- **Informing long-term waste management planning** to secure government funding for infrastructure improvements, such as landfill climate-proofing, road access upgrades, and essential waste management equipment.

As an example, Sainimili highlighted Fiji's proactive approach, where municipal councils keep **shredders on standby** to be **deployed immediately** in **disaster-affected areas**, ensuring swift response without relying on external aid.

Beyond waste volume estimation, the Practitioner's Guideline also assesses the **environmental risks posed by disaster waste**. **Hazardous materials** such as e-waste and oil spills can contaminate food and water sources, leading to serious health and environmental threats. The guideline offers risk **assessment methodologies** and **management strategies to prevent disease outbreaks, minimise pollution, and protect public health**.

A **video**[29] accompanying the presentation reinforced the **critical link between disaster waste and community health and safety**. It also introduced the **SPREP PacWastePlus Programme**, which developed an **Operational Guide for Disaster Waste Management** in the Pacific Islands. This guide provides practical steps for:

- **Estimating and recording disaster waste**
- **Assessing environmental damage**
- **Identifying temporary waste storage sites**
- **Supporting national PDNA and recovery frameworks**

These measures help governments **allocate resources efficiently** for **clean-up operations** and ensure **safe disaster waste disposal**.

The **Practitioner's Guideline** is designed to complement existing **disaster management frameworks**, ensuring a well-coordinated and **comprehensive approach** to disaster waste. Its primary goals include:

- **Preventing vector-borne diseases**
- **Minimising pollution**

[29] https://youtu.be/UwHLlpT4-jQ?si=djtMRWmVDSlNVMkY

- **Protecting the environment**
- **Ensuring disaster waste is handled safely and efficiently**

Sainimili's presentation reinforced that **effective disaster** waste management requires not only **understanding the scale and types of waste generated** but also **mitigating its environmental risks**. By equipping Pacific Island nations with **a structured and integrated approach to waste assessment**, the guideline strengthens **disaster response capabilities** and ensures that **critical resources** and **infrastructure** are in place, even in the **absence of external aid**.

4.6.9. Session #5j: Tonga's Journey through Disaster Waste Management: Lessons from the 2022 Volcanic Eruption

<u>**Speaker:**</u> **Mr Stalini Naufahu - Head of Department Special Projects - Waste Authority Limited (WAL), Tonga**

Mr Stalini Naufahu, Head of Department Special Projects at Tonga's Waste Authority Ltd (WAL[30]), shared insights from **Tonga's experience in managing disaster** waste following the catastrophic **volcanic eruption in January 2022**. His presentation emphasised the **critical role of data collection, the challenges faced during disaster response, and the lessons learned** from Tonga's efforts. The information provided shed light on how e**ffective waste management practices**, especially **data tracking**, can play a key role in disaster recovery and long-term sustainability.

The **Waste Authority Ltd (WAL)** is Tonga's central agency responsible for handling waste from **over 15,000 households and 3,000 institutions**. Mr Naufahu oversees special projects aimed at **enhancing waste management practices**, including the establishment of a **recycling facility** and a **surcharge on imported cans**. These **initiatives** are part of a **broader strategy to promote sustainability** and **improve waste management practices** throughout the country.

On **January 15, 2022**, a **massive volcanic eruption** disrupted daily life in Tonga, affecting **85% of the population** and causing **$208 million in damages** (**18.5% of the nation's GDP)**. The eruption generated a **huge volume of disaster waste**, including **ash fall**, which required a **$6 million clean-up effort**.

A significant challenge was the **influx of disaster relief goods**, which added pressure to the waste management system. For instance:

[30] https://www.facebook.com/wasteauthoritylimited/

- **88,600 bottles of water** were shipped in as aid.
- **500 drums of relief supply** further increased waste levels.

These donations, while essential, **exacerbated waste management difficulties**, highlighting the importance of **planning for post-disaster waste accumulation**.

Tonga struggled with **collecting accurate data** on disaster waste due to:

- **Lack of standardised reporting formats**, leading to inconsistent data from various sectors and making the assessment of the scope of the problem difficult.
- **Limited communication with donors and government agencies**, further complicating efforts to address the waste.
- **COVID-19 pandemic lockdown**, which temporarily **halted waste management activities** and delayed data collection efforts.

Accurate, **centralised data collection** is crucial for **effective decision-making** related to disaster waste management. Tonga used a **centralised database system** that allowed waste to be tracked **by type, location, and volume**. This system:

- **Allowed for quick data compilation** from various regions.
- **Facilitated real-time analysis and reporting**, improving coordination between stakeholders to manage both disaster-related and household waste.
- **Supported funding proposals**, such as securing **$10 million for end-of-life vehicle recycling**.
- **Ensured transparency**, allowing for a **data-driven approach to securing resources**.

The database helped **track waste disposal**, monitor **septic waste and construction debris**, and **identify service gaps**, such as sudden declines in septic waste collection, which signalled potential inefficiencies.

The experience reinforced **several key takeaways**:

- **Centralised data systems improve coordination** and help eliminate conflicting reports.
- **Data-driven funding requests** lead to better resource allocation.
- **A robust waste tracking system benefits both disaster response and routine waste management** and **informed long-term planning for waste management infrastructure improvements and capacity building for future disasters.**

Effective **data collection and reporting** played a crucial role in **securing international funding**. Clear and consistent data:

- Allowed Tonga to **communicate its needs effectively**.
- Helped **securing funding for both short-term disaster response and long-term infrastructure improvements**.

The **waste tracking system originally designed for disaster response** has since been **integrated into Tonga's daily waste management** operations, demonstrating its flexibility and **potential for use in other countries**. This system enables:

- **Efficient monitoring of waste volumes**.
- **Identification of trends** in household and disaster-related waste.
- **Long-term improvements in waste management policies and infrastructure**.

The presentation concluded with a video depicting **the aftermath of the volcanic eruption**, reinforcing how **effective waste management played a crucial role in Tonga's recovery process**.

Stalini Naufahu emphasised that **better coordination, clear waste tracking systems, and data-driven decision-making** are essential for disaster waste management. Tonga's **experience showcases how disaster waste management not only supports immediate recovery** but also **informs long-term planning and funding for sustainable projects**.

The **centralised tracking system has proven to be a valuable tool**, extending its usefulness beyond disaster response and into **everyday waste management practices**. Tonga's **innovative approach serves as a model** for other nations seeking to improve their disaster resilience and waste management strategies.

➢ **<u>Q&A / Comments</u>**

✓ *Managing Unsolicited Aid and Relief Waste in Tonga*

During the Q&A session, Ms Claytoncy Taurarii from the Cook Islands' Ministry of Infrastructure raised a question regarding whether Tonga's **waste data accounted** for the large volume of **unnecessary waste generated from unsolicited aid and relief goods**. She inquired whether these waste items were separated from other waste data.

In response, Mr Naufahu from Tonga explained that while **data was collected on imported relief goods**, these items were **not initially segregated** at the landfill level. Instead, **relief**

waste was mixed with general waste as it arrived, though customs data for these goods was available.

Ms Taurarii followed up by asking whether the **waste from relief goods was managed by the government or Tonga's Waste Authority Ltd**.

Mr Naufahu clarified that the **Tonga Waste Authority Ltd**, which **operates as a public enterprise with a private business model**, was **responsible for handling relief waste**. While the **government oversees the authority**, WMA directly **managed and processed the waste** from relief efforts.

- ✓ *Praise for Tonga's Waste Data Tracking System*

Mr Faafetai Sagapolutele praised Tonga's **real-time waste data tracking system**. He highlighted its ability to **record waste truck movements, entry times, types of waste, and volume of waste collected**. He emphasised that this system was **not only beneficial for disaster response** but also for **daily waste management** across Tonga, particularly in remote islands.

Similarly, Ms Miranda Waitreu from TRECODEC, a **New Caledonia**-based eco-organisation, noted that their **waste tracking system operates in a similar manner**. She highlighted the **importance of such data-driven systems** in improving **waste collection, reporting, and project efficiency** across the Pacific Islands.

- ✓ *Building Codes and Disaster Preparedness*

Mr Didier Labrousse, Futuna Office Director of the Department of Environment inquired whether Tonga had considered **updating building codes or construction standards** after the **2022 volcanic eruption** in relation to **disaster prevention measures**, particularly in light of **lessons from the 1993 earthquake in Wallis and Futuna**.

Mr Naufahu confirmed that while **Tonga had not made major changes to building codes** following the eruption, the disaster **exposed gaps in** the country's **preparedness for volcanic events**. However, some **adjustments were made in their disaster preparedness approach**, particularly for rare events like volcanic eruptions.

- ✓ *Documentary on Tonga's Volcanic Disaster*

Ms Julie Pillet, coordinative of the SWAP project at SPREP shared information about a **25-minute documentary**[31] that captures **Tonga's volcanic disaster and its aftermath**. The documentary, featuring Stalini, provides **an emotional account of the community response**. Ms Pillet recommended watching it on SPREP's YouTube channel for deeper insights into Tonga's disaster recovery.

✓ *Community-Driven Disaster Waste Management*

Ms Sainimili Bulai emphasised that **one of the standout aspects of Tonga's recovery** was the **community-led waste management efforts**. Despite the **influx of unsolicited aid**, Tonga's **residents were trained in disaster waste management**, enabling them to **handle waste effectively**.

One notable example was how Tonga's communities **returned unwanted plastic bottles** from aid shipments. This **demonstrated their preparedness and self-reliance** in managing disaster waste and preventing unnecessary landfill accumulation.

✓ *Lessons for Other Pacific Nations*

Mr Lindsay Teobasi from the Solomon Islands expressed interest in **learning from Tonga's experience** to **improve disaster preparedness** in their own country, particularly due to **the presence of an active volcano near Honiara**. His remarks reflected the **shared regional challenges** and the **importance of knowledge-sharing in disaster resilience**.

✓ *Integrating Waste Management into Donor Aid*

Mr Faafetai Sagapolutele emphasised the need for **donors to incorporate disaster waste management** into **relief supply packages**. He noted that **unsolicited donations often increase waste challenges**, and that donor support should include **waste management solutions** to ensure **sustainable recovery efforts**.

✓ *Training Communities for Safe Waste Management*

Ms Sainimili Bulai provided an example from **Vanuatu**, where **communities** were empowered to **clean up after disasters** but lacked **the knowledge to manage waste streams properly**.

[31] https://youtu.be/JYbIPNlFSJU?si=kr_5MIbugi9-Vpqf

She stressed the importance of:

- **Incorporating training into disaster response efforts** to ensure waste is handled safely.
- **Protecting local food and water sources** by preventing pollution from disaster waste.
- **Developing government policies and standards** to regulate **disaster relief goods**, ensuring items such as **expired canned food** do not **end up in landfills**.

✓ *Enhancing Construction Standards*

Mr Sakenasa Namisi, Environment Officer from the Department of Environment, Fiji, shared his experience working on **solar installations in rural Fiji**, highlighting that many **installations were damaged** in natural disasters due to **lower building standards in rural areas** made **infrastructure more vulnerable to disasters**.

Mr Faafetai Sagapolutele noted that **European-style homes tend to be more structurally resilient** compared to **traditional island housing**, which often struggles to withstand **severe cyclones**. This further emphasised the **need for improved building codes and construction practices** in disaster-prone regions.

4.7. Session #6: Organic activities

4.7.1. Session 6a: Introduction to how Composting supports the Circular Approach

<u>Speaker:</u> Ms Hilary Boyes - PacWastePlus Technical Waste Project Officer - SPREP, Samoa

Ms Hilary Boyes, PacWastePlus Technical Waste Project Officer at SPREP emphasised the importance of **managing organic materials as a valuable resource rather than waste**, highlighting their **role in the circular economy**. She underscored the **economic benefits** of proper organic waste management, including **generating funding** and **supporting sustainability initiatives**. Rather than being discarded, organic waste holds **untapped potential** and can be **repurposed to create value**.

She emphasised that **organic waste constitutes a significant portion** of both disaster **waste** and overall waste in the region, making it a **critical area** of focus. Indeed, she explained that **organic material**s, such as **food scraps and paper**, constitute **around 40% of landfill content**. By effectively managing these materials, we can reduce the burden on landfills and transform them into valuable products like compost. She highlighted composting as a **key strategy** for managing organic waste, offering multiple benefits:

- **Improves soil health** by returning nutrients to the land.
- **Enhances crop yields**, supporting local agriculture.
- **Builds climate resilience** by improving soil structure and water retention.
- **Creates local employment opportunities** in compost production and **stimulates local economies.**
- **Reduces dependence on imported fertilizers**, lowering costs and environmental impact.

Describing organic waste as "**low-hanging fruit**," Ms Boyes emphasised that its **management is accessible, cost-effective, and requires minimal technology**. She advocated for **scalable solutions**, ranging from **large-scale composting systems** to **community and household initiatives**.

Additionally, she discussed **alternative uses for organic waste**, including:

- **Repurposing market waste for pig farming**, reducing food waste while supporting livestock production.
- **Using wood chips for garden mulch**, promoting soil health and reducing waste disposal needs.

Ms Boyes outlined the **natural composting process**, where **bacteria break down organic material within 12 weeks**, allowing for efficient and scalable composting systems. She highlighted successful **community-scale composting initiatives** in **Niue and Fiji**, where households receive **compost bins** and **education on composting and waste reduction**.

Ms Boyes encouraged **decision-makers, compost operators, and policymakers** to recognise **organic waste management as a practical, scalable solution** for **reducing landfill waste and fostering sustainable practices**. By prioritising **composting** and **alternative organic waste uses,** communities can:

- **Reduce environmental impact**.
- **Strengthen local economies**.
- **Support food security and climate resilience**.

4.7.2. Session 6b: Presentation of existing or ongoing composting projects in the region - progress / lessons learned / results

Speaker: **Ms Hilary Boyes - PacWastePlus Technical Waste Project Officer - SPREP, Samoa**

The discussion focused on the **successes and challenges of composting initiatives** across the Pacific, particularly in **Fiji** and the **Cook Islands**, exploring **community engagement**, and **potential benefits**.

✓ *Successful Composting Initiatives in Fiji*

In Fiji, a **partnership** between the **Department of Environment** and **municipal councils** has led to a subsidised **compost bin programme**, reducing costs for households from $130 to $38 per year. **Community awareness** and **training** have played a **crucial role** in driving participation, with trial plots **demonstrating the benefits** of composting on plant growth. A **$30 deposit system** was introduced to **ensure commitmen**t; if bins are not used, residents must return them, with the government covering the cost. However, challenges remain, particularly in areas lacking dumpsites, where waste must be transported to Lautoka.

Mr Paul Irving from SPREP suggested **composting** could be **linked to social welfare programmes**, such as **growing food for local food banks**, while also highlighting the **environmental benefits** in **reducing methane emissions** from landfills. **Schools** have also embraced composting, **incorporating it into the curriculum** and hosting competitions to encourage student participation. He also highlighted **composting's potential to remediate contaminated lands**, particularly in cases like **oil spills**, but warned of the **risks of hazardous materials** such as **heavy metals**.

Ms Boyes appreciated the **success of Fiji's subsidised composting initiative**, recognising that **making bins affordable helped ensure household participation**. The model, where **households contribute a small amount**, has been **effective in sustaining the programme**.

✓ *Community-Led Composting in the Pacific*

Across the Pacific, **various composting initiatives,** including low-cost methods for household composting, including using bricks, chicken wire, or old drums to build compost bins, have been implemented **with differing levels of success**:

- In the **Solomon Islands**, the **"Custom Garden" initiative**, supported by the New Zealand Government, **repurposes organic waste to support local gardening efforts**.

- **New Caledonia** has faced challenges such as **rat infestations** and a **lack of long-term commitment from participants**, emphasising the need for a **dedicated manager to oversee composting efforts**.
- Mr Joshua Sam raised concerns about **phosphorus depletion in soil**, stressing that **composting could improve soil fertility** and **enhance food security**, though **traditional methods.** For instance, in **Samoa**, **informal composting methods** such as using **banana leaves** remain more common due to **challenges** in applying **formal training**.
- The conversation further covered challenges in the **Republic of the Marshall Islands** (RMI) due to **limited land** and **contamination with plastics**. Despite this, **composting** remains to **improve soil quality** for **small gardening projects**.
- **Vanuatu** has been working to improve its **government-supported composting programme**, launched in 2022, which **promotes backyard** and **vertical gardening** in **communities with limited space**, aiming to become self-sustaining. **Heavy rainfall** has posed **challenges** for **compost maturation**, but planned **infrastructure improvements** aim to make **composting more sustainable** year-round.
- Similarly, **New Caledonia** has seen success in **small-scale composting** at **poultry farms** and in **green waste management**, though the **high cost of shredding** remains an obstacle. Despite nitrogen deficiencies in green waste composting, **proper management** has proven it to be a **viable solution**.

✓ *Composting Wastewater Sludge: Opportunities and Risks*

The conversation also touched on the potential of **composting wastewater sludge**, with concerns raised about **contamination risks**.

Mr Sakenasa Namisi from the Department of Environment, Fiji, questioned the **suitability of sludge** from water treatment plants for composting due to **possible chemical contamination**.

Ms Chloé Saglibene from the VALORGA Cluster in New Caledonia clarified that only human waste sludge, after being tested for contamination, is used in composting. However, wastewater sludge from industrial processes presents a greater risk requiring high temperatures to kill pathogens before it can be safely repurposed.

✓ *Conclusion*

Ms Hilary Boyes closed the session by emphasising the importance of addressing **practical**, **accessible composting solutions** across the Pacific. The discussions highlighted the significance of **sustainable composting systems**, **community participation**, and **regional collaboration** in overcoming challenges and improving waste management practices.

4.8. Session #7: Sustainable Financing for Waste Management

4.8.1. Session 7a: Introduction to how sustainable finance schemes support the circular approach

Speaker: Ms Hilary Boyes - PacWastePlus Technical Waste Project Officer - SPREP, Samoa

In this session, Ms Hilary Boyes, the PacWastePlus Technical Waste Project Officer at SPREP, highlighted the **critical role of sustainable financing** in achieving a **circular economy**. While discussions about **circular economy practices** are essential, she stressed that these efforts **cannot be maintained without adequate financial support**. Additionally, Ms Susana Telakau, Solid Waste Adviser at EPRPS, emphasised the **need for long-term funding models beyond donor assistance**, linking waste management efforts to the circular economy.

Ms Boyes provided various examples of circular economy practices, beginning with the concept of a **True Circular Economy (Local)**, citing the example of **organic waste**, where food is grown, consumed, and composted, thus **returning nutrients back to the soil**. She also discussed **bottle-return systems**, such as **reusable beer bottles**, which minimise waste. In contrast, she described a **Circular Economy with Overseas Involvement**, using Coca-Cola's "bottle-to-bottle" model, where **PET bottles are collected, recycled, and processed into new bottles**, **though the process requires international transport** for processing.

Other examples included **Repurposing (Local)**, where **crushed glass bottles** are used in **municipal projects** for pothole repairs, reducing landfill waste but **not involving a fully circular system** as the **material cannot be reused for its original purpose**. Similarly, **Repurposing (Overseas)** was demonstrated by brands like Kathmandu, which **turn plastic bottles into products like T-shirts**, helpful in waste reduction but not restoring materials to their original purpose. Hilary encouraged Pacific countries to explore **local opportunities** for **building a truly circular economy**, which would **reduce dependency on external resources**.

Mr Paul Mooney from Vanuatu introduced an innovative sustainability project involving **Tetra Pak's "Save Board"**[32], a material made from used milk cartons. This **eco-friendly initiative**, which is **being explored across the Pacific Islands**, including a partnership in Timor Leste for

[32] https://www.saveboard.nz/drop-off-cartons

local production, aims to **repurpose liquid paper packaging into furniture and ceiling tiles**, providing an **alternative to plastic-based materials**.

Building on this, Ms Boyes discussed **different waste management financing models**:

- **Vanuatu's yellow bag system facilitates waste collection**, while helpful for waste reduction and reuse, does not fully support the circular economy and yet it **struggles with affordability**.
- **Kiribati** operates a **Green Bag Collection System**, where bag sales **fund waste collection** through a **public-private partnership**.
- **Despite these systems**, **illegal dumping remains a challenge**, which often **occurs when people do not pay for waste collection services**, as raised by Mr Joshua Sam from SPREP.
- **In Wallis**, Didier from the Department of Environment, shared that a **tax on imported goods funds recycling efforts**, but waste **segregation behaviour remains an issue**.

Ms Boyes stressed the importance for Pacific countries of transitioning from **linear economies** (where products are used and discarded) to **circular systems** that **promote reuse and reduce waste generation**. She stressed to involve **traditional knowledge in sustainable manufacturing** as key steps in this process She also advocated for **sustainable financing mechanisms** such as **deposit return schemes**, **advanced recovery fees**, and **extended producer responsibility programmes** to **support waste management**.

Mr Siosiua Hakaumotu, Assistant Environmental Officer, from the Department of Environment in Tonga shared their **waste levy system**, where **fees included in electricity bills fund landfill operations**, with **plans to introduce a plastic levy** to **address increasing plastic waste**.

Additionally, a video[33] produced under the PacWastePlus Project explained how an **Advanced Recovery Scheme (ARS)** can shift waste management towards a circular economy. Unlike the current linear system, where products end up in landfills, the **ARS incentivises recycling** by adding a refundable deposit on items like bottles. Consumers get their deposit back when returning items, ensuring a financial incentive for recycling. To make the system sustainable, a **handling fee** covers the costs of collection, recycling, and export. A **centralised fund**

[33] https://youtu.be/FK2baqT-Mmk?si=R2yJ-g1NN0HfPWsi

manages unredeemed deposits, supporting recyclers and maintaining the system's financial stability.

Hilary underscored the **effectiveness of ARS programmes in promoting recycling**, citing their success worldwide. Unlike prepaid bag systems, which support Waste-to-Energy initiatives but do not fully embrace the "polluter pays" principle, **ARS programmes assign value to each item, making recycling financially viable**. She concluded by encouraging Pacific nations to develop ARS models suited to their specific needs, ensuring a more sustainable waste management future.

4.8.2. Vanuatu Case Study: Product Stewardship Scheme (PSS)

Speaker: **Ms Roselyn Bue - Senior Officer (Chemical and Ozone) - DEPC, Vanuatu**

Ms Roselyn Bue, Senior Officer from DEPC, Vanuatu, presented **Vanuatu's approach to sustainable financing for waste management**, focusing on the **Product Stewardship Scheme (PSS)**. The initiative aims to **reduce landfill waste**, **improve recycling accessibility** across all six provinces, and ensure that **importers and producers take responsibility** for waste collection, transport, and recycling. A key objective is to **create job opportunities** while establishing a fair and efficient system.

One major concern was ensuring **nationwide private sector participation**. The government feared that businesses would focus only on the main island, neglecting outer provinces. To address this, they proposed a **National Community Fund**, which will oversee operations with a governance board comprising **49% government representatives and 51% private sector, civil society, and neutral organisations**. This model ensures both **private sector accountability and government oversight** while maintaining independence from direct government control.

The **PSS Act and Regulations** are being **designed to establish this body** and **manage the recycling scheme** efficiently, setting clear recovery targets and **defining the roles of the government and private sector**. **Ministerial support** has been crucial in **advancing the initiative**, and a **fund manager** will be appointed **to handle logistics** and **manage the scheme's finances**. The scheme is expected to be implemented by early next year, reflecting significant progress after years of planning.

Hilary Boyes commented that recent **key decisions** resulted from **extensive deliberation**, particularly **around private sector involvement**. A **compromise** was reached to satisfy all stakeholders, **balancing government oversight with private sector efficiency**. The **next**

challenge is determining the **best management structure**, whether through a **managing agency** or **another structure.**

Finally, Ms Bue highlighted the importance of ensuring that **local people receive the full 10 VATU refund** when returning bottles, preventing middlemen from taking a cut. She noted that **even small amounts** like 10 VATU could **significantly benefit individuals**, particularly **students and mothers**, and should **directly support the community rather than businesses**.

4.8.3. Session 7c: Experience sharing from New Caledonia

Speaker: Ms Miranda Waitreu - Cheffe de Projet - Filière Emballages - TRECODEC, New Caledonia

Ms Miranda Waitreu, representing TRECODEC[34], an eco-organisation, outlined **New Caledonia's Extended Producer Responsibility (EPR) system**, implemented in 2008 under the "**polluter pays" principle**. This system holds **manufacturers, distributors, and importers responsible** for the **entire lifecycle of their** products, from production to disposal. TRECODEC focuses specifically on the end-of-life phase of products when they become waste.

New Caledonia is divided into three provinces, each responsible for regulating and implementing the EPR system. However, producers have two options:

1. **Manage waste independently** by submitting a waste management plan.
2. **Collaborate with other producers** to optimise costs and resources in a circular economy model, through TRECODEC. This collaborative approach follows a circular economy model, starting with data collection, developing scenarios, and improving based on feedback and experience.

The **system is financed** through an **eco-tax**, which is paid by **consumers** (individuals, businesses, and public organisations) when purchasing products. The tax, collected by TRECODEC, covers **collection, transportation, storage, recycling, and public collection points**. The cost is calculated based on market quantities and operational expenses (including staff salaries, awareness campaigns, drop-off points, and recycling activities), averaging **USD$2.28 per person annually**.

Currently, **six waste streams** are managed by TRECODEC:

- **Car batteries**

[34] https://trecodec.nc/

- **End-of-life vehicles**
- **Used oil**
- **E-waste**
- **Tires**
- **Household batteries**

By **2025, packaging waste** will also be included. Since **2009, over 142,000 tons** of waste have been collected and reprocessed, with **693 producers** and **1,500 collection points** across New Caledonia supporting the system. More than **70% of TRECODEC's budget** is allocated to waste collection and recycling.

Due to New Caledonia’s geographic isolation, most waste is **shipped overseas for recycling**. However, local solutions are being explored, such as:

- **Crushing used tires** for construction materials.
- **Composting plants** for organic waste.

Although these activities are currently paused, TRECODEC plans to resume discussions with the construction sector once political conditions improve.

TRECODEC emphasises **public awareness** through partnerships with **local associations and schools** to promote waste segregation and recycling activities. Initiatives include:

- **Art competitions** showcasing the environmental impact of human activities.
- **Participation in France’s Waste Reduction Week**, displaying winning projects to raise awareness.

4.8.4. Session 7d: Sustainable Waste Management Financing Schemes in the Pacific to support the circular approach

Speaker: **Ms Hilary Boyes - PacWastePlus Technical Waste Project Officer - SPREP, Samoa**

Ms Hilary Boyes presented an update on **sustainable waste management financing projects** in the Pacific, focusing on **Product Stewardship Schemes (PSS)** such as **Deposit Refund Systems (DRS)** and **Extended Producer Responsibility (EPR)**. These schemes are **complex, require long-term planning**, and must effectively engage **communities, businesses, and regulators** to ensure widespread and sustainable impact.

Ms Boyes highlighted **three key stakeholders** essential for a successful waste management scheme:

1. **Consumers** – Play a crucial role by purchasing products and participating in recycling programmes.
2. **Regulators & Administrators** – Typically local authorities, responsible for financial and legal oversight.
3. **Manufacturers, Importers & Recycling Sectors** – Fund the schemes through **import fees** and manage **waste collection & recycling**.

She stressed that balancing these three sectors is **critical** to avoid pitfalls, such as **over-reliance on government** or **lack of consumer engagement**.

An **economic model** was introduced to evaluate waste collection and recycling strategies, through data collection using customs and waste audits. The model considered key factors such as:

- **Collection equipment and infrastructures** (bailers, glass crushers, trucks).
- **Deposit amounts** and incentives.
- **Recyclability of materials** and penalties for non-recycling.
- **Customs & waste audit data** to improve planning and monitoring.

Ms Boyes emphasised that **significant initial investment** in infrastructure is required for effective waste management, particularly in **handling, shipment (internal and external), and administration**.

She presented **six implementation scenarios**, ranging from **basic collection points** to **nationwide depots**. The **most equitable approach** would ensure depots in capital areas with **broad community access**. The model was designed to be **flexible and adaptable**, evolving as more data and resources become available, allowing for continuous improvement.

Ms Boyes concluded by emphasising that **thorough planning, collaboration, and data-driven decision-making** are essential for creating **effective and sustainable waste management schemes** across the Pacific.

➢ **Q&A / Comments**

✓ *Palau's Deposit Fee System & Expanding Waste Management Initiatives*

In **Palau**, the **Deposit Fee System** operates through two separate accounts: one **funding return operators** and the other **supporting recycling**. Despite an **informal market** where containers are resold for less than the official deposit, the system remains **highly effective**, achieving a **redemption rate of over 80%**. Plans are underway to **expand the programme** to include **food and oil containers**, with the goal of **automating recyclable sorting** through economic incentives.

- ✓ *Deposit refund in remote communities*

Ms Hilary Boyes raised concerns about ensuring **fair access** to deposit refunds, particularly for **remote communities**. She compared **formal refund schemes** with **informal models**, such as Palau's micro-business approach, where **entrepreneurs collect and sell containers for a small fee**. She stressed the **need for equitable system design.**

In **Kiribati**, the government plans to **increase the deposit refund from 5 to 10 cents** for administrative sustainability through small handling fees and set up **local collection points on outer islands** to **reduce transport costs** and **ensure community benefits**.

- ✓ *Single-use plastic bans*

In **Samoa**, Paul Irving raised concerns about **bottled water consumption**, even in areas with **clean tap water**, urging policymakers to consider **broader environmental and health costs** when developing waste management strategies.

In **Tuvalu**, the government has **banned large plastic bottles (over 1.5L)** to tackle waste issues. The focus is now on **reducing smaller bottle waste** and **promoting alternatives like cans**, which have **better recycling potential**.

The **Solomon Islands** is taking a **dual approach**, banning some **plastic bottles** while implementing a **deposit-return scheme for bottles over 1 litre**. The focus is now on **finding alternatives** and **enhancing recycling efforts**. This strategy aims to **balance environmental impact with economic incentives for recycling** while supporting waste management programmes.

- ✓ *Public-private partnership*

Discussions raised the challenges of implementing waste management projects, stressing the need to **secure funding** and **ensure long-term sustainability**. They also pointed out the **vital role of the private sector** in the success of such projects.

Ms Julie Pillet from SPREP discussed how governments can initiate **public-private partnerships**, citing the Scrap Metal Recovery Project in Wallis as an example, where the

Department of Environment, through the SWAP Project is constructing a facility, while a private counterpart will operate the facility.

Additionally, Mr Lindsay Teobasi from the Solomon Islands noted that the country is exploring **Waste-to-Energy solutions** and emphasised the **private sector's role in driving innovation and partnerships** for sustainable waste management.

- ✓ *Conclusion*

The discussion highlighted a **range of approaches** across the **Pacific**, from **informal collection networks** to **regulatory measures like bottle bans**. The main focus is on **balancing economic, environmental, and community needs** to develop **effective and sustainable waste management systems**.

V. CONCLUSION OF THE WORKSHOP ON CIRCULAR APPROACH FOR WASTE MANAGEMENT IN THE PACIFIC

The **Workshop on Circular Approach for Waste Management** held in Vanuatu in October 2024 marked a **significant milestone** in advancing **sustainable waste management** across the **Pacific**. It provided a **platform for collaboration**, bringing together **governments, private sector representatives, and local authorities** to share insights and explore **innovative solutions** tailored to the region's **unique challenges**.

A **key takeaway** was the **importance of transitioning from linear waste management models to circular systems**, where products are **reused, recycled, and repurposed** to minimise waste and maximise value. Participants stressed the **need for well-designed waste management schemes**, such as **Deposit Refund Systems (DRS)** and **Extended Producer Responsibility (EPR)**, which require **long-term planning, investment, and data-driven decision-making**. Ensuring **equitable access to recycling programs**, especially for **remote communities**, was another central theme.

The workshop also emphasised the need for **sustainable financing mechanisms**, such as **Advanced Recovery Schemes (ARS)**, which **incentivise recycling** and create **self-sustaining waste management systems**, reducing reliance on **external funding**. **Pacific Country and Territory representatives** shared valuable experiences showcasing the region's commitment to **innovative and sustainable approaches**.

Finally, the workshop **deepened the understanding** of the **circular economy's potential** in the **Pacific**, fostering continued **collaboration and action**. As participants return to their respective countries, the **knowledge, partnerships, and momentum** built during this event will drive further efforts to **enhance waste management, promote sustainability, and reduce environmental impact**. The **collective energy and commitment** demonstrated at the workshop will be **pivotal** in advancing the **circular economy agenda in the Pacific**, ensuring that **waste is transformed from a burden into a valuable resource**.

VI. APPENDICES

- APPENDIX A: CONCEPT NOTE OF THE REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION
- APPENDIX B: AGENDA
- APPENDIX C: PARTICPANTS' LIST
- APPENDIX D: PRESENTATIONS

Appendix A: Concept note of the Regional Workshop: A Circular Approach to Waste Management in the Pacific: Creating Resources from Waste and Pollution

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION

Port Vila, Vanuatu, 30 September - 4 October 2024

CONCEPT NOTE

I. CONTEXT

Circular Economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the life cycle of products is extended.

In practice, it implies reducing waste to a minimum. When a product reaches the end of its life, its materials are kept within the economy wherever possible thanks to recycling. These can be productively used again and again, thereby creating further value.

This is a departure from the traditional, linear economic model of production, consumption, and disposal, which is based on a take-make-consume-throw away pattern. This model relies on large quantities of cheap, easily accessible materials and energy.

Unlike the traditional economic model, the circular economy model enables:

- Protect the environment by reducing the use of natural resources, greenhouse gas emissions, landscape and habitat disruption, energy consumption, and waste generation;
- Reduce raw material dependence, and mitigates the risks associated with supply of raw materials, such as price volatility, availability and import dependency; and
- Create local jobs and stimulate economic growth.

There are opportunities available for PICTs to incorporate a Circular Economy approach into waste management decision making and legislation e.g., importation bans, importation quality restrictions/controls, sustainable finance “deposit/return” schemes, organic/composting programmes, local repair, re-manufacture, or recycling collection and processing infrastructure, etc.

The Pacific Regional Environment Programme (SPREP) assists member countries and territories in implementing activities to promote a regional Circular Economy System, through various projects and programmes. To discuss opportunities for PICTs to set up a Regional Circular Economy Network and share experiences and lessons learned based on existing or pipeline activities from the Pacific Region, SPREP, through the ‘Committing to Sustainable Waste Actions in the Pacific’(SWAP - AFD) Project, PacWastePlus Programme (EU), PacPlan (Australia), ISLANDS (GEF) and J-PRISM III (JICA) Projects will deliver a five-day workshop to promote Circular Economy across the region.

This regional workshop will be held in Vanuatu from 30 September to 4 October 2024 and will be structured into 7 sessions:

- Session #1: Regulation and policy for hazardous waste including used oil;
- Session #2: Side visit to Bouffa landfill;
- Session #3: Waste to energy;
- Session #4: Emergency response to oil or chemical spillage;
- Session #5: Disaster Waste and Circular Economy;
- Session #6: Organic activities in the Pacific;
- Session #7: Sustainable financing for waste management.

II. Objectives

The expected objectives of this workshop are as follows:

- To become familiar with the concept of Circular Economy;
- To discuss what the Circular Approach means for the Pacific Regio;
- To learn more about the different aspects of Circular Economy Activities (Policy/regulation, Sustainable Financing, etc.);
- To be informed about existing and upcoming Circular Economy Activities within the region;
- To share experience of activities and projects implemented across the Pacific region; and
- To strengthen the networking across the Region regarding Circular Economy.

III. Audience

Waste Management actors and practitioners (governments, recycling associations, business, NGOs, etc.) from all Pacific countries and territories. The experiences and specificities of French territories will also be highlighted with representatives from New Caledonia, French Polynesia and Wallis & Futuna.

Appendix B: Agenda

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION – DAY 1

Monday 30 September 2024

Location: Iririki Island Resort

Time (Vanuatu Time)	Topic	Resource Person
8:30am – 9:00am	REGISTRATION	
9:00am – 9:10am	Opening Session - Welcome	**Ms. Rolenas Tavue Baereleo** Acting Director Department of Environmental Protection and Conservation Ministry of Climate Change Adaptation, Meteorology & Geo-Hazards, Energy, Environment and Disaster Management
9:10am – 9:20am	Opening Address (Virtual)	**Mr Sefanaia Nawadra** Director General SPREP, Samoa
9:20am – 9:30am	Special Address	**Mr Sebastien Jaunâtre** First Counsellor at the French Ambassy in Vanuatu
9:30am – 9:40am	Special Address	**Mr Naohisa OKUDA** Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Vanuatu
9:40am – 9:50am	Special Address	**Ms Bénédicte ALSAC** AFD's representative in Vanuatu Agence Française de Développement, Vanuatu
9:50am – 10:10am	**Opening session:** Overview of Circular Economy (Virtual) - Changing the narrative - from linear to circular for WM. Options to apply circular solutions for the Pacific. Illustrating the "tools" available for PICTS to close the loop	**Ms Tania Hyde** Circular Economy Lead Beca, New Zealand
10:10am – 10:20am	**Opening session:** Q/A (Virtual)	**Ms Tania Hyde** Circular Economy Lead Beca, New Zealand

PacPlan Resilience Project 2022-25

10:20am – 10:30am	GROUP PHOTO	
10:30am – 11:00am	MORNING TEA	
11:00am – 11:20am	**Session #1a:** Circular Approach to Hazardous Waste Management – Setting the scene - Sources of hazardous waste/used oil; - Why a proper management system of hazardous waste may be a priority for Pacific countries and territories; - How circularity can be incorporated into the management of hazardous waste including used oil.	**Mr Joshua Sam** Hazardous Waste Management Adviser SPREP, Samoa
11:20am – 11:40pm	**Session #1b:** Circular Approach to Hazardous Waste Management – Regulation and policy for hazardous waste including waste oil management - Hazardous Waste Management Plans	**Mr John O'Grady** Director Araspring Ltd, New Zealand
11:40am – 12:00pm	**Session #1c:** Circular Approach to Hazardous Waste Management - Best practices for Hazardous Waste / Used Oil Management	**Mr John O'Grady** Director Araspring Ltd, New Zealand
12:00pm – 12:30pm	**Session #1d:** Circular Approach to Hazardous Waste Management – Hazardous Waste / Used Oil Management - Leveraging the Basel and Waigani Conventions to Foster a Circular Economy in the Pacific	**Mr Joshua Sam** Hazardous Waste Management Advisor SPREP, Samoa
12:30am – 1:00pm	**Session #2:** How circularity in waste management can extend the lifespan of landfill	**J-PRISM III** (Speaker to be confirmed)
1:00pm – 2:00pm	LUNCH BREAK	
2:00pm – 5:30pm	**Session #2:** Side visit to Bouffa Landfill	Introduction: **Mr Faafetai Sagapolutele** JICA Expert, J-PRISM III New Zealand Visit: **Mr Jason Andrew** Waste Management Manager Port Vila City Council, Vanuatu

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION – DAY 2

Tuesday 1 October 2024

Location: Iririki Island Resort

Time (Vanuatu Time)	Topic	Resource Person
8:30am – 9:00am	REGISTRATION	
9:00am – 9:30am	**Session #1/3:** Hazardous Waste / Used Oil Management - Experience sharing from Wallis and Futuna	**Mr Didier Labrousse** Futuna Office Director Department of Environment, Wallis and Futuna
9:30am – 10:00am	**Session #3:** Waste to Energy - Waste to energy options	**Mr Inia Saula** Energy Officer The Pacific Community (SPC), Fiji
10:00am – 10:30am	**Session #3:** Waste to Energy - Presentation of the pyrolysis technology from an academic point of view	**Dr Ravita Prasad** Assistant Professor Fiji National University, Fiji
10:30am – 11:00am	MORNING TEA	
11:00am – 11:30am	**Session #3:** Waste to Energy (Virtual) - Presentation of the community-based Pilot Project in the Solomon Islands	**Mr Leigh Ramsey** Director Nufuels, New Zealand
11:30am – 12:00am	**Session #3:** Waste to Energy - Technology (Pyrolysis) demonstrations for Innovative Technologies in Waste-to-Energy	**Mr Lindsay Teobasi** General Manager Design Technology Centre, Solomon Islands
12:00pm – 1:00pm	LUNCH BREAK	
1:00pm – 1:10pm	**Session #3:** Waste to Energy - Presentation of the SWAP Used Oil Management Pilot project in Vanuatu	**Ms Roselyn Bue** Senior Officer (Chemical and Ozone) Department of Environmental Protection and Conservation (DEPC), Ministry of Climate Change & Adaptation – Vanuatu
1:10pm – 1:20pm	**Session #3:** Waste to Energy	**Mr Andrew Bohn** Chief Executive Officer

	- Presentation of the Used Oil Reprocessing Project, Vanuatu	Ocean Environmental Solutions, Vanuatu
1:20pm – 1:40pm	<u>**Session #3:** Waste to Energy</u> - Presentation of a business-scale pyrolysis technology	BESTON GROUP, China
1:40pm – 2:00pm	<u>**Session #3:** Waste to Energy</u> - Design of the Storage and Reprocessing Plant, Vanuatu	**Mr Paul Mooney** Principal consultant, Environmental Management Vanuatu **Mr John O'Grady** Director Araspring Ltd, New Zealand
2:00pm – 2:15pm	<u>**Session #3:** Waste to Energy</u> - Presentation of the biogas technology from an academic point of view	**Dr Ravita Prasad** Assistant Professor Fiji National University, Fiji
2:15pm – 2:30pm	<u>**Session #3:** Waste to Energy</u> - Experience sharing from New Caledonia on projects to convert organic waste into animal feed products	**Ms Chloé Saglibene** Coordinator Valorga, New Caledonia
2:30pm – 3:00pm	AFTERNOON TEA	
3:00pm – 4:00pm	Side visit at the market to see the Biogas Project	**Mr Jason Andrew** Waste Management Manager Port Vila City Council, Vanuatu

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION – DAY 3

Wednesday 2 October 2024

Location: Iririki Island Resort

Time (Vanuatu Time)	Topic	Resource Person
8:30am – 9:00am	REGISTRATION	
9:00am – 9:30am	**Session #4:** Emergency response to oil or chemical spillage - Experience sharing from Ocean Environmental Solutions: Logistics regarding the Solomon Islands oil spillage;	**Mr Andrew Bohn** Chief Executive Officer Ocean Environmental Solutions, Vanuatu
9:30am – 10:00am	**Session #4:** Emergency response to oil or chemical spillage - Spillage Management Plan: cleaning / temporary storage / final disposal	**Mr Paul Irving** Marine Pollution Project Officer SPREP, Samoa
10:00am – 10:30am	MORNING TEA	
10:30am – 11:00am	**Session #4:** Emergency response to oil or chemical spillage - Oil management / Oily waste management	**Mr Paul Irving** Marine Pollution Project Officer SPREP, Samoa
11:00am – 11:30am	**Session #4:** Emergency response to oil or chemical spillage - Insurance	**Mr Paul Irving** Marine Pollution Project Officer SPREP, Samoa
11:30am – 12:00pm	**Session #4:** Emergency response to oil or chemical spillage (Virtual) - Landfarming in Samoa	**Ms Yoko Onuma** Chief Advisor, J-PRISM III Japan
12:00pm – 1:00pm	LUNCH BREAK	
1:00pm – 2:00pm	**Session #5a:** Disaster Waste Management - Setting the Scene: Overview of Disaster Waste and Impact 1. Type of Disaster: ✓ Natural Disaster ✓ Man-made Disaster	**Ms Sainimili Bulai** PacWaste Plus Technical Waste Project Officer SPREP, Samoa

	2. Type of Waste ✓ Impact	
2:00pm – 3:00pm	**Session #5a**: Disaster Waste Management - Setting the Scene *(Presentation and Q&A Session):* - Objective for FRDP - Overview of Disaster Risk Reduction - Prolonged Environment Risk/ Impact	**Ms Rebecca Polestico** Monitoring and Evaluation Adviser SPREP, Samoa
3:00pm – 3:30pm	AFTERNOON TEA	
3:30pm – 4:30pm	**Session #5a:** Mainstreaming Waste Management into National Disaster Management Office Framework: Regional Disaster Waste Management Guideline (a) Preparatory Phase ✓ Adopting 3R plus Return ✓ Activities under each stage of the Preparatory Phase of the Disaster Management Cycle (b) Response Phase ✓ Adopting 3R plus Return Activities under each stage of the Response Phase of the Disaster Management Cycle	**Mr Faafetai Sagapolutele** JICA Expert, J-PRISM III New Zealand
4:30pm – 5:00pm	Questions & Wrap Up	**Ms Sainimili Bulai** PacWaste Plus Technical Waste Project Officer SPREP, Samoa

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION – DAY 4

Thursday 3 October 2024

Location: Iririki Island Resort

Time (Vanuatu Time)	Topic	Resource Person
8:30am – 9:00am	REGISTRATION	
9:00am – 9:30am	**Session #5b:** Recap of Disaster Waste Session from Day 3: Brief Summary of Disaster Waste Session from Day 3 and Setting the Scene for Day 4 Session	**Ms Sainimili Bulai** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
9:30am – 10:00am	**Session #5b:** Mainstreaming Waste Management into National Disaster Management Office Framework: Practitioner's Guideline on Drafting National Disaster Waste Management Plan ✓ Introduction of the Practitioner's Guideline ✓ Animation Video on importance of National Disaster Waste Management Plan	**Ms Sainimili Bulai** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
10:00am – 10:30am	MORNING TEA	
10:30am – 11:10 am	**Session #5b:** Mainstreaming Waste Management into National Disaster Management Office Framework: Panel Session: Case Study on drafting of National Disaster Waste Management Plan 1. Fiji and Niue to share experience on establishing National Disaster Waste Management Plan 2. Tonga to share challenges on implementing National Disaster Waste Management Plan based on experience of the Hunga Tonga Hunga Ha'apai Volcano– this will set the scene for the next Practitioner's Guideline 3. Vanuatu to share challenges in responding to TC Harold *Inclusive of Q&A*	**Mr Sakenasa Namisi** Environment Officer, Department of Environment-Fiji.

11:10am - 11:20am	**<u>Session #5b:</u>** <u>Mainstreaming Waste Management into National Disaster Management Office Framework:</u> Practitioner's Guideline on Establishing Environment Sector Working Group ✓ Introduction of the Practitioner's Guideline ✓ Animation Video on importance of Establishing Environment Sector Working Group	**Ms Sainimili Bulai** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
11:20am– 11:40am	**<u>Session #5b:</u>** <u>Mainstreaming Waste Management into National Disaster Management Office Framework:</u> Practitioner's Guideline on Establishing Environment Sector Working Group ✓ Case Study: Vanuatu's experience on the need to establish Environment Sector Working Group ✓ Vanuatu NDMO/DEPC to present on past attempt in establishing ESWG and challenges. Presentation will include attempt to improve this through the PWP Regional Disaster Waste Management Project Phase II (Trialing of Practitioner's Guideline)	**Ms Roselyn Bue** Senior Officer (Chemical and Ozone) Department of Environment Protection and Conservation, Vanuatu
11:40am – 11:50pm	**<u>Session #5b:</u>** <u>Mainstreaming Waste Management into National Disaster Management Office Framework:</u> Practitioner's Guideline on Establishing Environment Sector Working Group ✓ Question and Answers	
11:50pm – 12:00pm	**<u>Session #5b:</u>** <u>Mainstreaming Waste Management into National Disaster Management Office Framework:</u> Practitioner's Guideline on Estimating and Recording Disaster Waste ✓ Introduction of the Practitioner's Guideline ✓ Animation Video on Disaster Waste Estimation	**Ms Sainimili Bulai** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
12:00pm – 12:35pm	**<u>Session #5b:</u>** <u>Mainstreaming Waste Management into National Disaster Management Office Framework:</u> Practitioner's Guideline on Estimating and Recording Disaster Waste ✓ Case Study: Vanuatu and Tonga ✓ Benefit of collecting Waste Data – inform budget allocation in the building	**Mr Stalini Naufahu** Head of Department Special Project, Waste Management Authority, Tonga

	back phase of a disaster for the waste sector. ✓ Challenges in collecting data for past challenges. ✓ Lessons learnt to benefit participants.	
12:35pm – 1:00pm	<u>**Wrap up of Session 5(a) and Session 5(b)**</u> ✓ Recap of Session 5(a) and Session 5(b) ✓ Open Discussion on potential of including oily waste in the Disaster Waste Management Framework.	**Ms Sainimili Bulai** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
1:00pm – 2:00pm	LUNCH BREAK	
2:00pm – 2:05pm	<u>**Session 6: Organic activities:**</u> Welcome	**Ms Susana Telakau** Solid Waste Management Adviser SPREP, Samoa
2:05pm – 2:15pm	<u>**Session 6: Organic activities:**</u> Introduction to how composting supports the circular approach	**Ms Hilary Boyes** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
2:15pm – 2:25pm	<u>**Session 6: Organic activities:**</u> Presentation of existing or ongoing composting projects in the region - progress / lessons learned / results	**Ms Hilary Boyes** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
2:25pm – 2:40pm	<u>**Session 6: Organic activities:**</u> Practical activity – using the Decision Support Tool to understand options for organics management Q & A on DST Facility design options and resources available	**Ms Hilary Boyes** PacWaste Plus Technical Waste Project Officer SPREP, Samoa + Individual / small group activity
2:40pm – 3:25pm	<u>**Session 6: Organic activities:**</u> Technical session – composting 101 / technology options	Composting expert (Tonkin & Taylor International)
3:25pm 3:40pm	<u>**Lessons learnt from New Caledonia**</u> Composting systems in New Caledonia	**Ms Chloé Saglibene** Coordinator Valorga, New Caledonia
3:40pm – 3:50pm	<u>**Session 6: Organic activities:**</u> Q & A	
3:50pm – 4:00pm	<u>**Session 6: Organic activities:**</u> Close – recap on how sustainable finance schemes support the circular approach Resources available Call to action	**Ms Hilary Boyes** PacWaste Plus Technical Waste Project Officer SPREP, Samoa + **Ms Susana Telakau** Solid Waste Management Adviser SPREP, Samoa

4:00pm – 4:30pm	AFTERNOON TEA	
4:30pm – 5:30pm	**<u>Session 6: Organic activities:</u>** Site Visit to the Vanuatu organic site - Bio Organics Vanuatu	**Mr Michel Raikatalau** Manager of the Vanuatu organic site, Vanuatu
7:00pm – 9:00pm	**<u>Function</u>**	Mele Beach Bar

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION – DAY 5

Friday 4 October 2024

Location: Iririki Island Resort

Time (Vanuatu Time)	Topic	Resource Person
8:30am – 9:00am	REGISTRATION	
9:00am – 9:05am	**Session 7: Sustainable Financing for waste management:** Welcome	**Ms Susana Telakau** Solid Waste Management Adviser SPREP, Samoa
9:05am – 9:15am	**Session 7: Sustainable Financing for waste management:** Introduction to how sustainable finance schemes support the circular approach	**Ms Hilary Boyes** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
9:15am – 9:30am	**Session 7: Sustainable Financing for waste management:** Presentation of various existing or ongoing sustainable financing projects in the Pacific: progress / lessons learned / results	**Ms Hilary Boyes** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
9:30am – 10:00am	**Session 7: Sustainable Financing for waste management:** Experience sharing from New Caledonia regarding used oil management	**Ms Miranda Waitreu** Chef de Projet Filière Emballages TRECODEC, New Caledonia
10:00am – 10:15am	**Session 7: Sustainable Financing for waste management:** Experience sharing from Niue regarding financial modelling	**Ms Trinya Vilila** Environment Officer – Waste Management Department of Environment, Niue
10:15am – 10:30am	**Session 7: Sustainable Financing for waste management:** Experience sharing from Vanuatu regarding PSS design	**Ms Roselyn Bue** Senior Officer (Chemical and Ozone) Department of Environmental Protection and Conservation (DEPC), Ministry of Climate Change & Adaptation – Vanuatu
10:30am – 11:00am	MORNING TEA	

11:00am – 11:50am	**<u>Session 7: Sustainable Financing for waste management:</u>** Practical activity – using the 21 step pathway resources to undertake evidence-based decision making	**Ms Hilary Boyes** PacWaste Plus Technical Waste Project Officer SPREP, Samoa + Individual / small group activity
11:50am – 12:00pm	**<u>Session 7: Sustainable Financing for waste management:</u>** Q & A	
12:00pm – 12:10pm	**<u>Session 7: Sustainable Financing for waste management:</u>** Close – recap on how sustainable finance schemes support the circular approach Resources available Call to action	**Ms Hilary Boyes** PacWaste Plus Technical Waste Project Officer SPREP, Samoa
12:10pm – 12:20pm	Closing of the Workshop	**Ms Susana Telakau** Solid Waste Management Advisor SPREP, Samoa
12:20pm – 13:20pm	LUNCH BREAK	

Appendix C: Participants' List

Country	Name	Position	Organisation	email address
COUNTRY REPRESENTATIVES				
Cook Islands	Claytoncy Taurarii	Director Waste Management	Ministry of Infrastructure	claytoncy.taurarii@cookislands.gov.ck
Cook Islands	Cailean Henderson	Jnr. Environmental Compliance Officer	National Environment Service	cailean.henderson@cookislands.gov.ck
Fiji	Jashika Lal	Principal Environment Officer – Project Management Unit	Department of Environment, Ministry of Environment and Climate Change	jashika.lal@environment.gov.fj
Fiji	Sakenasa Namisi	Environment Officer	Department of Environment, Ministry of Environment and Climate Change	sakenasa.namisi@govnet.gov.fj
Kiribati	Teniti Taam	Solid Waste Management Officer	Ministry of Environment, Lands and Agricultural Development - Environnement and conservation Division	-
Kiribati	Gerdi Raimon	Solid Waste Compliance Officer	Ministry of Environment, Lands and Agricultural Development - Environnement and conservation Division	g.raimon@melad.gov.ki
New Calédonia	Miranda Waitreu	Chef de Projet Filière Emballages	TRECODEC	m.waitreu@trecodec.nc
New Calédonia	Chloé Saglibene	Animatrice	Cluster VALORGA	valorga@valorga.nc
Palau	Calvin Ikesiil	Chief	Bureau of Public Works- MPII - Division of Solid Waste Management	calikesiil@gmail.com
Palau	Ferris Baulechong	Waste generation Rate Surveyor	Koror State government	ferrisbaulechon@gmail.com
PNG	Violet Vavine Loi	Waste Management Officer - Waste & Legal Disposal	National Capital District Commission - Waste Management Division - Sustainability & Lifestyle Directorate	VioletL@ncdc.gov.pg
RMI	Jacqueline Lakmis	Operation Manager	Majuro Atoll Waste Company	jacqueline.lakmis@gmail.com
RMI	Jellesen J.Rubon	Chief of education and Awareness	RMI Environment Protection Authority	educationawareness@rmiepa.com
Solomon Islands	Michael Suinao	Senior Environment Officer	Ministry of Environment Climate Change Disaster Management and Meteorology - Environment and Conservation	MSuimae@mecdm.gov.sb
Solomon Islands	Lindsay Teobasi	Managing Director	Design and Technology Centre	Lindsay.teobasi@gmail
Tonga	Siosiua Hakaumotu	Assistant Environmental Officer	MEIDECC - Department of Environment	siuahakaumotu@gmail.com
Tonga	Stalini Naufahu	Manager Special Projects, Information Technology & Support	Waste Authority Limited - Head of Department for Special Projects, Information Technology & Support	stalininaufahu@gmail.com
Tonga	Saimone VUKI	President	Tonga Recyclers Association (TRA)	tongarecyclers@gmail.com
Vanuatu	Roselyn Bue	Senior Officer (Chemical and Ozone)	Department of Environmental Protection and Conservation (DEPC), Ministry of Climate Change & Adaptation	rbue@vanuatu.gov.vu
Vanuatu	Camila Noel	Environment Protection Officer	Department of Environmental Protection and Conservation (DEPC), Ministry of Climate Change & Adaptation	ncamilla@vanuatu.gov.vu
Wallis and Futuna	Didier Labrousse	Chef d'Antenne	Service Territorial de l'Environnement	Didier.labrousse@environnement.wf
Wallis and Futuna	Mélanie Duron	Chargée de mission Economie circulaire et Biodiversité - VSC (ADEME/OFB/STE)	Service Territorial de l'Environnement	melanie.duron@environnement.wf

Country	Name	Position	Organisation	email address
OFFICIALS				
Vanuatu	Rolenas Tavue Baereleo	Acting Director	Department of Environmental Protection and Conservation	-
Vanuatu	Mr Sébastien Jaunâtre	Premier conseiller	French Ambassy	-
Vanuatu	Mr Grégoire Bonhomme		COCAC	-
Vanuatu	Loic Teilemb	Attaché de communication	French Ambassy	-
Vanuatu	Mr Naohisa OKUDA	Ambassador Extraordinary and Plenipotentiary of Japan to the Republic of Vanuatu	Japanese Ambassy	-
Vanuatu	Mme Bénédicte Alsac	Représentante AFD au Vanuatu	Agence française de Développement	-
WMPC STAFF / JICA STAFF				
Samoa	Susana Telakau	Solid Waste Management Adviser	SPREP	susanat@sprep.org
Samoa	Julie Pillet	Technical Waste Project Coordinator, SWAP	SPREP	juliep@sprep.org
Samoa	Memoree Imo	SWAP Technical and Financial Assistant	SPREP	memoreei@sprep.org
Samoa	Hilary Boyes	PWP Technical Waste Project Officer	SPREP	hilaryb@sprep.org
Samoa	Sainimili Bulai	PWP Technical Waste Project Officer	SPREP	sainimilib@sprep.org
Samoa	Lilian Penaia	Technical Waste Officer, PAWES	SPREP	lilianp@sprep.org
Samoa	Paul Irving	Marine Pollution Project Officer	SPREP	pauli@sprep.org
Samoa	Joshua Sam	Hazardous Waste Management Adviser	SPREP	joshuas@sprep.org
Samoa	Leanne Moananu	Communications Support Officer	SPREP	leannem@sprep.org
Samoa	Rebecca Polestico	Monitoring and Evaluation Adviser	SPREP	rebeccap@sprep.org
Samoa	Ms Hisayo TAKENAKA	Coordinator/Public Relations	JICA (J-PRISM3 Project Office, SPREP)	hisayot.ext@sprep.org
Japan	Mr Shungo SOEDA	Team Leader (J-PRISM3 Country Activity Team)	JICA (J-PRISM3 Country Activity Team)	soeda-sh@n-koei.jp
New Zealand/Samoa	Mr Faafetai Sagapolutele	JICA Expert	JICA (J-PRISM3 Country Activity Team)	faafetais2018@gmail.com
Japan	Mr Shiro AMANO	JICA Technical Advisor	JICA	
Vanuatu	Mr Akihito MOTEGI	Project Formulation Advisor	JICA Vanuatu Office	Motegi.Akihito3@jica.go.jp
Vanuatu	Mr Mitsutaka UCHIJIMA		JICA Vanuatu Office	-
SPEAKERS				
New Zealand	John O'Grady	Director	Araspring Ltd	jogrady@actrix.co.nz
Vanuatu	Andrew Bohn	Chief Executive Officer	Ocean Environmental Solutions	andrew.bohn@ocean-logistics.vu
Vanuatu	Jason Andrew	Waste Management Manager	Port Vila City Council	jandrews@pvmc.gov.vu
Fiji	Mr Inia Saula	Energy Officer	The Pacific Community (SPC)	inias@spc.int
Fiji	Dr Ravita Prasad	Assistant Professor	Fiji National University, Fiji	ravita.prasad@fnu.ac.fj
Vanuatu	Michel Raikatalau	Owner of the Vanuatu organic site	Vanuatu organic site	
New Zealand	Chris Purchas	Resource Recovery, Waste Management and Circular Economy	Tonkin & Taylor International	cpurchas@tonkintaylor.co.nz
Vanuatu	Paul Mooney	Environmental Management Vanuatu (EMV)	Founder & Principal Consultant	emv.vanuatu@gmail.com
New Zealand (Virtual)	Tania Hyde	Beca	Technical Director & Circular Design Lead	Tania.Hyde@beca.com
New Zealand (Virtual)	Mr Leigh Ramsey	Director	Nufuels	leigh@bfsnz.net
China (Virtual)	Ally Wang	Project Consultant	BESTON GROUP	allywang@bestongroup.com

Country	Name	Position	Organisation	email address
Japan (Virtual)	Ms Yoko Onuma	Chief Advisor	J-PRISM III	Onuma.Yoko2@jica.go.jp
OTHER ATTENDEES				
Australia	Philippe Tanguy	Interpreter	OnCall	paul.spain@oncallinterpreters.com
New Zealand	Rohan Parekh	Investment Facilitation Manager	Pacific Trade Invest	rohan.parekh@pacifictradeinvest.com
Vanuatu	Masashi Ozawa	JICA Volunteer	Shefa Provincial Council	
Vanuatu	Owen Sisi	Head of Property Tax Unit	Shefa Provincial Council	
Vanuatu	Carlos Johnson			
Vanuatu	Peter Johnson			
Fiji	Nitesh Vellaidan	Business development manager	South Sea Towage Ltd	nitesh.vallaidan@sstl.com.fj
Fiji	Lusiana Kuinikoro	Business Adviser	Palladium Group, Market Development Facility, Pacific Regional Team	lusiana.kuinikoro@thepalladiumgroup.com

Appendix D: Power Point Presentations

OPENING SESSION: OVERVIEW OF CIRCULAR ECONOMY APPROACH

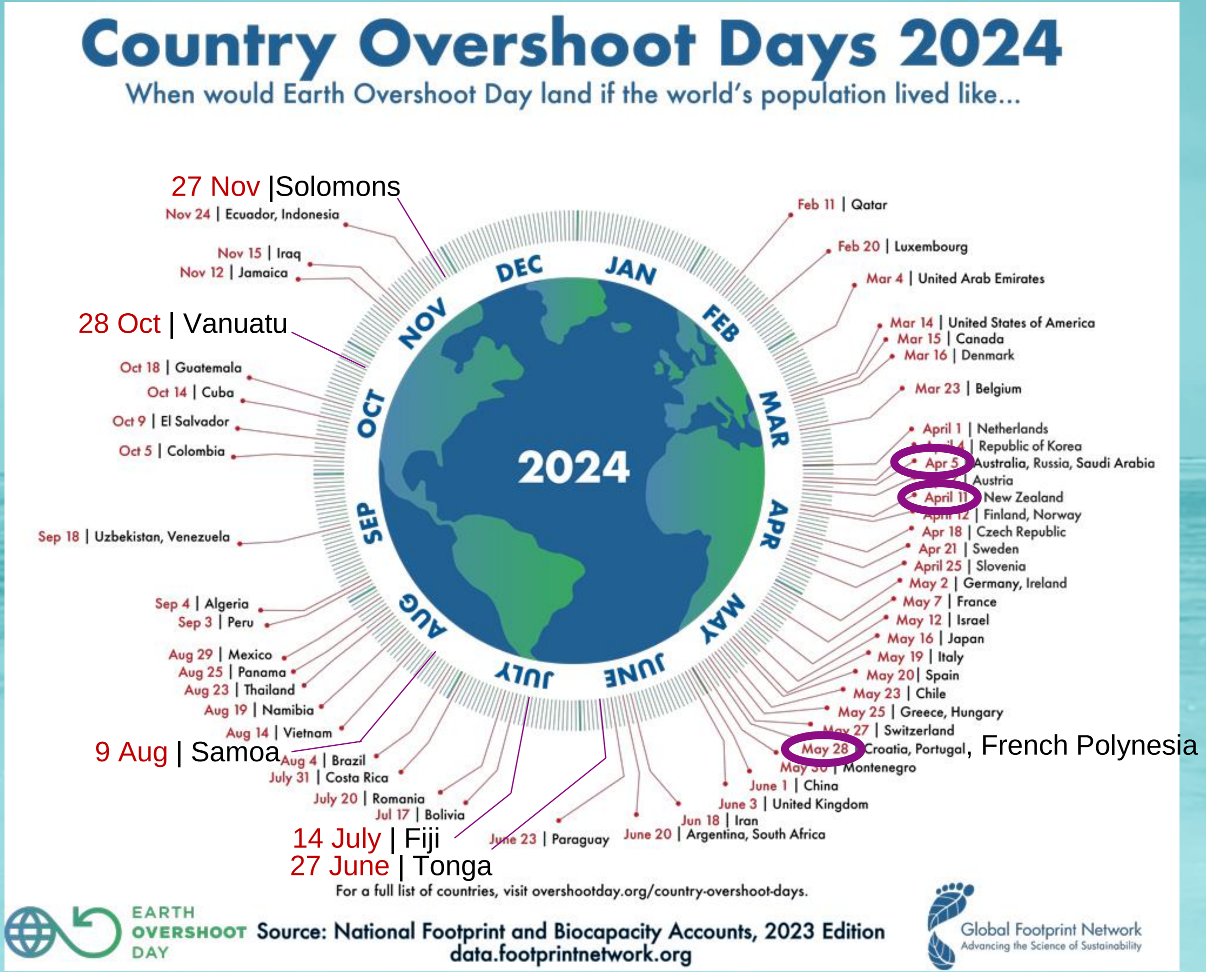
- Appendix D1: Changing the Narrative – from Linear to Circular Waste Management
- Appendix D2: Circular Approach for Waste Management: Changing the Narrative

CHANGING THE NARRATIVE

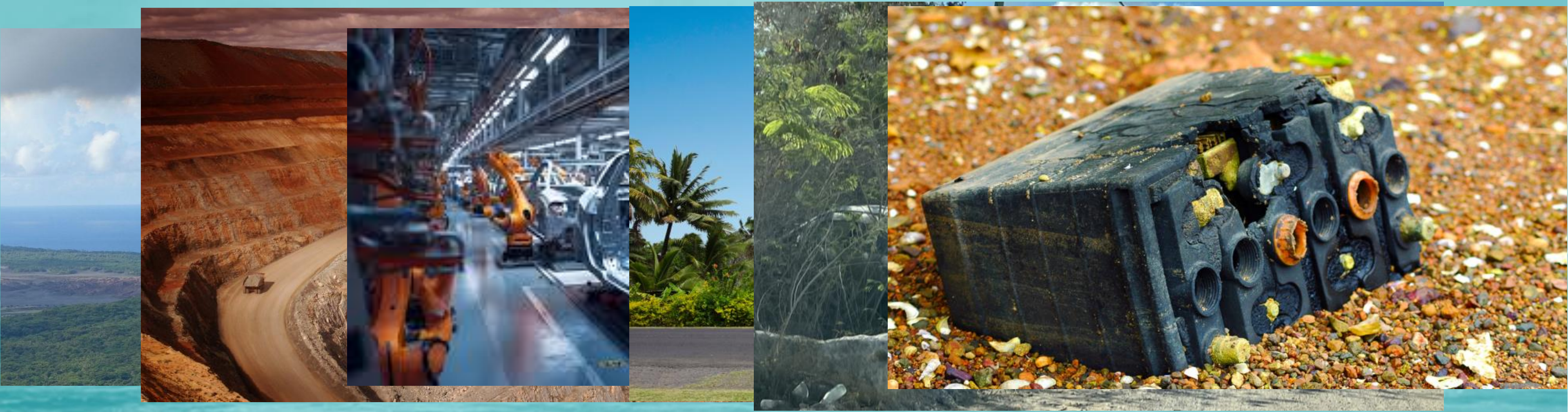
From Linear to Circular Waste Management

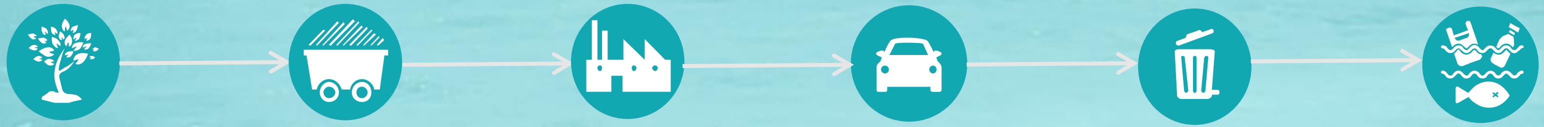
Tania Hyde | 30th September 2024

Beca


Country Overshoot Days 2024
When would Earth Overshoot Day land if the world's population lived like...
27 Nov |Solomons
Nov 24 | Ecuador, Indonesia
Nov 15 | Iraq
Nov 12 | Jamaica
28 Oct | Vanuatu
Oct 18 | Guatemala
Oct 14 | Cuba
Oct 9 | El Salvador
Oct 5 | Colombia
Sep 18 | Uzbekistan, Venezuela
Sep 4 | Algeria
Sep 3 | Peru
Aug 29 | Mexico
Aug 25 | Panama
Aug 23 | Thailand
Aug 19 | Namibia
Aug 14 | Vietnam
9 Aug | Samoa
Aug 4 | Brazil
July 31 | Costa Rica
July 20 | Romania
Jul 17 | Bolivia
14 July | Fiji
27 June | Tonga
June 23 | Paraguay
June 20 | Argentina, South Africa
Jun 18 | Iran
June 3 | United Kingdom
June 1 | China
| Montenegro
May 28 | Croatia, Portugal, French Polynesia
| Switzerland
May 25 | Greece, Hungary
May 23 | Chile
May 20| Spain
May 19 | Italy
May 16 | Japan
May 12 | Israel
May 7 | France
May 2 | Germany, Ireland
April 25 | Slovenia
Apr 21 | Sweden
Apr 18 | Czech Republic
| Finland, Norway
April 11 | New Zealand
| Austria
Apr 5 | Australia, Russia, Saudi Arabia
| Republic of Korea
April 1 | Netherlands
Mar 23 | Belgium
Mar 16 | Denmark
Mar 15 | Canada
Mar 14 | United States of America
Mar 4 | United Arab Emirates
Feb 20 | Luxembourg
Feb 11 | Qatar
DEC
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEP
OCT
NOV
2024
For a full list of countries, visit overshootday.org/country-overshoot-days.
EARTH OVERSHOOT DAY
Source: National Footprint and Biocapacity Accounts, 2023 Edition
data.footprintnetwork.org
Global Footprint Network
Advancing the Science of Sustainability

Recognising the linear economy at work





Natural Resources → Take → Make → Use → Dispose → Pollution

Recognising the linear economy at work

Linear impacts

- Limited land for waste disposal
- Increase waste in the marine environment (relied on as a food, income and tourism source)
- Over-exploitation of resources
- Imbalance of available resources
- Breakdown of ecosystems
- Biodiversity loss
- Climate change

The Economies

Linear

Take

↓

Make

↓

Waste

↓

Recycling

Take

↓

Make

↓

Waste

↓

Recycle

Circular

Repair

Reuse

Adopting Circular Principles

Regenerating natural systems

Keep products and materials in use

Design out waste and pollution

Beca

Circular Economy in Action

Pacific Reuse Examples

Circular Economy in Action

International Circular Examples

CIRCULAR APPROACH TO WASTE MINIMISATION IN THE PACIFIC

R - Strategies

CIRCULAR ECONOMY

↑ Increasing Circularity ↓

LINEAR ECONOMY

	STRATEGIES
Smarter product use and manufacture	R0 Refuse
	R1 Rethink
	R2 Reduce
Extend lifespan of product and its parts	R3 Reuse
	R4 Repair
	R5 Refurbish
	R6 Remanufacture
Useful application of materials	R7 Repurpose
	R8 Recycle
	R9 Recover

R – Strategies in Action

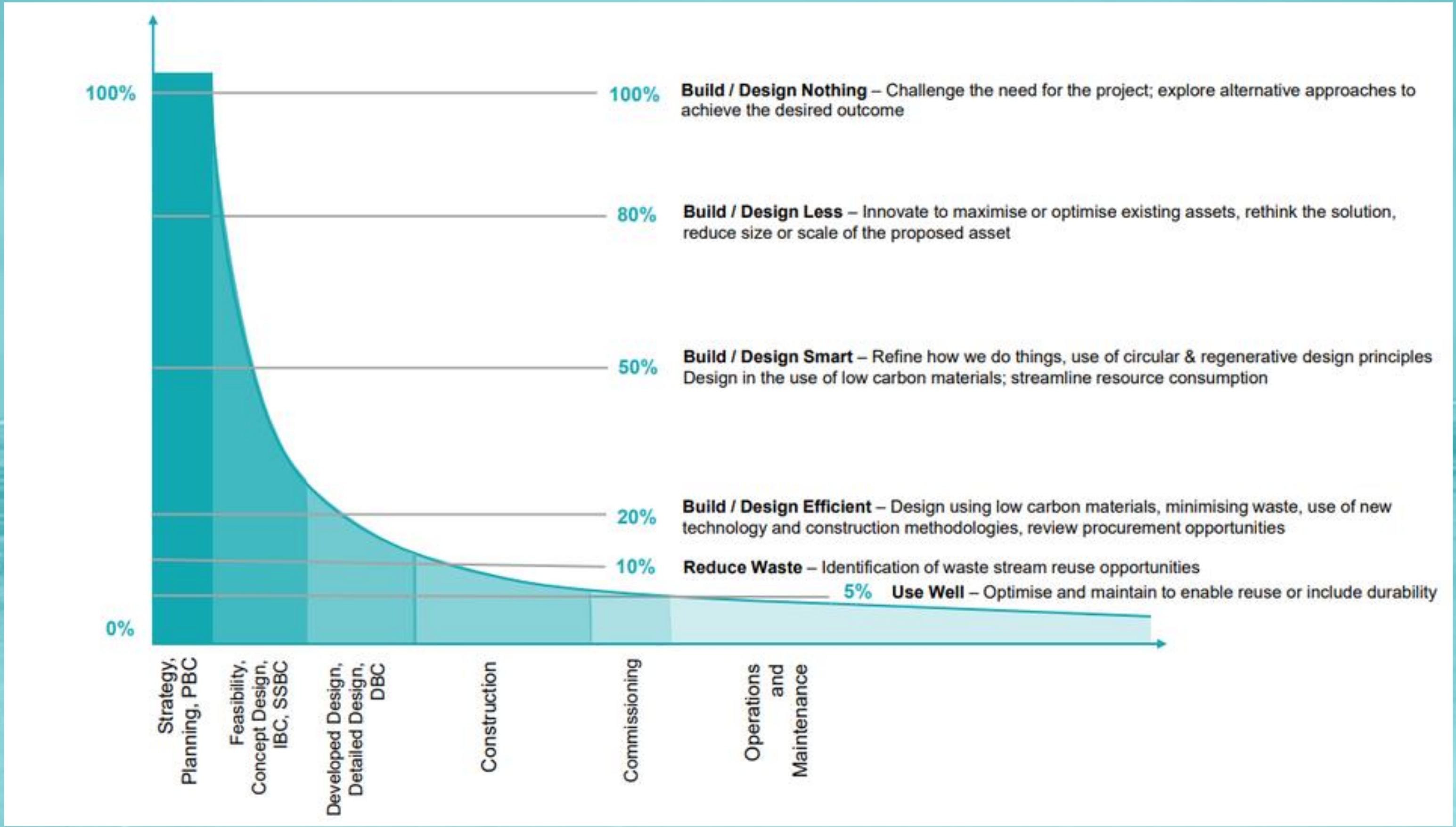
Circular economy

Increasing circularity

Linear economy

	Circularity strategies (Potting et al., 2017)	Design strategies (van Stijn and Gruis, 2019)
Narrowing loops Decrease use of materials and energy	R0 - Refuse R1 - Rethink R2 - Reduce	Design for material reduction Design for energy reduction
Slowing loops Extend the utilization period	R3 - Reuse R4 - Repair R5 - Refurbish R6 - Remanufacture R7 - Repurpose	Design for attachment and trust Design for reliability and durability Design for standardisation and compatibility Design for ease of maintenance and repair Design for upgrades and adjustments Design for dis- and re-assembly
Closing loops Increase recirculation of materials	R8 - Recycle R9 - Recover	Design for biodegrading and recycling Design for disassembly

Source: Circular design in practice: Towards a co-created circular economy through design, Gilliam Dokter, 2021


100%
0%
100%
Build / Design Nothing – Challenge the need for the project; explore alternative approaches to achieve the desired outcome
80%
Build / Design Less – Innovate to maximise or optimise existing assets, rethink the solution, reduce size or scale of the proposed asset
50%
Build / Design Smart – Refine how we do things, use of circular & regenerative design principles Design in the use of low carbon materials; streamline resource consumption
20%
Build / Design Efficient – Design using low carbon materials, minimising waste, use of new technology and construction methodologies, review procurement opportunities
10%
Reduce Waste – Identification of waste stream reuse opportunities
5%
Use Well – Optimise and maintain to enable reuse or include durability
Strategy, Planning, PBC
Feasibility, Concept Design, IBC, SSBC
Developed Design, Detailed Design, DBC
Construction
Commissioning
Operations and Maintenance

The Messy Middle

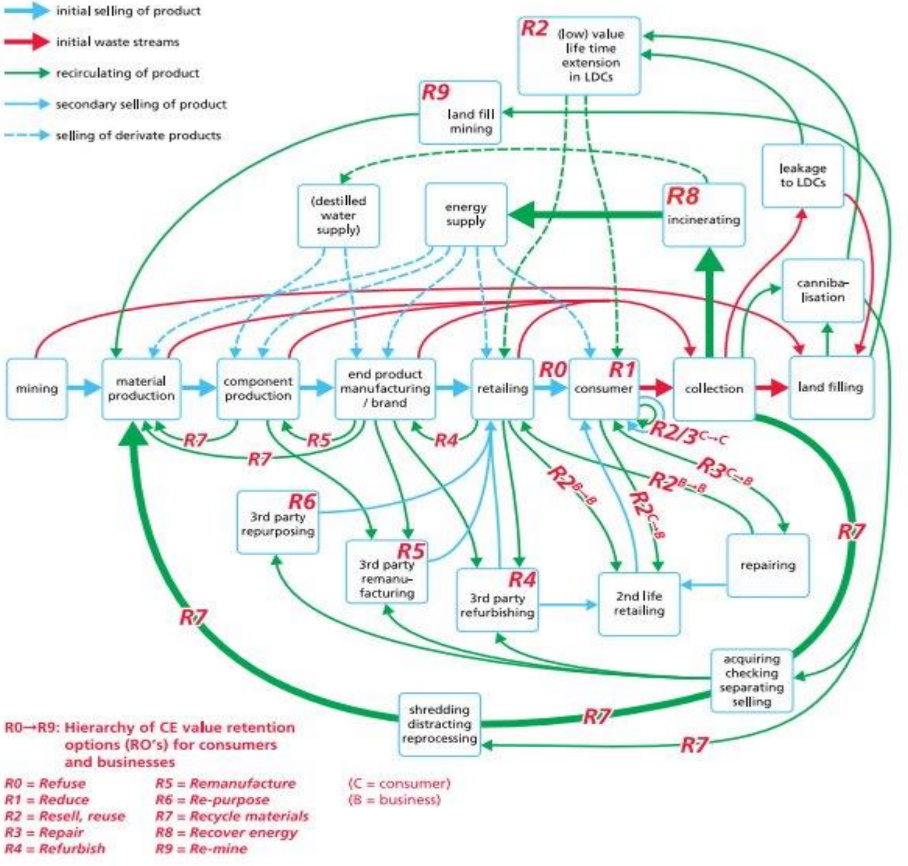


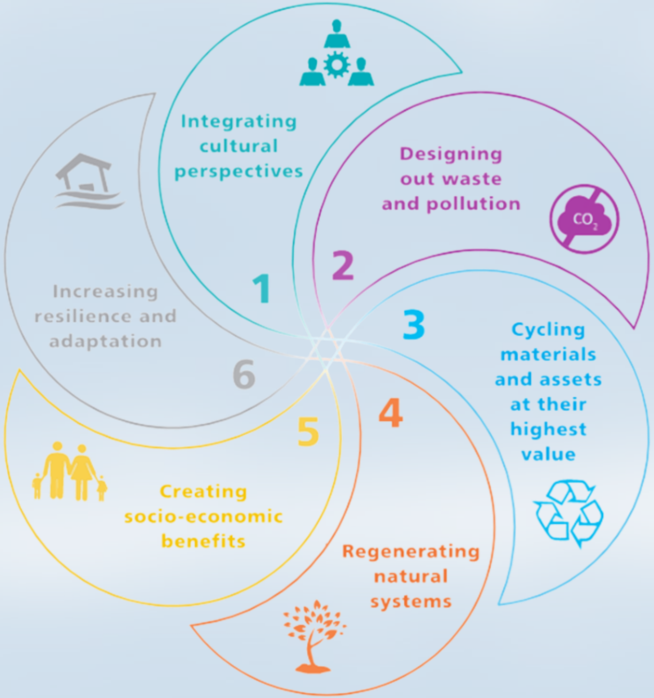
Figure 1 Mapping Circular Economy Retention Options: The Product Produce and Use Life Cycle (Reike et al. 2018).

Circular Design Framework

Increasing Resilience and Adaptation
- Has there been a climate risk assessment done for the location?
- How can we make an asset more resilient to natural disasters and climate impacts? What adaptation measures need to be considered?
- Have we considered nature-based solutions to combat climatic impacts?

Creating Socio-Economic Benefits
- Are there Pacifica people working on this project?
- Are there opportunities for minority or young community members on a project?
- Are there any opportunities for local communities to co-design a project?
- Are we supporting local businesses and communities during procurement and construction?
- Is there an opportunity for local businesses to innovate new materials or products?

Regenerate Natural Systems
- Are we considering nature-based solutions in designs?
- Can we enhance the surrounding ecosystem and community by creating ecosystem services?
- Does a design allow for natural processes to continue (e.g. fish passage through streams)?
- Is there an opportunity to install rain gardens or passive irrigation systems?



Integrating a Pacifica Perspective
- What steps can we take to enable the project to aligns with Pacifica knowledge, practices, and aspirations while maintaining project objectives?
- What thought has been given to the available skillsets and capabilities of the local communities' businesses?

Designing Out Waste and Pollution
- What opportunities are there for reducing or removing waste from a design?
- Can we identify materials or products that can be locally manufactured to reduce the reliance on imports?
- Can we maximise the collection, processing, and reuse of organic waste to be reused in topsoil or agriculture?
- Is there any opportunity to implement a Product as a Service model?

Cycle Materials and Assets at their Highest Value
- What secondary materials are available locally that we can consider using?
- Is there existing infrastructure that can be retrofit to extend the life of that asset?
- Have we designed for disassembly at end-of-life?
- Can we maximise the use of by-products by slowing the loop and creating an economy for them?

Living Labs

QUESTIONS

Tania.Hyde@beca.com

EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

This initiative is supported by **PacWastePlus**-a 72 month project funded by the European Union (**EU**) and implemented by the Secretariat of the Pacific Regional Environment Programme (**SPREP**) **to sustainably and cost effectively improve regional management of waste and pollution.**

Circular Approach for Waste Management: Changing the Narrative

Thinking INSIDE the Circle

Presented by Ms Hilary Boyes
PacWaste Plus Technical Officer

CPRT
5 August 2024

WHERE ARE WE AT?

64.66%
Average household collection service coverage

15.33%
Average national recovery rate

416,541
Regional total weight of waste disposed (tpa)

5,937
Regional total weight of waste recovered (tpa)

101.3
Average per capita waste generation rate (kg/capita/annum)

133,198
Regional marine plastic pollution potential (tpa)

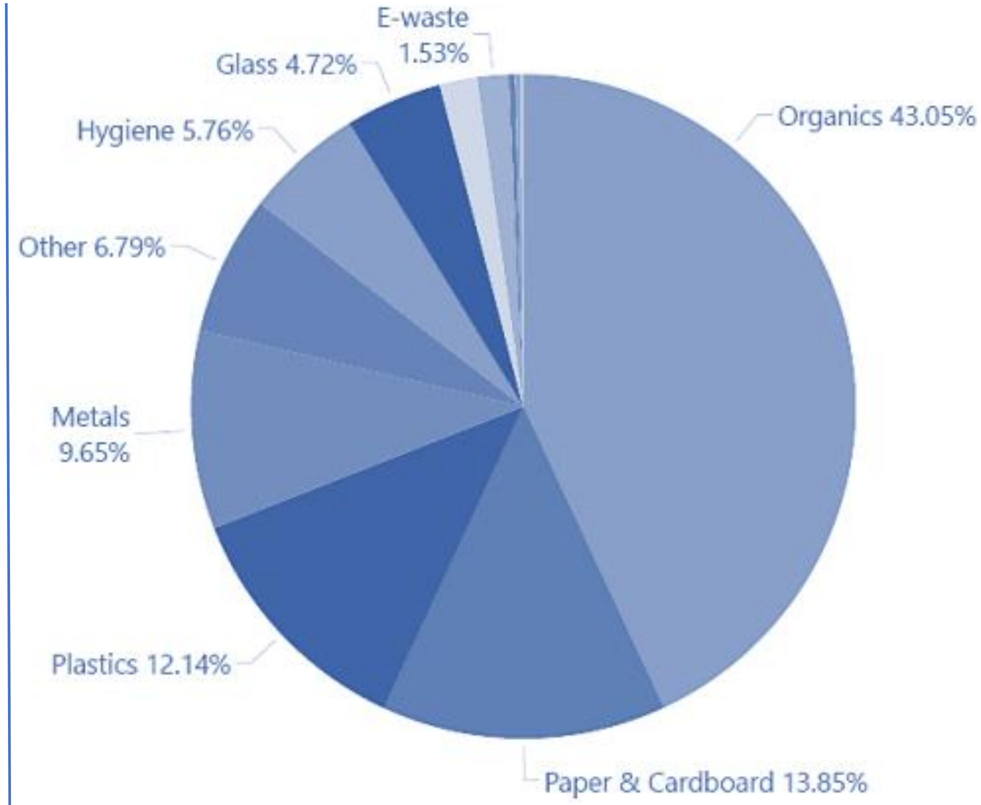
Hazardous waste stockpiles (m^3)

33
Asbestos total

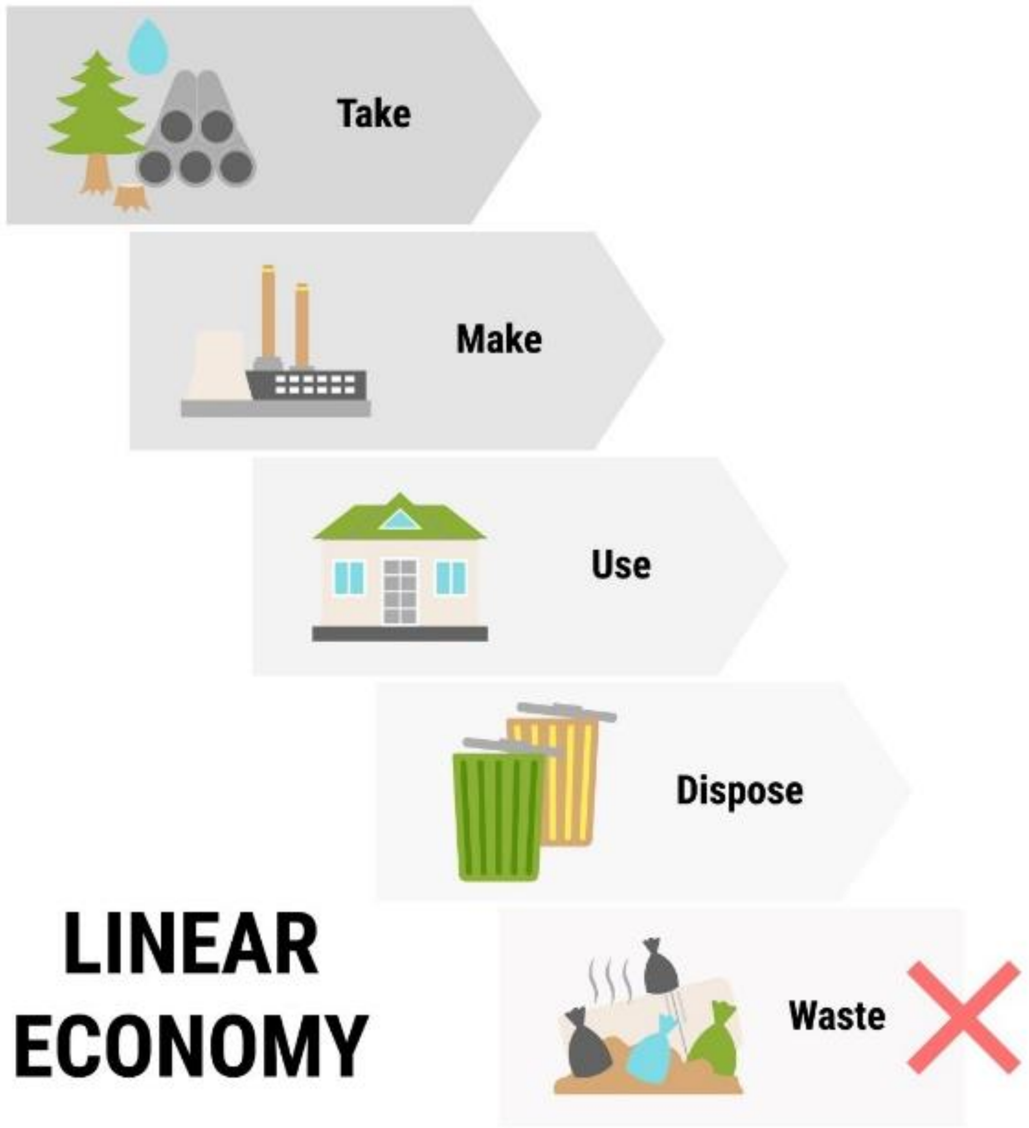
7,160
E-waste total

5,491
Used oil total

14,032
Used tyre total



Regional Waste Audit Analysis Report 2023
https://pacwasteplus.org/resources/regional-waste-audit-analysis-report/


Take
Make
Use
Dispose
Waste
LINEAR ECONOMY


Raw materials
Design
Production
Retail
Consumption
Reuse & repair
Collection
Recycling
CIRCULAR ECONOMY

Thinking INSIDE the Circle

ORGANICS

Feed the pig

Eat the pig

Grow food

Eat food

Collection system

Processing

Increase crop yield

Investment into collection / drop-off system

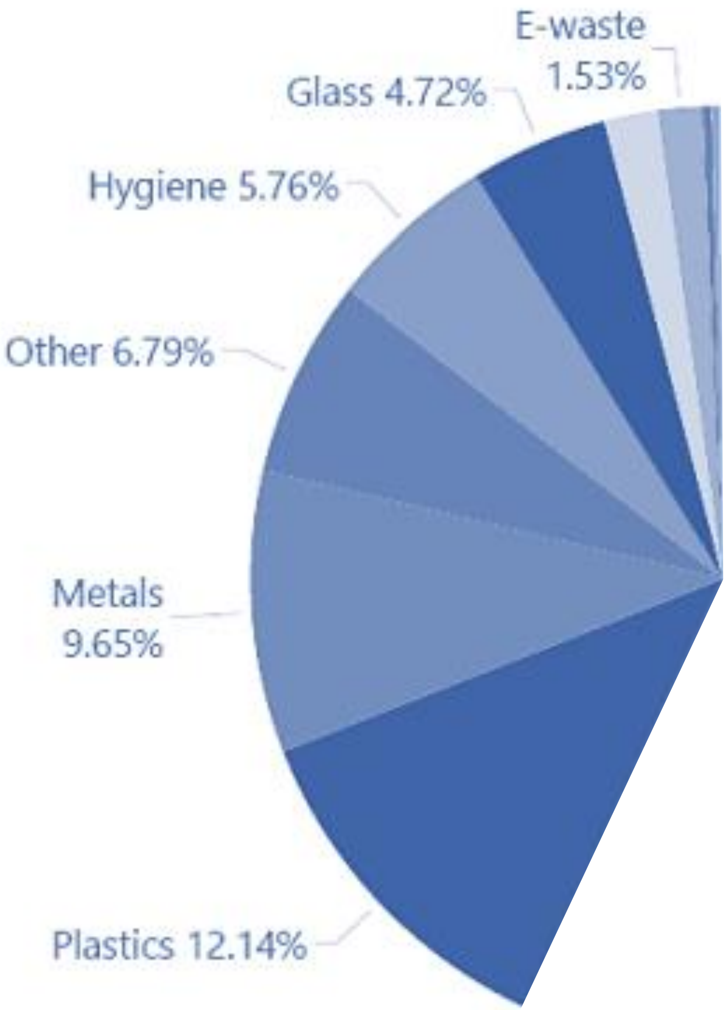
Awareness on how to use collection system

Investment into facilities - composting or other organics processing

Increased capacity – operating facility

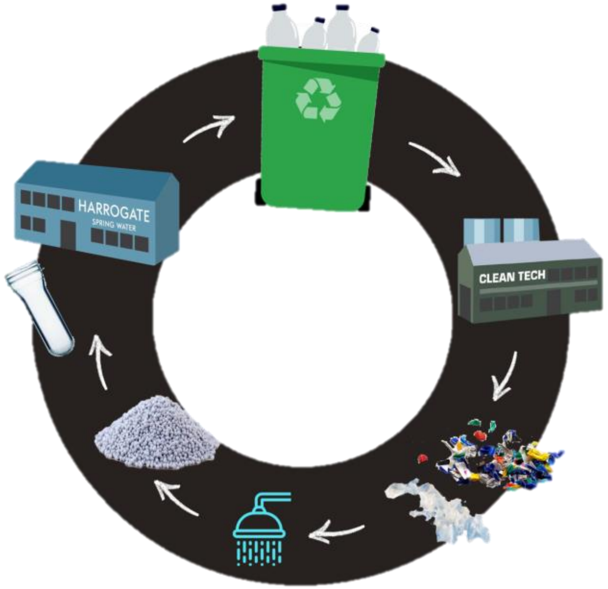
Awareness on home composting

Awareness on why to use local compost over imported fertilizer


E-waste 1.53%
Glass 4.72%
Hygiene 5.76%
Other 6.79%
Metals 9.65%
Plastics 12.14%

56.9%

BEVERAGE CONTAINERS



Consume

Collection system

In-country processing

Export

Overseas Processing

Import (preforms or bottles)

FUNDING

EPR / PSS / CDL / ARFD

Investment into collection / drop-off system

Awareness on how to use collection

Investment into facilities – materials transfer centre

Increased capacity – operating facility

Increased capacity – accessing markets

Import controls – ensuring recycle content of imported bottles and pellets

GLASS

Import

Consume

Collect

Re-purposing

Investment into washing services facilities

Promotion of washing services

Washing

TEXTILES

Import

Local manufacture

Consume

Re-use

Repair

Re-
maunfacture

"dump shops"

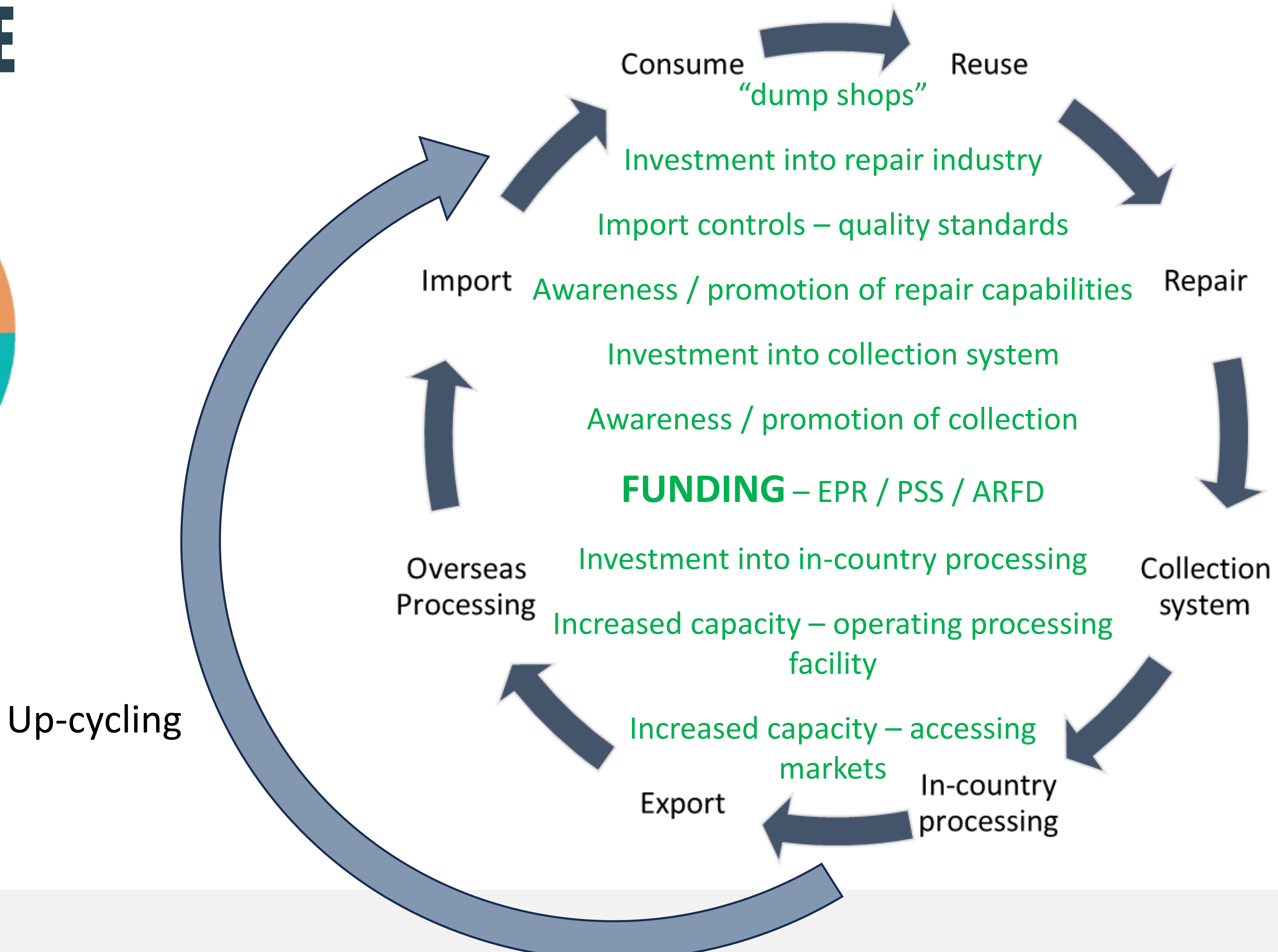
Investment into sewing / repair / re-manufacture industry

Awareness / promotion of re-use / repair / re-manufacture capabilities

Importation controls / Importation bans

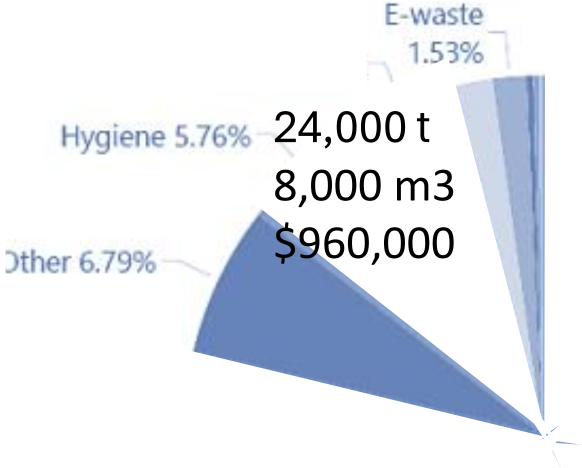
Upcycle / Re-manufacture to alternative products

E-WASTE

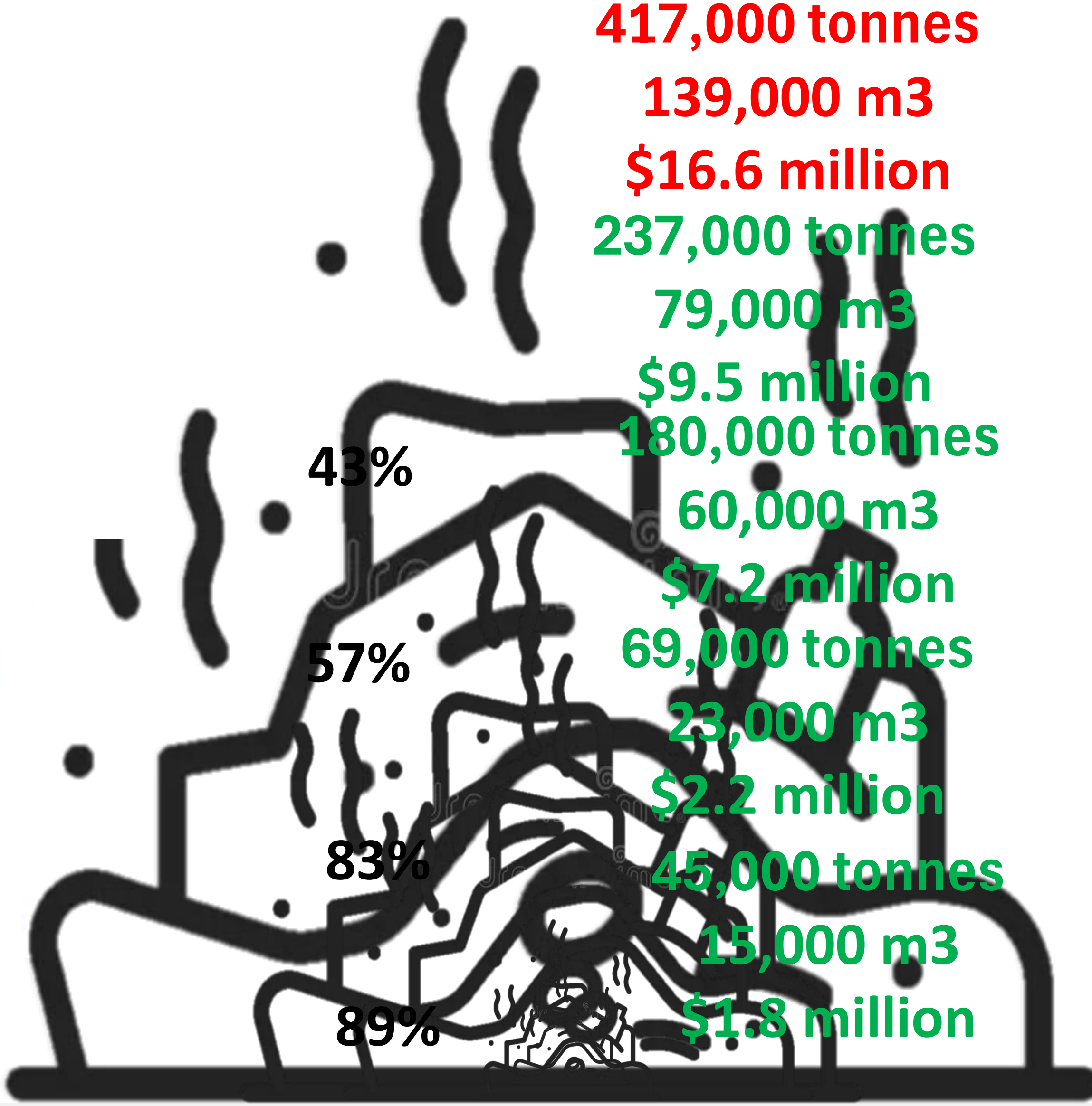

Consume
Reuse
"dump shops"
Investment into repair industry
Import controls – quality standards
Import
Awareness / promotion of repair capabilities
Repair
Investment into collection system
Awareness / promotion of collection
FUNDING – EPR / PSS / ARFD
Overseas Processing
Investment into in-country processing
Collection system
Increased capacity – operating processing facility
Up-cycling
Increased capacity – accessing markets
Export
In-country processing

WHERE DO WE WANT TO BE?

416,541
Regional total weight of waste disposed (tpa)



24,000 t
8,000 m3
$960,000



417,000 tonnes
139,000 m3
$16.6 million

237,000 tonnes
79,000 m3
$9.5 million

43%
180,000 tonnes
60,000 m3
$7.2 million

57%
69,000 tonnes
23,000 m3
$2.2 million

83%
45,000 tonnes
15,000 m3
$1.8 million

89%

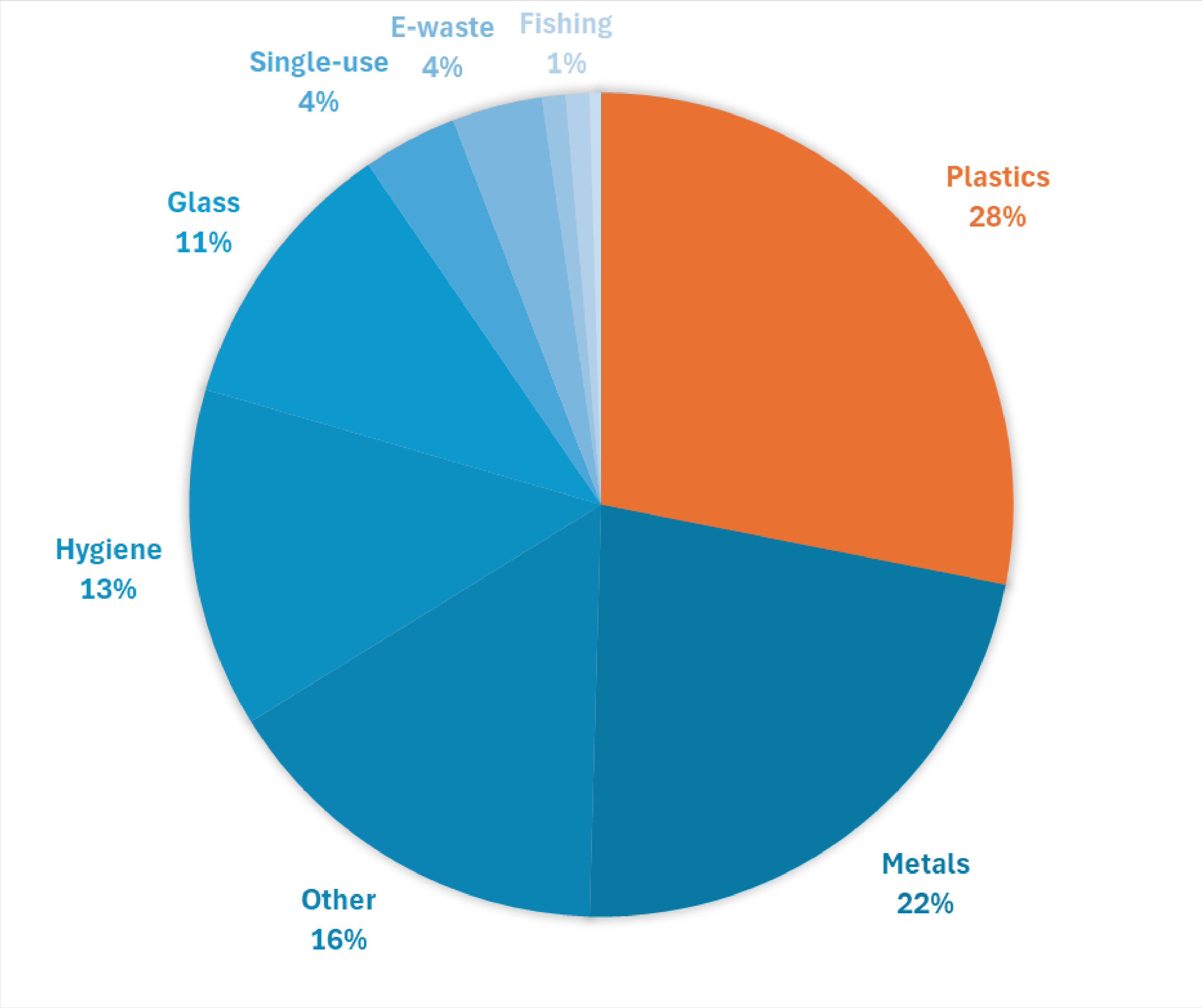
THINKING INSIDE THE CIRCLE

Physical Infrastructure & Services

- Composting and organics facilities
- Manufacture of local alternatives to common waste materials
- Repair programmes
- Resource recovery / recycling transfer facilities
- In-country recycling facilities
- Service industries

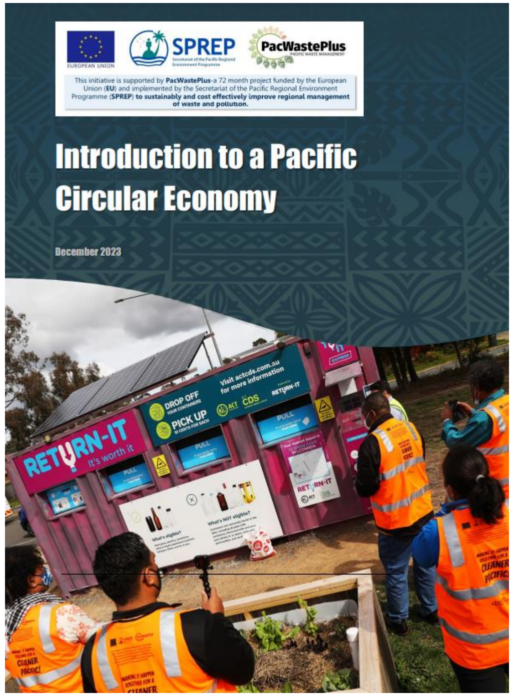
Policy Controls

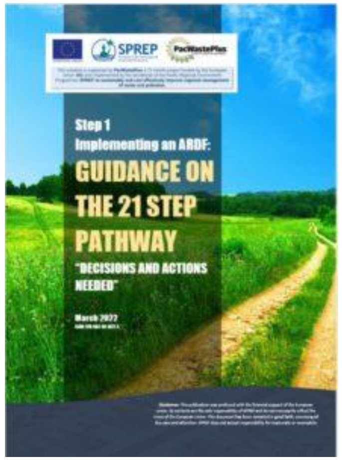
- Importation bans
- Import quality controls
- Sustainable financing schemes (fee and deposit)
- Supporting the outcomes Instrument to end Plastic Pollution
- Awareness programmes

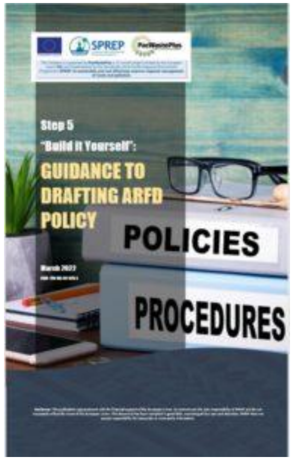

E-waste
4%
Fishing
1%
Single-use
4%
Plastics
28%
Glass
11%
Hygiene
13%
Metals
22%
Other
16%

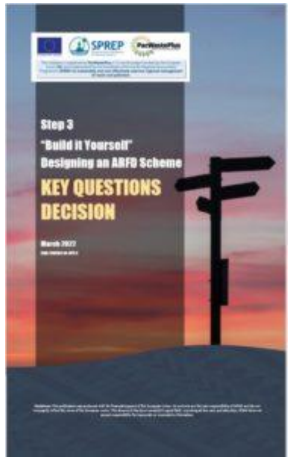
SPREP SUPPORT

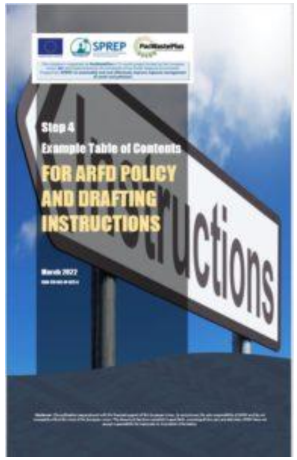
REPORTS / DOCUMENTS

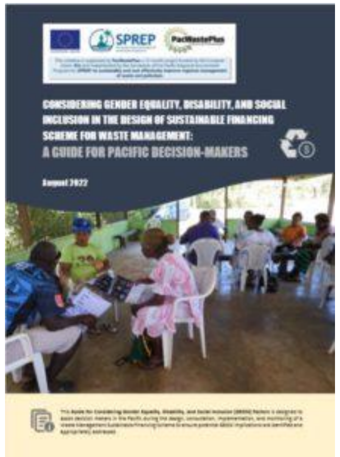


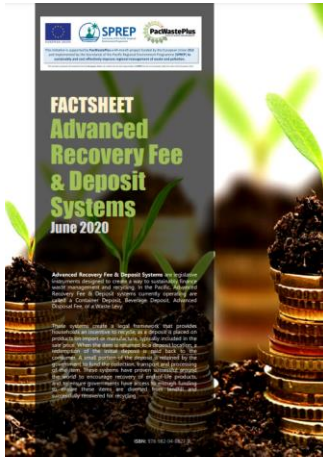


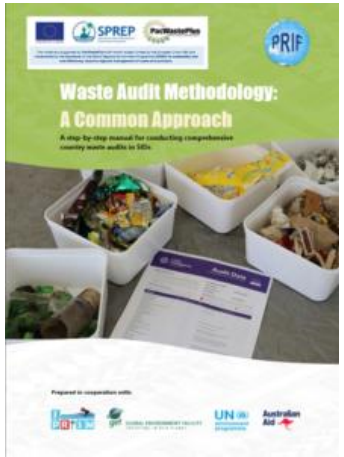












QUESTIONS?

Visit our website to learn more

www.pacwasteplus.org

Appendix D: Power Point Presentations

SESSION #1: CIRCULAR APPROACH TO HAZARDOUS WASTE MANAGEMENT

- Appendix D3: Setting the scene
- Appendix D4: Regulations, Policies and Plans
- Appendix D5: Used Oil Management
- Appendix D6: Leveraging the Basel and Waigani Conventions to Foster a Circular Economy in the Pacific
- Appendix D7: Hazardous Waste and Used Oil Management - Experience sharing from Wallis and Futuna

Circular approaches to hazardous waste management

Joshua Sam

Hazardous Waste Management Adviser

Introduction & objectives

Brief definition of hazardous waste

Objectives

- Identify sources of hazardous waste.
- Explain why managing hazardous waste is critical for Pacific countries.
- Discuss how circularity can improve hazardous waste management.

Sources of hazardous wastes

1. Industrial activities
2. Household wastes
3. Energy production
4. Marine and aviation sectors
5. Healthcare facilities
6. Agriculture
7. Municipal waste
8. Transport sector

Challenges in hazardous waste management in the Pacific

1. Limited infrastructure and technical capacity for proper treatment
2. Economic impacts: Clean up of hazardous wastes is costly
3. Geographic isolation: Transportation challenges and high cost of disposal
4. Environmental vulnerability

Incorporating circularity in hazardous waste management

Given the Pacific's unique circumstances:

1. **Focus on waste minimization at sources:** Policies to reduce imports of hazardous products.
2. **Improve reuse and recycling:** Repurpose materials like used oil and scrap metal
3. **Strengthen consumer information & tools:** Encourage more sustainable consumption
4. **Increase transparency & traceability along value chains:** impacts of products on population to be accessible

End of presentation

Circular Approach to Hazardous Waste Management

Regulations, Policies and Plans

Circular Economy

The NZ Ministry for the Environment tells us:

> *"A circular economy is an alternative to the traditional linear economy, in which we keep resources in use for as long as possible, extract the maximum value from them whilst in use, then recover and regenerate products and materials at the end of each service life."*

But hazardous wastes are….**hazardous!** Shouldn't we just try to dispose of them in ways that renders them non-hazardous – like the wastes in the first slide picture – Vanuatu Ministry of Health Waste Pesticides?

Hazardous Waste Hierarchy

A variation on the familiar Waste Hierarchy

- Eliminate where possible products containing hazardous substances and thus leading to hazardous wastes.
- Where elimination is not possible, apply methods to reduce the quantity and/or hazard involved, such as replacement with a less hazardous alternative.
- Minimise the amount of waste for disposal by recycling, reuse and/or recovery where possible and safe to do. This includes the recovery of energy which may be available from the waste.
- Treat waste to stabilise, immobilise, contain or destroy hazardous properties.
- Dispose of residues with a minimum of environmental impact.
- Appropriately contain, isolate and store hazardous wastes for which no acceptable treatment or disposal option is currently available.

Cleaner Production

- A parallel concept to the hazardous waste hierarchy is **cleaner production**, which refers to the first step of the waste hierarchy namely eliminating the production of hazardous waste. In many cases the introduction of cleaner production measures brings economic benefits in addition to savings in waste disposal costs. It is particularly relevant to the Pacific Countries where ways to deal with hazardous wastes are very limited. Examples of ways in which cleaner production can be achieved include:
    - Substituting a hazardous material used in a process with a non-hazardous material. Examples are the use of citrus-based parts cleaners in automotive repair shops instead of flammable solvents, and substituting organic non-hazardous pesticides for hazardous pesticides in agriculture.
    - Process changes that generate less hazardous waste and less waste in general.
    - Reducing the amount of hazardous material inputs used.

Undesirable Impacts of Hazardous Waste

- Hazardous wastes are predominantly wastes that can be directly or indirectly related to chemicals or chemical products.
- The undesirable impacts of hazardous wastes would be similar to that of chemicals, considering they are predominantly chemicals and products that are no longer wanted. The waste chemicals and products are often changed substantially in their waste form, but nonetheless the hazards often remain.
- **In one real sense, hazardous wastes present potentially more of a risk than chemicals and chemical products. They can reach the environment in an unrestrained way that can cause serious harm to both the environment and human health.**

What is the Rest of this Presentation About?

We will now look at:

- Common hazardous wastes and issues in Vanuatu and other PICs
- Hazardous wastes in Vanuatu and other PICs, including ones that can be recycled
- The Vanuatu NWHPIP – National Hazardous Waste Policy and Costed Implementation Plan. This plan includes policies and measures, including regulations, for the management of hazardous wastes.

Common Hazardous Wastes in Vanuatu and other PICs

- ***Chemical wastes, POPs, solvent and paint wastes, a variety of industrial wastes, including acid and alkali waste, mercury wastes, and chemicals that are no longer required, including expired and unwanted pesticides.***
- ***Used oil,***
- ***Expired laboratory chemicals,***
- ***Used batteries, including lead-acid batteries, Ni-Cd batteries and lithium batteries,***
- ***Many varieties of e-waste,***
- ***Medical waste (healthcare waste)***
- ***Asbestos waste***

Two Current Hazardous Waste Issues in Vanuatu

- There is no mechanism for excluding Hazwastes from Landfills – eg Bouffa

- Asbestos may still be for sale

Used Oil

- Used oil is a prime example of a hazardous waste that can be recycled and become part of the Circular Economy.
- There is now an effective Used Oil Management Plan in place in Vanuatu – see next presentation.
- Used oil collection and storage is being set up in Vanuatu and a used oil processing plant is being established.

Used Batteries

- It is estimated that around 4,000 used lead acid batteries (ULABs) per year are being exported by Recycle Corp, Vanuatu. ULABs are a special class of battery. They are comparatively large and many in number and contain two hazardous substances - lead and dilute sulphuric acid electrolyte. Several Pacific countries (Australia, NZ and Fiji) can recycle ULABs.
- There are a range of other disposable and rechargeable batteries as follows:
  - Disposable – alkaline, lithium, Hg oxide, Ag oxide, zinc carbon, zinc chloride etc.
  - Re-chargeable – lithium ion, nickel-cadmium, nickel metal hydride, etc.
- They all contain heavy metals, and all are potentially polluting in the environment. In addition, lithium-ion batteries are a serious cause of fires, as are some other batteries.
- Batteries for recycling must be shipped overseas so batteries may need to be stored for a long time until recycling becomes financially viable.

E-Waste

- E-waste refers to end-of-life electrical and electronic items - computers, printers, photocopiers, TVs, washing machines, radios, mobile phones, toys, and these are made of plastics, metals, and other materials. Due to demand for newer technology, the lifespan of these products is progressively decreasing. Consequently, older and outdated items are becoming obsolete and being discarded in large quantities and at increasing rates worldwide.
- **The limited information available for PICs indicates that the use of electrical and electronic equipment is increasing significantly on an annual basis.** E-waste contains hazardous materials, but also valuable scarce materials such as metals and alloys, which can be recovered and recycled.
- Proper management and disposal of E-waste is important to the long-term protection of the environment, as well as to the maintenance of long-term sustainability

Asbestos

- Surveys for the presence of asbestos in PICs were completed in 2015. The most abundantly encountered asbestos-containing building material found in Vanuatu is cement sheeting and the sheeting is mostly applied as wall cladding. **Asbestos cladding may still be being sold in Vanuatu.**
- The derelict Manganese Mine at Forari is now being inhabited by several families and presents a significant hazard and requires substantial amounts of cladding and roofing removal and contaminated site clean-up.
- Other high risk asbestos-containing sites in Vanuatu include the Ministry of Lands and Natural Resources (cladding, gables and soffits), and Port Vila Central Hospital (vinyl floor cladding).
- A location for the disposal of asbestos building material wastes is now provided for at the Bouffa Landfill. Other PICs such as Fiji and Tonga have effective ways of disposing of asbestos. Careful procedures are needed for the operation of these asbestos disposal areas, mainly to protect the workers and to make sure that it is not uncovered again. **Asbestos waste cannot be recycled.**

Healthcare Waste

- Medical wastes (healthcare wastes) generated from hospitals and health care centres in PICs include infectious wastes, body part wastes, chemical or pharmaceutical wastes, expired pharmaceuticals, soiled bandages, contaminated sharps, radioactive and cytotoxic wastes and broken thermometers.
- There is currently ineffective separation of medical waste at source. Landfilling and low temperature burning of these wastes is still a common practice in PICs. This is likely to result in unacceptable community health risks, and expired drugs may be acquired by children or scavengers if disposed of in a landfill or open dump site. The preferred disposal method is high temperature incineration.
- **Overall nation-wide healthcare waste management systems are needed to protect healthcare workers and the public from the very real risks posed by this class of waste.**

Expired Laboratory Chemicals

As an example, the Vanuatu Stockholm Convention NIP Update lists the chemicals used at the Port Vila Central Hospital as chlorinated solvents (including carbon tetrachloride, chloroform, dichloromethane and trichloromethane), oxidisers (including peroxides, perchlorates, chlorates, permanganates, dichromates and nitrates), large quantities of flammable substances, ethers, picric acid, hydrofluoric acid, cyanides, phosphorus, potassium, sodium, bromine. **All these chemicals are potentially highly hazardous, including explosive.**

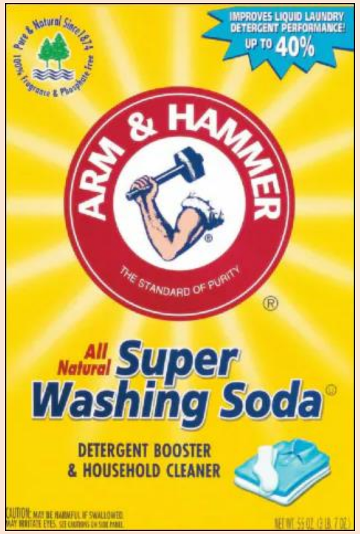
The disposal method was reported to be "chemicals poured down the sink into 3 chamber treatment system and expired pharmaceuticals burnt at landfill". **Some of these chemicals may react in a very hazardous manner if mixed.**

The Port Vila Central Laboratory may be an extreme example, but labchems are of real concern in PICs. **In the Pacific, expired laboratory chemicals are frequently mis-managed and poorly understood. There is often little knowledge of safe disposal methods, and in many cases, stockpiles of expired and unwanted chemicals have accumulated with little understanding of safe storage and attention to chemical incompatibilities.**

Re-use of Chemicals

Some expired chemicals are useful and could be saved – for example:

- Sodium carbonate (washing soda) – Good for cleaning, e.g. chopping boards, mops and dishcloths. A mild solution effectively cleans windows, mirrors and tiles. It cuts through soap scum and lime scale in the bath, basin and shower.
- Sodium bicarbonate (baking soda) – Good for neutralizing odors and cleaning, as it helps remove tough stains, eliminate foul odors, and clean difficult areas like the oven, microwave, and tile grout.
- Magnesium sulphate (Epsom Salts) – A popular remedy for many ailments, such as muscle soreness and stress. It's easy to use, and harmless when used appropriately.
- Calcium sulphate (Gypsum) - A moderately soluble source of the essential plant nutrients, calcium and sulfur, and can improve overall plant growth. It has numerous other uses.
- Sodium Hydroxide (Caustic soda) – highly corrosive and needs to be used carefully with PPE. Main uses include being used as a drain-pipe cleaner, unblocks drains, removes built up grease from ovens, used to make soap and detergents. It is a versatile product to have around the house as it has many uses.



POPs Chemical Wastes

- There are potentially significant quantities of PCB contaminated oils in Vanuatu and other PICs. The Vanuatu Stockholm Convention NIP Update stated the following, regarding PCBs. PCB contaminated transformers may be present in the VUI storage, and both UNELCO and VUI, and maybe other parties, probably have PCB capacitors.
- No PFOS / PFOA contaminated fire-fighting liquids was found in Vanuatu, but it is still possible that some may turn up, perhaps in foam fire extinguishers or other locations. PFOS/PFOA may also be present in other PICs.
- There may also still be stockpiles of old POPs pesticides in Vanuatu, especially DDT. A large amount (482 kg) of Ministry of Health DDT was exported for destruction in 2018/2019 but there may be other stockpiles. Malaria is present in Vanuatu and destruction of mosquitoes has been a major concern for a long time.
- **There is therefore potentially quite a large amount of POPs waste to be exported for destruction in PICs and secure storage will be needed to store this waste until export arrangements can be made, including securing funds, as the export process is expensive.**

Non-POPs Chemical Wastes

- There is potential for other commercial and industrial hazardous chemical wastes to be generated in PICs, including:
- wood preserving waste,
- solvent and paint waste,
- acid and alkali waste,
- expired chemicals or chemicals that are no longer required,
- expired pesticides.

These wastes will generally need treatment, if suitable treatment is available. Otherwise they will need to be exported overseas for treatment and disposal.

The NHWPIP

We were recently involved in preparing for the DEPC a NHWPIP (National Hazardous Waste Policy and Costed Implementation Plan). This was a companion plan to the similarly named NCPIP (National Chemical Policy and Costed Implementation Plan). A detailed plan was prepared in each case and detailed legislation was drafted.

We won't go into the details here but will set out the key features of the NHWPIP.

Key Elements of the New System for Managing Hazardous Wastes

- All hazardous wastes should be managed by the system, except for radioactive wastes. Radioactive wastes are a special class of hazardous waste that require management under separate legislation.
- There should be a reliance on existing resource documents (such as Codes of Practice and Standards) available internationally.
- Hazardous wastes that are not contaminated and retain their identity as individual chemicals or products should still be subject to all the provisions of legislation governing the management of Chemicals.
- Hazardous wastes that are mixtures of chemicals or products, also need to be assigned UN Globally Harmonised System Rev 7 (GHS7) classifications and management requirements.
- All hazardous wastes are to be managed (stored and transported) in accordance with the requirements pertaining to their GHS7 classifications.

More Key Elements

- Solid hazardous wastes with minor hazards can be landfilled.
- Liquid hazardous wastes with minor hazards can be collected and discharged to suitable treatment systems.
- Hazardous wastes with hazards above minor hazards should either be treated to reduce them to “low hazard” GHS classifications, or they should be exported for treatment and disposal.
- Special secure storage areas are required for hazardous wastes awaiting export.
- All exports of hazardous wastes are to be carried out in full accordance with the requirements of the Pacific transboundary movement conventions (Basel or Waigani Conventions) as appropriate.
- There needs to be a duty imposed on waste generators and waste service providers to protect human health and the environment.

More Key Elements

- Special provisions are required for certain special classes of wastes, including e-wastes, used oil, asbestos wastes, old batteries and end-of-life vehicles. These requirements can be managed by Codes of Practice.
- Product stewardship schemes are required for some waste streams e.g. used oil, e-waste, batteries and end-of-life vehicles.
- Emphasis should be placed where possible on hazardous waste minimization and cleaner production.
- The system should not place too much of a load on government officials as then inefficiencies and delays will occur, due to overwork.
- The system should not impose too much cost on users as it will then be by-passed and evaded. It is logical to have user-pay charges, but they should not be onerous.

More Key Elements

- There needs to be penalties and enforcement, but emphasis should be placed on education and cooperation.
- The legislation can be largely general and simple rather than prescriptive. Detailed and prescriptive information can be placed in support documents.
- The new elements of the system will need to be phased in, probably over a two-year period so everyone has time to learn, understand and assimilate the new ideas and requirements
- Extensive training will be required.
- Ownership and responsibility concepts for hazardous waste need to be clarified.

Ownership

- It is generally accepted that all wastes remain in the ownership of the generator indefinitely. This will minimise confusion in the event of a dispute. The generator shall be responsible for the waste while it is on their site, including health and safety issues, spills and site contamination issues.
- The generator shall be responsible for any unauthorised discharges of waste and contaminants on their site, including in the event of a spill during waste collection. The generator shall classify and identify their waste and sign a declaration, prior to transferring responsibility to a second person.
- The generator shall be responsible for contracting a suitable transporter to move the waste and should keep records as to who took what, when and where. The generator may be found liable (in conjunction with the transporter) for accidental spillage during transport.

Responsibility

- A person does not need to own a waste to be responsible for it. The legislation needs to give a degree of responsibility to everyone directly or indirectly involved in an associated activity regardless of whether they own the waste. People shall be responsible for the waste in their care until such time as the responsibility has been passed to a subsequent person.
- The person(s) responsible for the waste at the time of an emergency must have provisions in place for dealing with the emergency and must:
  - Stop the escape of a waste into the environment.
  - Rectify the problem.
  - Minimise the adverse effects of the incident on the environment.

Waste Transporter

- A transporter shall accept a waste only if they are confident that the waste classification and identification is accurate and signed by the generator. On accepting the waste, the transporter shall accept responsibility for it and is liable for the waste while it is in their vehicle and on their site.
- The transporter (along with the generator, if they have not shown due diligence) may be found liable for accidental spillages during transport in the event that the accidental spill was foreseeable and therefore preventable. This includes having inadequate preparations for emergencies.
- The transporter shall comply with the "UN Recommendations on the Transport of Dangerous Goods – Model Regulations Rev 21 (2019)".
- The transporter shall deliver the waste to a receiver who is willing and able to receive and manage the waste properly.

Waste Receiver

- Receivers shall only accept waste for which they are able and willing to take responsibility.
- The receiver shall be fully responsible for the waste, including responsibility for health and safety issues, spills and site contamination issues.
- Waste receivers should record acceptance of the waste, including all details relevant to the waste. On completion of this process, responsibility shall be retained by the receiver, though the ownership of the waste may still lie with the generator.

Documentation

- In view of the liabilities associated with handling hazardous waste, operators need to show that all aspects of waste handling and transfer have been undertaken with due care and that adequate documentation has been completed and filed. There needs to be an understanding that if the waste description is not accurate, the waste can be returned to the client's site and costs recovered.
- Such documentation will not be necessary for "low risk" wastes, such as sewage material including septage, grease trap waste, roadside cess pits, and other simple organics where the level of risk is judged by the transporter/ treater to be low.

Disposal of Hazardous Wastes

- The options for disposal of hazardous wastes in Vanuatu and other PICs are limited. It is proposed that "Low Hazard" solid hazardous wastes go to suitable landfills that can receive such wastes. The only landfill that currently meets this category in Vanuatu is the Bouffa Landfill near Port Vila. The landfill procedures will, however, need to be upgraded, including improved reception and record keeping, and allocation of special waste cells that will need to be covered. This landfill is engineered, managed and locked. The low hazard hazardous wastes will need to be received and covered.
- Low hazard liquid hazardous wastes could be disposed to sewers if any satisfactory sewage collection system exists.
- All medium and high hazard hazardous wastes are to be treated to render them low hazard, or stored for export. Secure storage areas are needed for storing these wastes awaiting export.

Product Stewardship

- **Product Stewardship** (sometimes called Extended Producer Responsibility) is when producers, brand owners, importers, retailers and consumers accept responsibility for reducing a product's environmental impact.
- Taking responsibility under Product Stewardship can typically include responsible disposal or recycling of a product and designing a product which can be broken down into recyclable or reusable components.
- A tax can also be added to the cost of products to cover safe re-use or disposal at the end of product life.
- This concept is especially relevant to products that can cause hazardous wastes, or the costs of safe disposal of these products, in economic terms, becomes "externalities" that are borne by the public or the environment. The costs of safe hazardous waste disposal are high, especially in countries like the PICs where disposal options are very limited.

In Conclusion

Hazardous wastes, by their nature, can be difficult to recycle and include in the Circular Economy.

Some hazardous wastes can, however, be recycled, including used oil, e-waste, and batteries.

All hazardous wastes need to be managed safely, and a plan to do this has been developed for Vanuatu – the NHWPIP.

The NHWPIP includes detailed policies and control measures including regulations.

All wastes, including solid waste, organic waste (compost) and disaster waste, need proper control measures as appropriate.

Circular Approach to Hazardous Waste Management

Used Oil Management

What is Used Oil?

- Used oils are produced from industrial and non-industrial sources where oil has been used for lubrication, hydraulic movement, heat transfer, electrical insulation or other purposes
- Used oil is defined as any petroleum-based or synthetic oil or fluid that, has become unsuitable for its original purpose due to the <u>presence of impurities or loss of original properties</u>
- **Used oil is a hazardous waste that is ideal for including in the Circular economy. Wherever possible it should be reprocessed and reused.**

Why is Used Oil a Problem?

Poor management of used oil is a major environmental concern for Pacific Island nations, as it can pollute the environment when not managed properly.

Points to Note

- Used oil can enter aquatic ecosystems in water runoff from urbanized areas if it is not contained
- Used oils typically contain a range of compounds that may have adverse impacts when released into the environment. These compounds include polycyclic aromatic hydrocarbons (PAHs), heavy metals, additives and antioxidants, trace levels of chlorinated solvents, and polychlorinated biphenyls (PCBs)
- (Human) exposure to these compounds can result in damage to the liver, kidneys, heart, lungs and nervous system. Poly-aromatic hydrocarbons are also potent carcinogens
- Oil concentrations as low as one part per million (ppm) can contaminate drinking water.

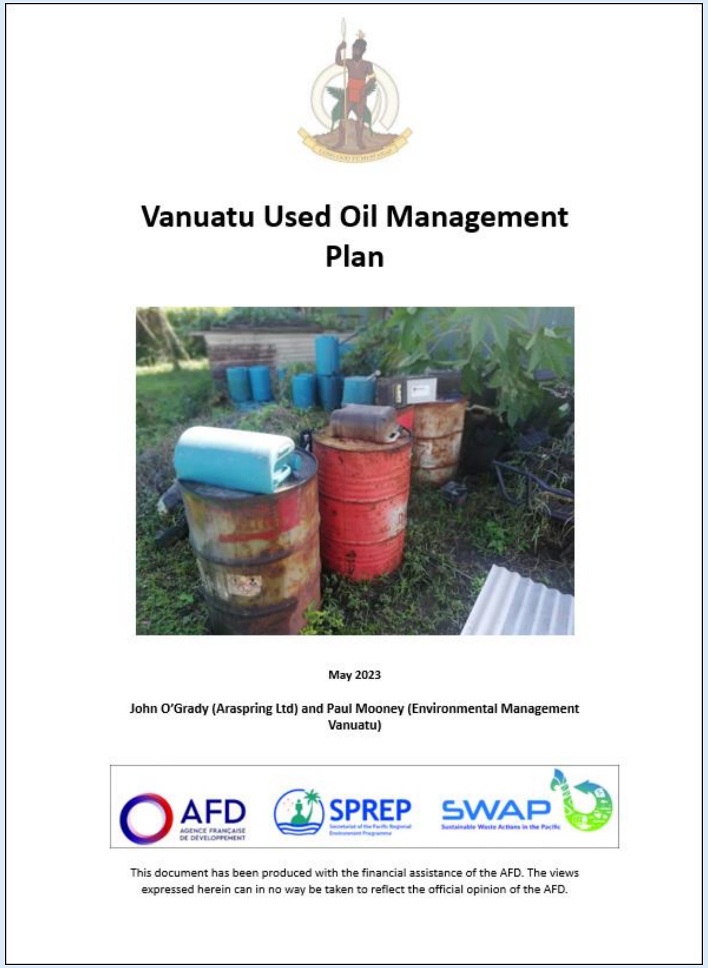
Current Unsatisfactory Uses in the Pacific

- Dust control
- Weed abatement
- Coating to prevent vehicle corrosion
- Pest control – including carrier fluid for agrichemicals
- Combustion in, for example, kerosine burners
- For sports field marking
- Small scale private use including chainsaw bar lubrication
- Fence post protection from termites
- Treatment of pig skin diseases

All these uses can result in land, water or air pollution

The SWAP Programme

- A major programme (SWAP) has been set up to help mitigate risks from used oil, in conjunction with SPREP, and funded by the *Agence Française de Développement* (AFD)
- With the assistance of national stakeholders, a wide range of data on oil and used oil management has been now collected in Samoa, Solomon Islands, Tonga and Vanuatu as part of this programme
- This data has been used to develop a <u>practical and cost effective</u> national **Used Oil Management Plan** for these four countries.


Vanuatu Used Oil Management Plan

May 2023

John O'Grady (Araspring Ltd) and Paul Mooney (Environmental Management Vanuatu)

This document has been produced with the financial assistance of the AFD. The views expressed herein can in no way be taken to reflect the official opinion of the AFD.

How Much Used Oil?

The photos are from Kiribati but using Vanuatu as an example:

- Vanuatu Customs (DCIR) Data (2021) indicates that about 640,000 litres of lubricants are imported annually.
- It is estimated that about 280,000-380,000 litres of used oil are being generated annually in Vanuatu
- Legacy used oil is also stored long-term in Vanuatu. Information from key stakeholders indicates that about 50,000 litres may be currently stockpiled awaiting recycling or disposal.

Best Practice Used Oil Collection

- Best practice used oil collection prevents contamination of the used oil and provides safe handling and efficient collection and transportation procedures for used oil
- An appropriate number of public drop off points need to be available with regular oil collection
- Also, containers need to be left at regular generator locations for collection
- Industrial and commercial used oil generators must have trained staff and must store used oil in containers that are correctly labelled and in bunded and covered enclosures

Best Practice Used Oil Transportation

- Used oil transporters commercially collect used oil from generators or collection points and transport it to storage facilities.
- All drivers must have a valid driver's licence for the vehicle they are driving and appropriate used oil transportation training
- All tank wagons used in the collection of used oil must comply with relevant national regulations for transport of hazardous substances
- Transported used oil must have a flash point greater than 60degC (determined by a flash point test or vapour test at collection points.
- Records must be kept for each collection site detailing the date and volume of used oil collected
- All tank wagons must carry a road tanker spill kit.

Best Practice Used Oil Bulk Storage

Owners and operators of used oil bulk storage facilities must:

- Maintain and operate the facility in accordance with consents
- Must comply with all relevant requirements of the relevant legislation
- Used oil storage tanks must have some method to determine the volume of used oil in it and be in situated in bunded areas (110% and preferably covered). Alternatively, the tanks can be double-skinned.
- The storage facility must have hazard signage, an emergency response plan, fire extinguishers, trained staff and spill clean-up kits and PPE available
- Need fire extinguishers and precautions for flammable liquids

Local Collection Containers

Drums can be used, but a good idea is to use double-skinned strong plastic tanks 1000 litres in capacity that are easily lifted and collected.

Public Drop-off Centres

Many variations are possible. The photo shows an “Off the Shelf” Public Drop-off Centre that is easy to use and has a double skinned tank.

Disposal / Reuse Options

- Local reuse – Boiler fuel or other fuel – there is a risk if used untreated – air pollution, damage to equipment
- Controlled Incineration – Heat / electricity generation potential
- Pyrolysis – processing is needed – e.g. Nufuels
- Local construction of a suitable plant – could also be pyrolysis as in Vanuatu
- Overseas export – a common solution in the Pacific, e.g. to New Zealand, Fiji and other places – e.g. India, South Korea and Saudi Arabia

How Can all this be Financed?

- By Product Stewardship mechanisms, or Extended Producer Responsibility (EPR) which requires for used oil, that the cost to collect and treat or export used oil is added to purchase price of imported lubricant product
- Sustainable use oil management in PICs will require establishment of **a user-pays management system** enforced under legislation
- This will require the collection of an Advanced Recycling Fee (ARF) on all imported lubricant products enforced under Government regulations
- The Advance Recycling Fee (ARF) can be collected before the product is sold, and collected monies are then directed to whoever conducts the recovery for recycling or export

Management Plan Purpose

- The National Used Oil Management Plan (NUOMP) establishes and directs an appropriate management framework to improve national management of used oil
- **It promotes shared used oil management responsibility by all national stakeholders**
- The NUOMP has been guided and directed by a comprehensive range of national stakeholder data on existing national used oil generation and management

NUOMP Goals

1. Minimisation of Unnecessary Generation of Used Oil
2. Minimisation of the Adverse Effects of Used Oil on the environment and people
3. Management of used oil conforms with relevant national and international legal requirements
4. Costs associated with used oil management are met by the generators of used oil.
5. Coordination of management activities is maximised to ensure cost-effective environmental outcomes.
6. Capacity of stakeholders to achieve effective outcomes is increased.

Regulatory Framework – Vanuatu as an Example

- The Waste Management Act 2014 (WMA) provides for the protection of the environment by encouraging effective waste services and operations. Responsibilities are shared between DEPC, local councils, MOH and Biosecurity Vanuatu. The WMA can be used to set in place the ARF.
- National Hazardous Waste Policy and Costed Implementation Plan (NHWPIP). This is part of a broader reform of chemicals management (NCPIP) and used oil is one of several hazardous waste streams to be covered by the NHWPIP.
- Environmental Protection and Conservation Act 2011 (EPCA). This is the overarching environmental law of Vanuatu. Among other things it provides for regulation of the environmental effects of hazardous substances.
- Pollution Control Act 2013 (PCA). This Act controls the discharge and emission of pollution in Vanuatu, including Compliance Action.

Role of the Government

The following are the Government Roles:

- Take the lead in establishing legislation to regulate used oil management activities
- Take the lead in final cost benefit analysis of national used oil management
- Take the lead in reporting national lubricating oil imports and used oil data
- Take the lead in the development of national environmental guidelines for the safe handling, collection, transportation, and storage of used oil,
- Take the lead in the development of national training programmes for used oil management, targeting both industry and the community
- Implement a Code of Practice for used oil management
- Take the lead in enforcement of relevant workplace compliance and health and safety legislation

Critical Establishment Activities

- Prepare the National Used Oil Management Policy based on the NHWPIP and SWAP Used Oil Project
- Complete Detailed National Used Oil Cost Benefit Analysis
- Amend WMA to incorporate used oil management in conjunction with NHWPIP Reform
- Establish of a User Pays system under the Waste Management Legislation
- Establish a National Used Oil Steering Committee
- Establish a National Used Oil Managing Agency

Moana Taka Partnership (MTP)

The Moana Taka Partnership (MTP) is a partnership between Swire Shipping and SPREP to provide free container hire and free shipment of eligible wastes between Swire Shipping serviced ports. The waste shipment has to be for cargoes that are classified as “non-commercial”.

“Waste Oil” is one of the clearly stated categories of waste eligible for this service.

The MTP therefore offers benefits for the management of used oil if export is planned.

Critical Implementation Activities

- Commence National Used Oil Management System
- Public and industry education and training programme
- Collection of an Advanced Recycling Fee (ARF)
- Monitoring and Evaluation

National Used Oil Management System

The key parts of the system are:

- Used Oil Collection
- Used Oil Transportation
- Used Oil Storage
- Used Oil Treatment and Reuse – Local processing or export

Conclusions

- Used Oil is frequently mismanaged in the Pacific and therefore has negative impacts on Human Health and the Environment.
- Used oil is ideal for including in the Circular Economy.
- The SWAP Programme has set out to develop practical and cost- effective used oil management systems in the Pacific– four countries, Samoa, Solomon Islands, Tonga and Vanuatu.
- SWAP has focused on safe collection, storage and disposal, funded by an ARF, and setting up effective management systems.

LEVERAGING THE BASEL AND WAIGANI CONVENTIONS TO FOSTER A CIRCULAR ECONOMY IN THE PACIFIC

JOSHUA SAM

WAIGANI CONVENTION SECRETARIAT

Introduction

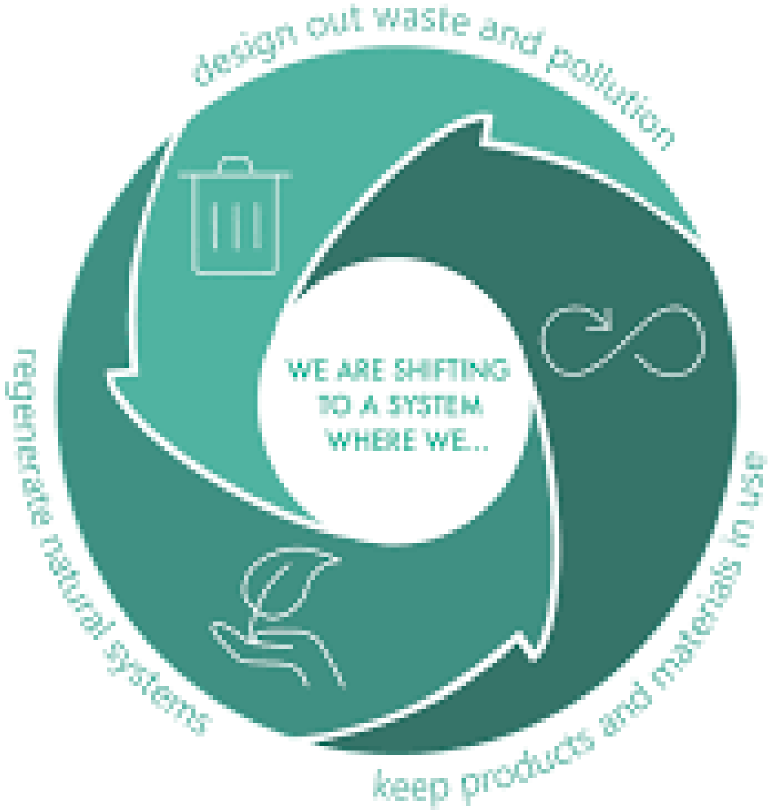
- **Objective:** Introduce the importance of international frameworks, particularly the Basel and Waigani Conventions, in promoting circular economy principles in the Pacific.

- **Key Message:** The Pacific's ability to contribute to the circular economy is closely tied to effective waste management through reuse, pre-treatment, and export of recyclables, which are enabled by these conventions.

Secretariat of the Pacific Regional Environment Programme

The reality of the circular economy in the Pacific

- The Pacific's small-scale manufacturing sector limits its role in circular economy efforts at the design and production stage.
    - The Pacific islands import the majority of their goods, making it difficult to influence product design and sustainable production methods.
    - Circularity at the design stage—like product longevity or modularity—is not within the control of Pacific Island countries (PICs).
- Given these constraints, the focus must shift toward managing waste post-consumption, particularly through reuse and recycling.



SPREP
Secretariat of the Pacific Regional Environment Programme

Circularity opportunities for import dependent countries

- In import-dependent economies like the Pacific, circularity opportunities primarily lie in post-consumption processes such as reuse, recovery, re-purpose and recycling.
- Examples:
  - Extending the lifecycle of goods through repair and refurbishment.
  - Collecting and exporting recyclable materials (plastics, e-waste) rather than allowing them to accumulate in landfills.
- PICs must maximize circular economy gains through effective waste management, reuse, and recycling strategies, rather than relying on manufacturing innovations.

Current reality of recycling in the Pacific

- Lack of infrastructure for full-scale recycling
- Limited to collection and pre-treatment
- Requires export for recycling

SPREP
Secretariat of the Pacific Regional Environment Programme

The Basel Convention: Key international legal framework governing circularity

Overview: The Basel Convention is the leading global agreement controlling the transboundary movements of hazardous wastes and their disposal.

- Adopted in 1989, it has 188 parties, making it one of the most widely ratified environmental treaties.
- Its primary goal is to protect human health and the environment by ensuring that hazardous waste is managed safely and does not end up in countries lacking the capacity for sound disposal.

Key Features

- **Prior Informed Consent (PIC) Procedure:** Requires countries to give explicit consent before hazardous waste is transported across borders, ensuring transparency and accountability.
- **Ban on Hazardous Waste Exports to Non-Party Countries:** Prohibits the export of hazardous waste to non-parties or countries that cannot manage the waste.
- **Focus on Recycling and Circular Economy:** Recent amendments include controls on the international trade of plastic waste, encouraging recycling and the proper disposal of plastics.

The Basel Convention plays a crucial role in preventing hazardous waste dumping in developing countries, promoting global environmental justice, and facilitating sustainable waste management practices that align with circular economy principles.

SPREP
Secretariat of the Pacific Regional Environment Programme

The Basel Convention & Circularity in the Pacific

- Key enabler of the circular economy
- Ensures that waste exported for recycling is managed responsibly, adhering to global environmental standards.
- Enables access to international world class recycling facilities through clear legal frameworks.

BASEL CONVENTION

SPREP
Secretariat of the Pacific Regional Environment Programme

Consequences of Circularity Without Basel and Waigani

Waste in Landfills: Without the ability to export recyclables, valuable resources such as metals, plastics, and other materials used in manufacturing would end up in Pacific landfills, undermining efforts to create a circular economy.

Environmental and Economic Costs: This waste leads to pollution, loss of potential revenue from recyclables, and increased greenhouse gas emissions from landfill decomposition.

Circularity Compromised: If the Pacific cannot export waste, resources embedded in imported goods are effectively wasted, resulting in environmental degradation and lost economic opportunities.

Without Basel and Waigani Conventions, we remain stuck in the "linear economy".

Conclusion

- The Basel and Waigani Conventions are indispensable for the Pacific's ability to contribute to the global circular economy. By facilitating the safe export of recyclables, these conventions ensure that valuable resources are recovered rather than wasted in landfills.

- Strengthen the mechanisms supporting waste collection, pre-treatment, and export to enhance circularity and secure a sustainable future for the Pacific.

SPREP
Secretariat of the Pacific Regional Environment Programme

HAZARDOUS WASTE MANAGEMENT IN WALLIS AND FUTUNA

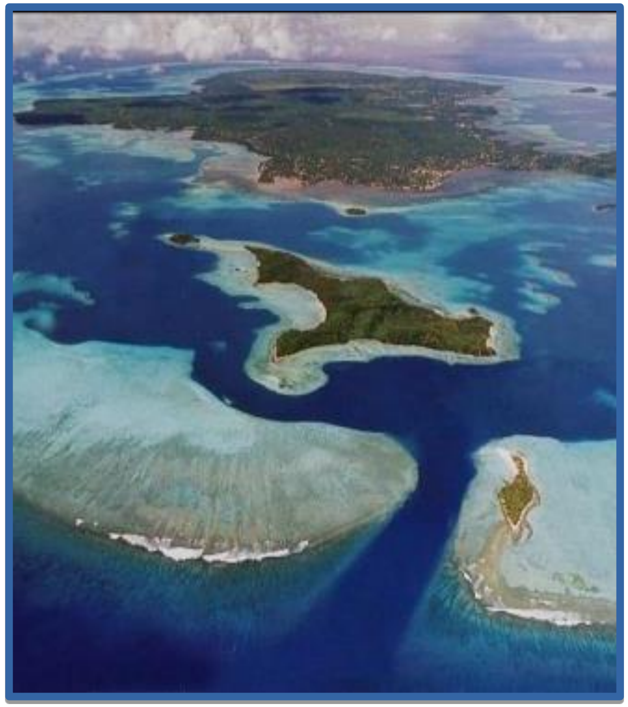
DANGEROUS WASTE MANAGEMENT

A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

Geographical context



Wallis:
78 km² of land,
200 km² lagoon,
4 passes,
80 m deep,
20 volcanic coral islets.
Population: 8,088

Futuna :
46 km² of land,
No lagoon,
Fringing reefs,
Neighbouring island:
Alofi, 18km², uninhabited.
Population: 3,063

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

Wallis :

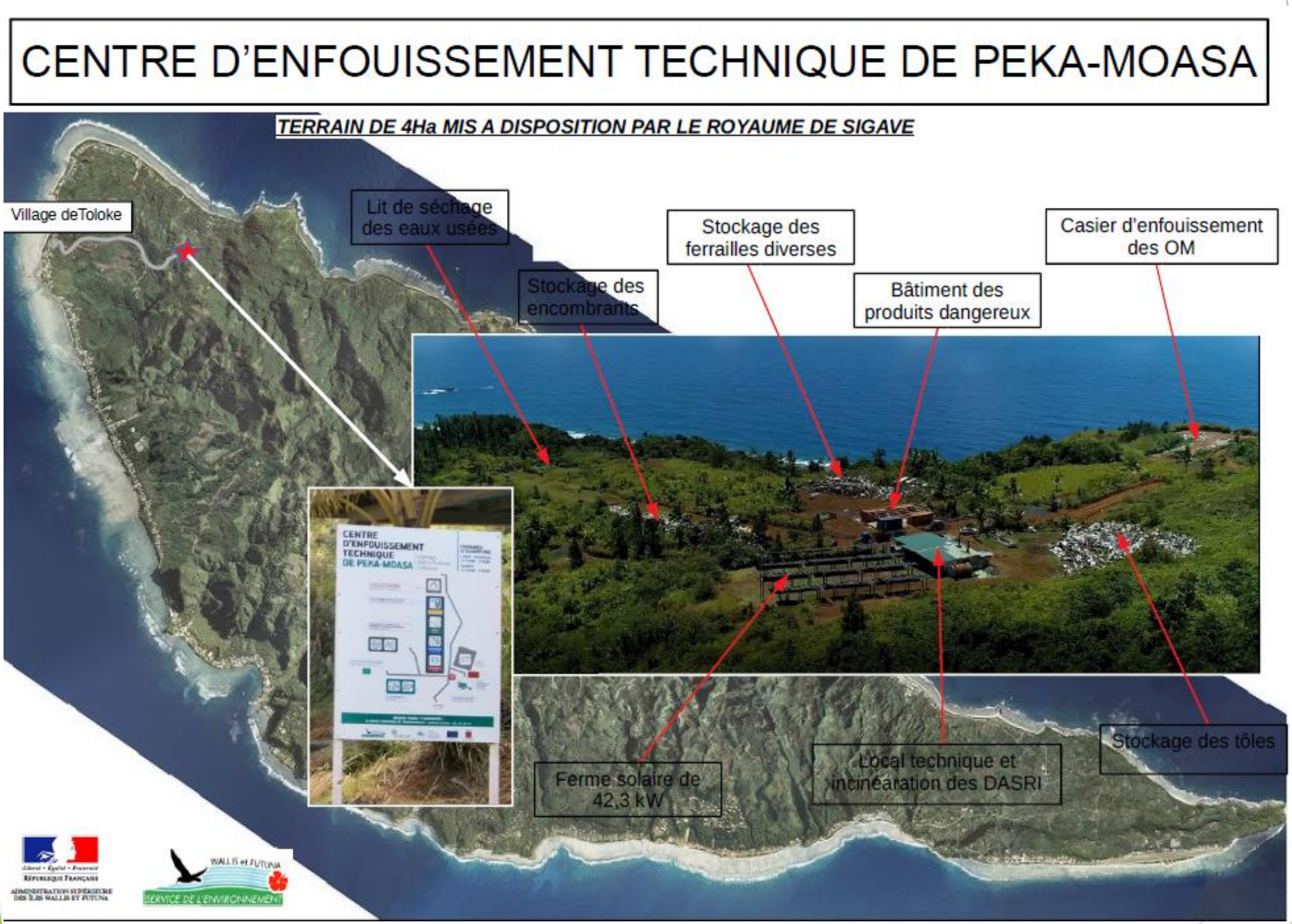
Population: 8,088

CENTRE D'ENFOUISSEMENT TECHNIQUE DE VAILEPO

TERRAIN DE 8 Ha MIS A DISPOSITION PAR LA CHEFFERIE D'UVEA

Futuna :

Population: 3,063



Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

Historical context

1997: Setting up of the « service territorial de l'environnement (STE) »

2003: Rehabilitation of the VAILEPO dumpsite (Wallis) into a landfill managed by STE

2006:Setting up of MOASA landfill on the PEKA plateau in Futuna under the management of STE

2007: Adoption of the territorial environmental code

- Ensure and monitor the management of the physical, natural and man-made environment, and improving the quality of life.
- Define and propose the necessary content for development of a coherent environmental policy
- To be consulted for its opinion on any proposed text concerning or having an impact on the environment

Historical context

10% levy on batteries, accumulators, pesticides and heavy oils (Art E.142-1 and Art E.142-2)

A cleanliness tax on other goods

2008: Initiation of oil and battery sorting in garages with commitments through agreements with the STE

2016-2017: Export of historical stockpiles, i.e. almost 200,000 litres of used oils and more than 200 tonnes of used batteries. EU funding INTEGRE Programme

Lessons learnt

Significant involvement of the region's public policies in protecting water resources and the environment in general

2016-2018

- 1ST EXPORT OF HAZARDOUS WASTE

→ **Creation of export networks** from WF to NZ, exchanges between NC experts and the Territory for better **treatment of hazardous waste.**

→ **Staff training:** **r**econditioning in compliance with current regulations, capacity building, improvement of health and safety conditions, etc.

→ **Political willingness:** finding solutions via specific agreements, preserving water resources, improving waste management, etc.

Lessons learnt

Significant involvement of the region's public policies in protecting water resources and the environment in general

2019-2022

- REINFORCEMENT OF LANDFILLS UNDER OPERATION

Le projet de réaménagement du site est présenté sur le plan de masse joint au présent dossier.

CET de Vailepo – Avant-projet Détaillé Page 19/52

- Acquisition of two ELV depollution plants (one on each island)
- Hazardous waste storage areas complying with export regulations

Lessons learnt

Significant involvement of the region's public policies in protecting water resources and the environment in general

2021

- FINANCING FOR THE TREATMENT OF HAZARDOUS WASTE, IN PARTICULAR FOR THE RENEWAL OF STOCKS

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

Lessons learnt

Significant involvement of the region's public policies in protecting water resources and the environment in general

2022-23

- 2ND EXPORT OF HAZARDOUS WASTE

63 T of Batteries
115 T of Oil

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

Reprocessing overseas

Packaging → Huge stockpiles → Valuable deposit → Reprocessing overseas

Hazardous waste	Car batteries (kg)	Used oil (L)	Transformers (u)	Household batteries (kg)
WALLIS	136,000	121,600	12	2,000
FUTUNA	39,000	37,000	8	200

Liberté • Égalité • Fraternité
République Française

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

Export Procedure

1. **Procurement**
2. Request for transboundary
3. Export permits
4. Export

Procurement: annual purchase order contract, renewable 3 times, awarded to SOCADIS (NC): certified company specialised in hazardous waste, with treatment and disposal facilities.

SOCADIS handles all the documentation: Cross-border movements: subject to the Basel Convention, and therefore subject to authorisation from each country of maritime transit; **Export permits**

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

Exportation Coûts

DESIGNATION	QTE	UNITE	PU.HT	TAXE %	MONTANT HT
PRESTATIONS					
TRAITEMENT					
BATTERIES					
WALLIS					
Batteries au Plomb WF UN2794	94 800	KG	-6	0	- 568 800
Coût opérationnel	94 800	KG	92	0	8 721 600
Coût Exportation	94 800	KG	196	0	18 580 800
FUTUNA					
Batteries au Plomb WF UN2794	18 000	KG	-6	0	- 108 000
Coût opérationnel	18 000	KG	92	0	1 656 000
Coût Exportation	18 000	KG	196	0	3 528 000
HUILES USAGEE					
WALLIS					
Huile usagée 32 400 kg	32 400	KG	58	0	1 879 200
Coût opérationnel	32 400	KG	92	0	2 980 800
Coût Exportation	32 400	KG	196	0	6 350 400
FUTUNA					
Huile usagée 11 520 kg	11 520	KG	58	0	668 160
Coût opérationnel	11 520	KG	92	0	1 059 840
Coût Exportation	11 520	KG	196	0	2 257 920

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

Exportation Coûts

MELANGES GASOIL					
WALLIS					
Mélange gasoil	3 600	KG	280	0	1 008 000
Coût opérationnel	3 600	KG	92	0	331 200
Coût Exportation	3 600	KG	196	0	705 600
FUTUNA					
Mélange gasoil	5 220	KG	280	0	1 461 600
Coût opérationnel	5 220	KG	92	0	480 240
Coût Exportation	5 220	KG	196	0	1 023 120
EMBALLAGES ET CHIFFONS SOUILLES					
WALLIS					
Emballages et chiffons souillés aux hydrocarbures	2 400	KG	122	0	292 800
Coût opérationnel	2 400	KG	92	0	220 800
Coût Exportation	2 400	KG	196	0	470 400
FILTRES A HUILES					
WALLIS					
Filtres à huiles	2 400	KG	72	0	172 800
Coût opérationnel	2 400	KG	92	0	220 800
Coût Exportation	2 400	KG	196	0	470 400
PILES USAGEES					
WALLIS					
Piles usagées	2 400	KG	1738	0	4 171 200
Coût opérationnel	2 400	KG	92	0	220 800
Coût Exportation	2 400	KG	196	0	470 400

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

PROSPECTS

WASTE MANAGEMENT PLAN 2022-2030 for Wallis and Futuna in progress

OVERALL OBJECTIVE: TO LIMIT POLLUTION AND NUISANCE CAUSED BY WASTE

- Reduce waste and all sources of pollution upstream
- Cleaning up and restoring sites
- Improve waste collection and sorting
- Improve local and/or export waste recovery

Development of a local and/or regional circular economy

Local and/or export recovery of recyclable waste (hazardous, sorted, etc.) through :
* strengthening technical and administrative capacities →cf modernisation of ladfill
* regional cooperation (development of maritime links and exchanges with our close neighbours)

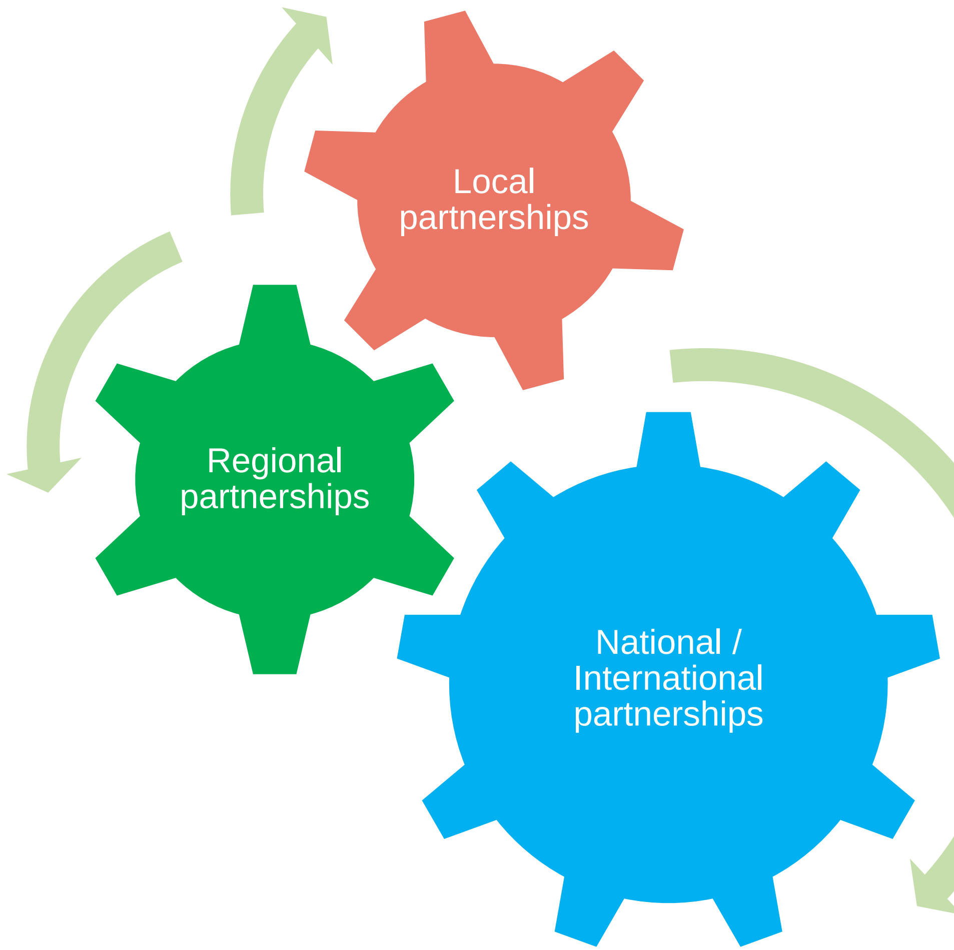
- Engager des discussions entre les PTOM sur le sujet de la gestion des déchets dangereux en vue de préparer des positions communes
- Engager des discussions entre les PTOM et l'Etat sur l'accession de la France à la Convention de Waigani
- Engager des discussions avec certains Etats clés de la région pour ouvrir la possibilité d'accords bilatéraux sur le transfert des déchets
- Faire un état des lieux sur les réglementations sur les déchets dangereux et leurs mouvements dans les PTOM pris individuellement
- Engager des discussions avec le PROE et les autres Etats du Pacifique sur leur accession à la Convention de Bâle
- S'associer avec le PROE pour porter le sujet d'amélioration de la gestion des déchets dangereux dans le Pacifique

Regi

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE

WALLIS et FUTUNA
SERVICE DE L'ENVIRONNEMENT

The success of a strategy depends on a synergy of partners at all levels



Many thanks to all our partners for your contribution

Malo te ofa mo te kataki

Appendix D: Power Point Presentations

SESSION #2: CIRCULARITY IN WASTE MANAGEMENT VS LANDFILL

- Appendix D8: How circularity in waste management can extend the lifespan of landfill

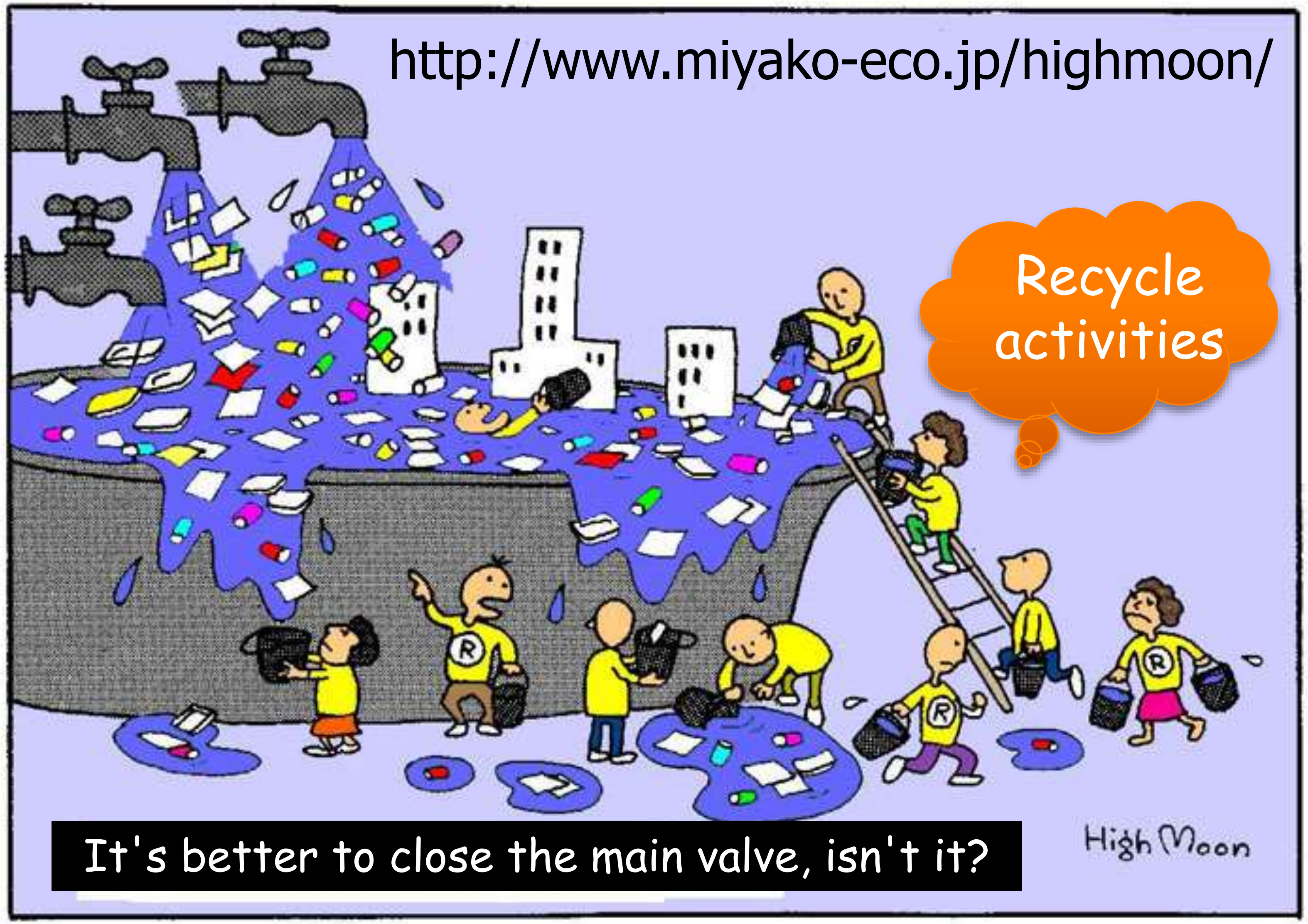
How Circularity in Waste Management Can Extend the Lifespan of Landfill

Regional Workshop:
A circular approach to waste management in the Pacific
30 September 2024

Amano Shiro
JICA Advisor

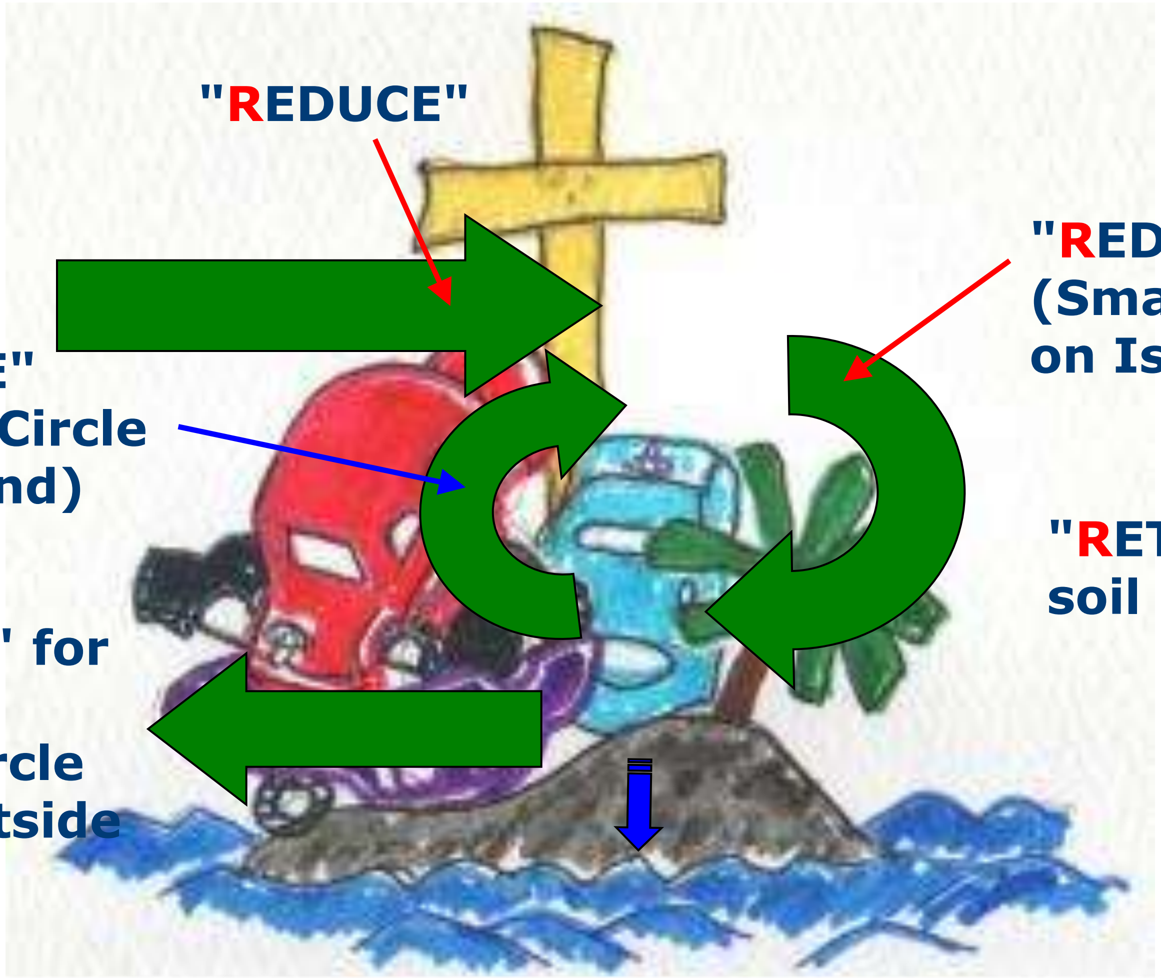
PacPlan Resilience Project 2022-25

The real problem is upstream !



One-way Traffic
- Waste Remains on Island -

What is the “3R+Return”?



Reduce input/import, maximize circulation and maximize output/return in order to minimize waste disposal in a small island!...... .

Success of Waste Minimization in a small city in Japan

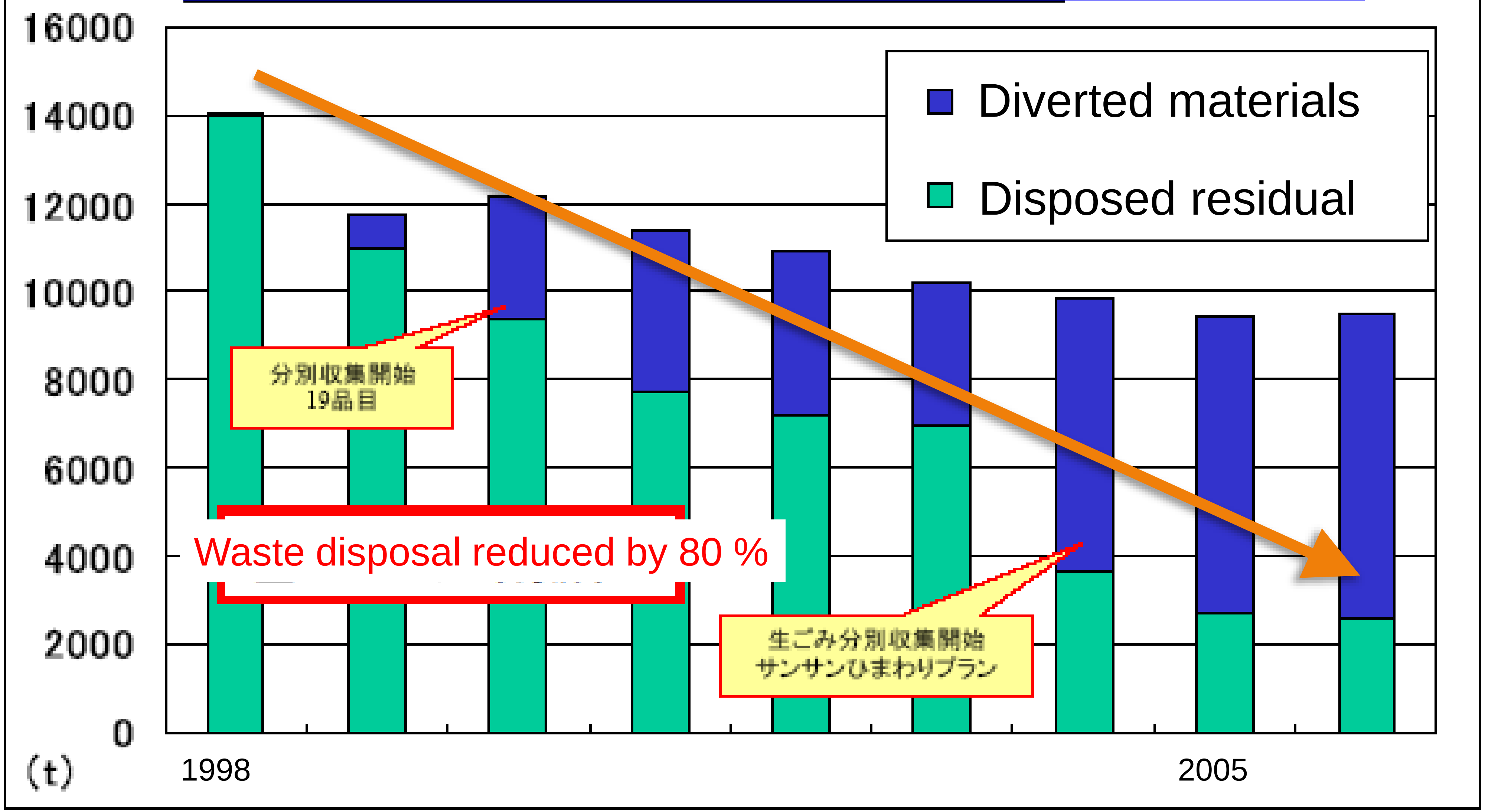
- 80% reduction of waste without incineration

  (50t/day →10t/day in 7 years)

- Key Factors for Success

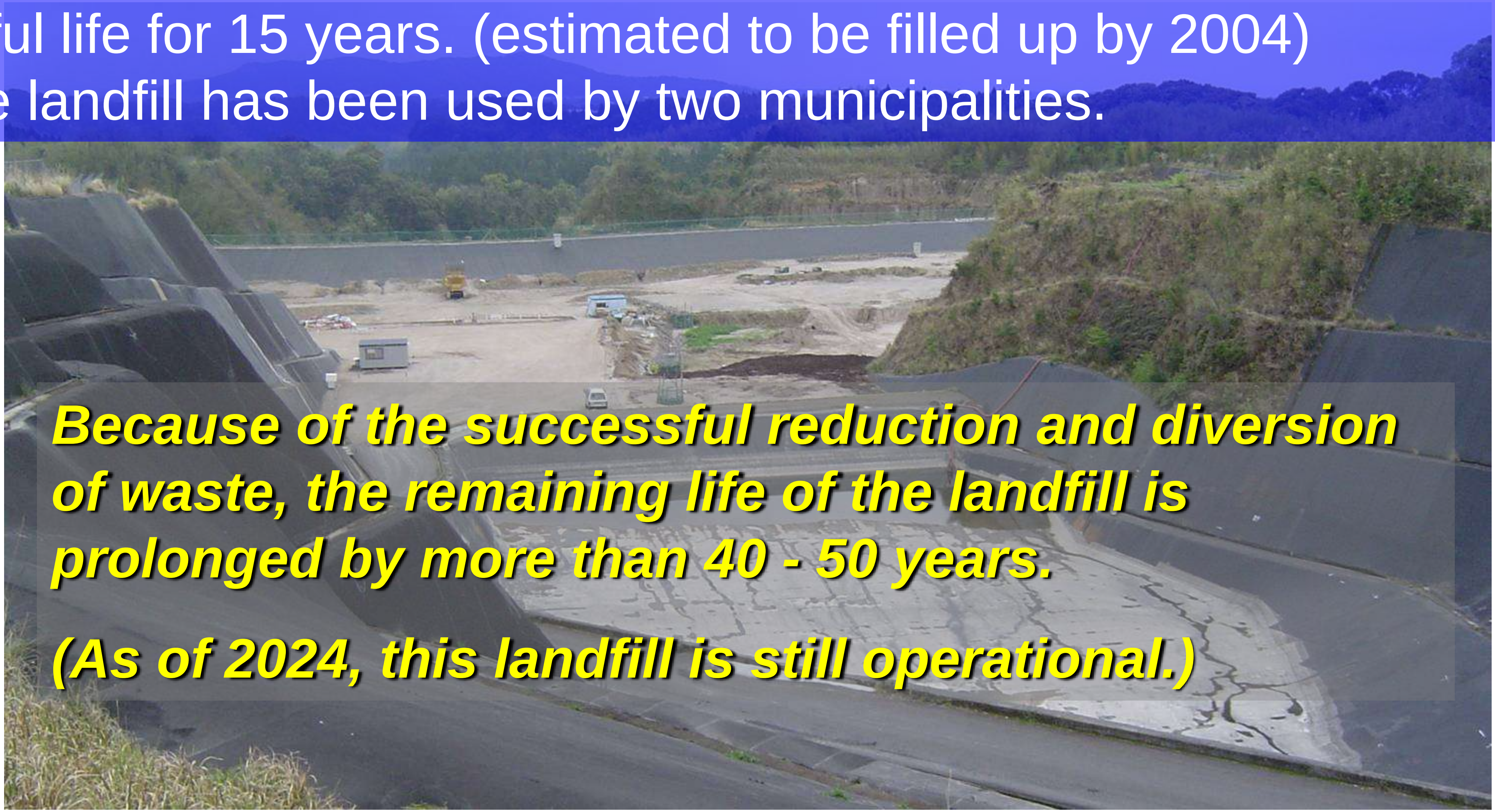
  - Collaboration of the local government, community and private sector

Success Story of SHIBUSHI City



Shibushi Landfill

- Operation started in 1990 with the capacity of 720,000 m^3 and its useful life for 15 years. (estimated to be filled up by 2004)
- The landfill has been used by two municipalities.



Because of the successful reduction and diversion of waste, the remaining life of the landfill is prolonged by more than 40 - 50 years.

(As of 2024, this landfill is still operational.)

Improved Landfills in PICs Assisted by Japan/JICA

Country	Name of Landfill	Year	Assisted by:	Method Applied	Current Status
Samoa	Tafaigata Landfill	2003, 2005	JICA experts	Fukuoka method	Fair/Good
	Vaaiata Landfill	2006	**Local expert*[1]**/Funded by Samoa Gov.	Fukuoka method (P)	Fair
Vanuatu	Bouffa Landfill	2006~2008	JICA expert/JICA Project	Fukuoka method	Poor
Palau	M-dock Landfill	2005~2008	JICA expert/JICA Project	Fukuoka method	Good
	Aimeliik Landfill	2020	Japanese Grant Aid (New Landfill)	Fukuoka method	Good
FSM	Kosrae Landfill	2006~2008	US engineer guided by JICA expert	Fukuoka method	Fair/Good
	Yap Landfill	2014	J-PRISM/Funded by Japanese Embassy	Fukuoka method	Fair/Good
	Pohnpei Landfill	2013	**Local expert*[1]**/J-PRISM	Fukuoka method	Fair/Good
Fiji	Vunato Landfill	2008~2012	JICA expert/3R Project	Controlled dump	Good
	Sigatoka Landfill	2013	JICA expert/J-PRISM	Controlled dump	Poor
	Labasa Landfill	2014	**Local expert*[1]**/J-PRISM/Australia	Fukuoka method	Good
Tonga	Kalaka Landfill	2011~2012	**Local expert*[1]**/J-PRISM	Fukuoka method (P)	Fair
Solomon Islands	Ranady Landfill	2015, 2017	**Local expert*[2]**/J-PRISM/NZ	Fukuoka method (P)	Poor
	Gizo Landfill	2012	**Local expert*[1]**/J-PRISM	Controlled dump	Poor
Papua New Guinea	Baruni Landfill	2015~2017	**Local engineer**/J-PRISM	Fukuoka method	Good

Note: (P) – partially adopted

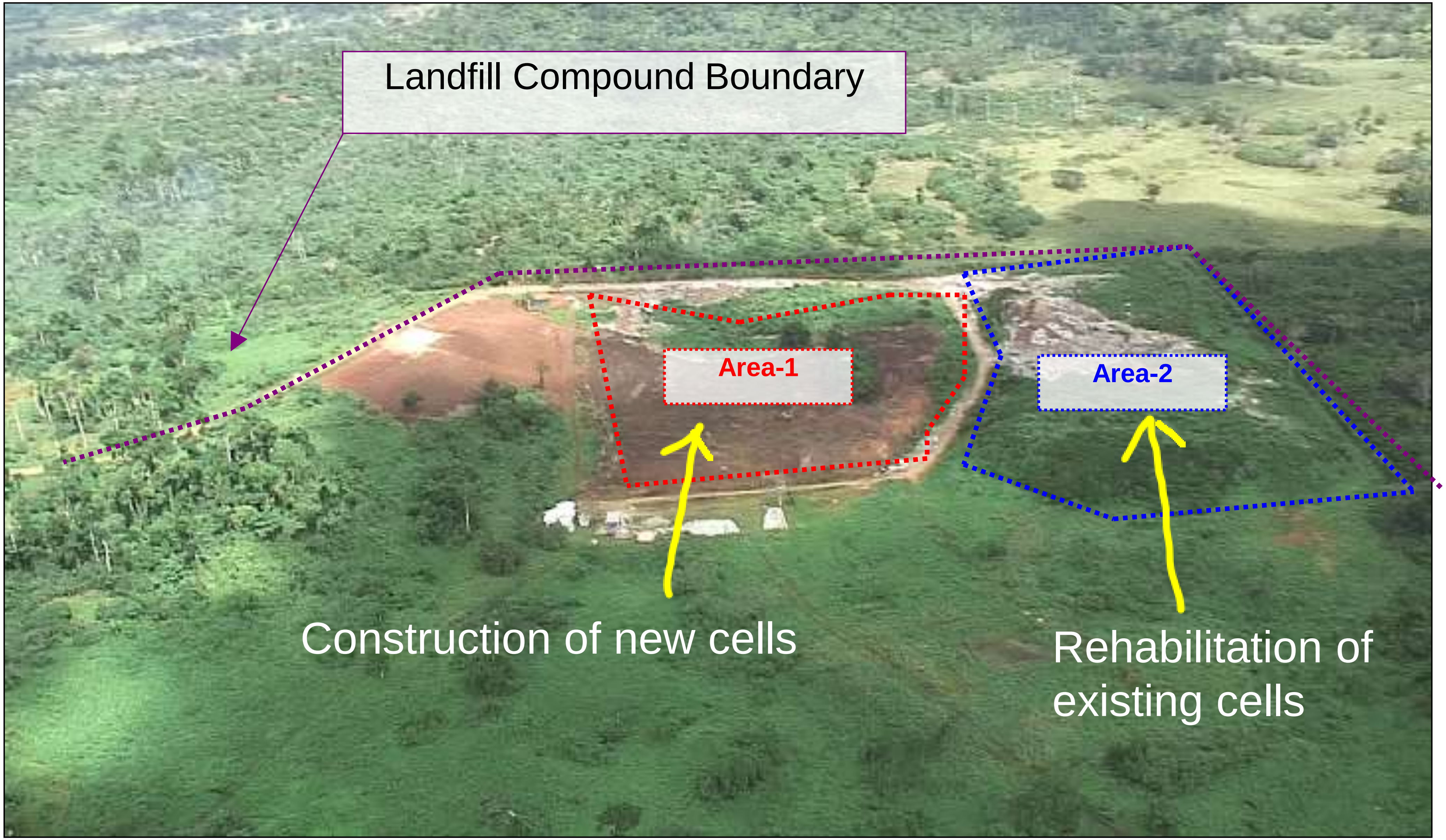
Previous Situation of Bouffa Landfill in 2005

Smoldering

Fire

Typical Open Dumping

Improvement Plan: Site Location



Preparation Work for Construction

Steel molds

Casting Concrete

Concrete Leachate Pipe

Concrete pipes manufactured on site

Rehabilitation of Existing Cells (Area-2)

Clearing/removing Existing Waste

Placing Leachate Pipes

Building the Pipes Network with leachate/gas-vent Pipes

Backfilling Waste on the pipes

Construction of New Cells (Area-1)

Clearing of Top Soil

Excavation

Cell construction

Cell construction

New Disposal Cells (Area-1)

Built up Leachate Collection Network Pipe line

New Disposal Cells (Area-1)

Starting of Tipping

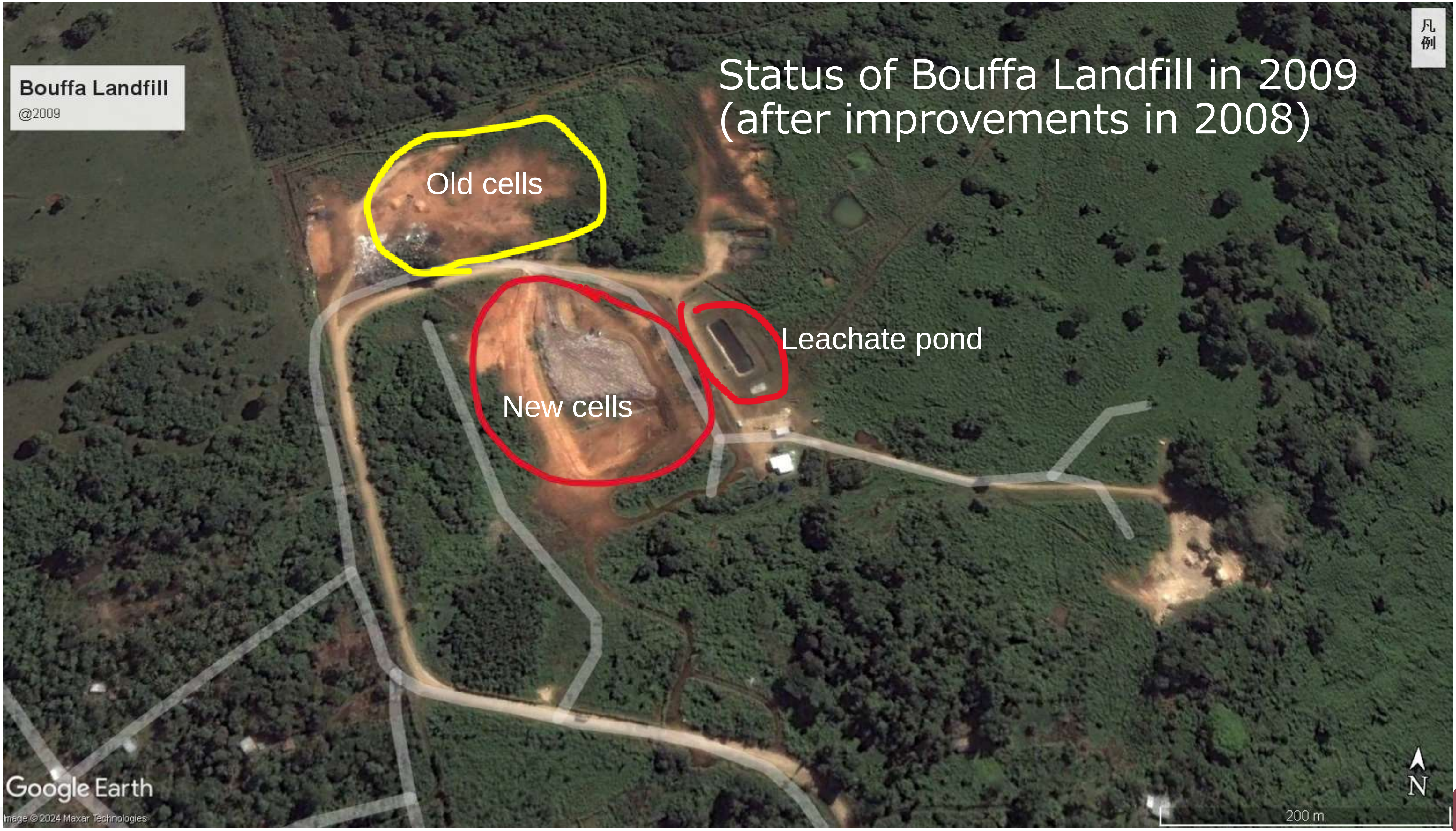
Others

Conduit pipe to the pond from the existing cells

Warehouse

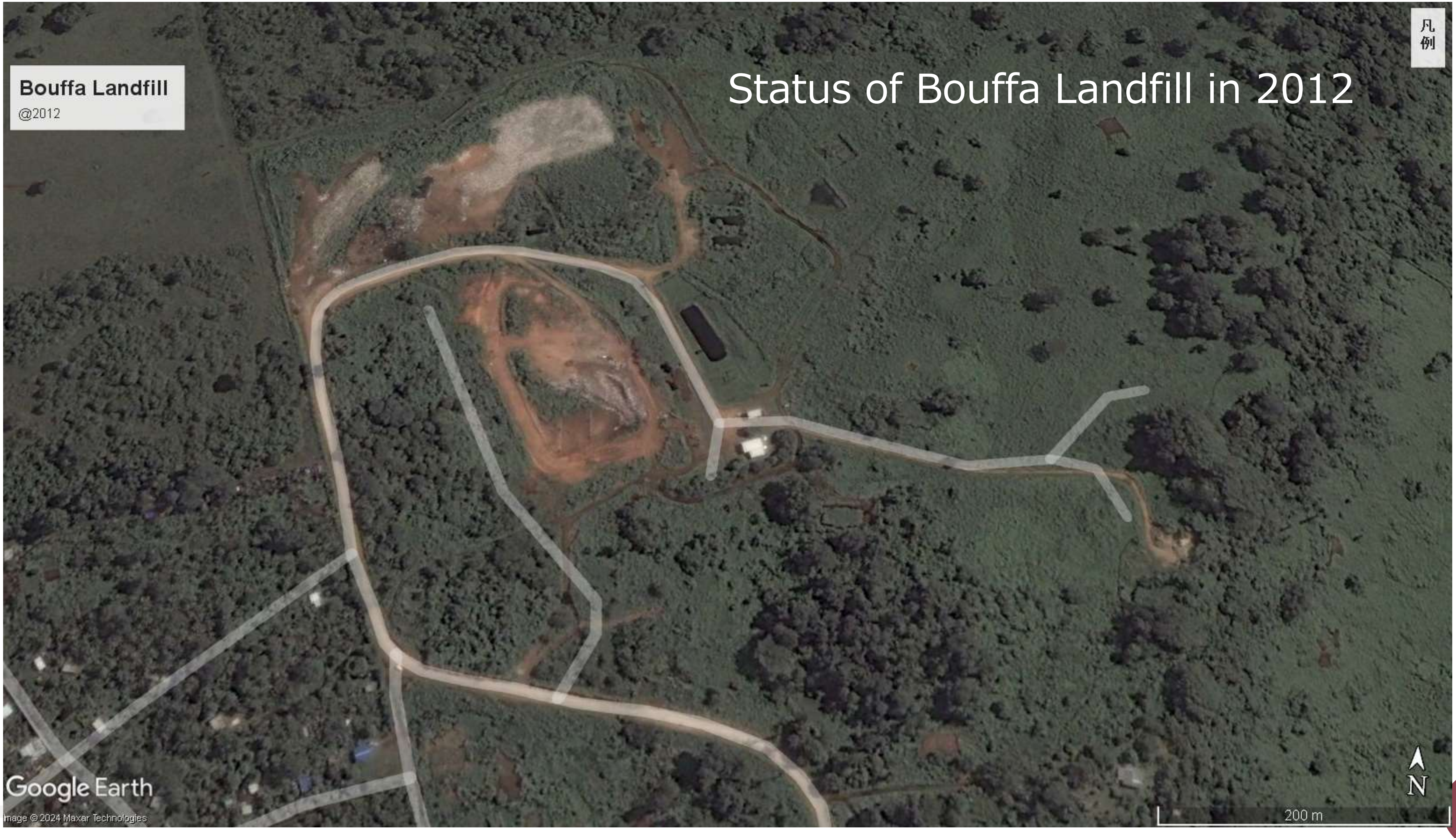
Initial on-site training

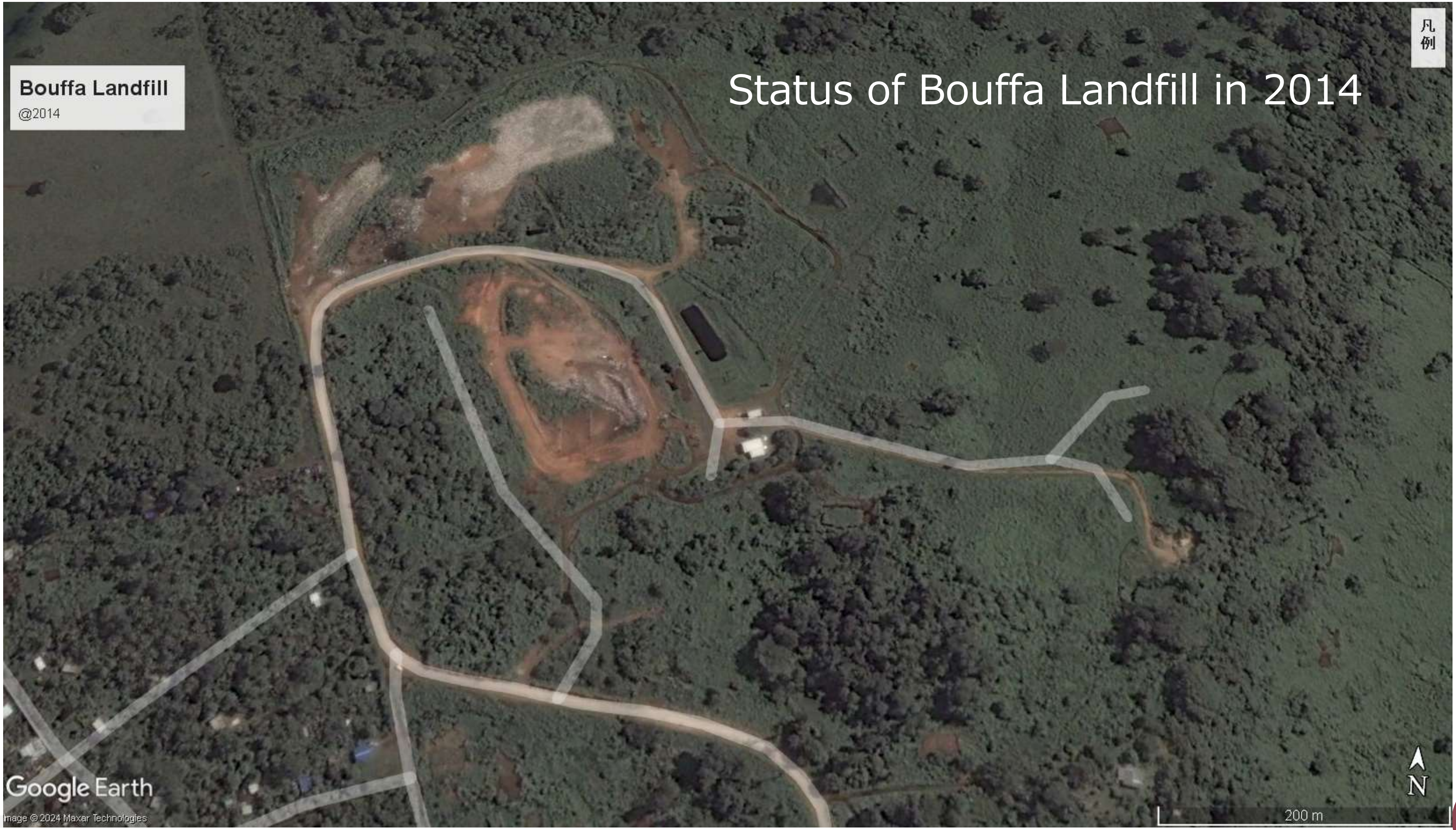
Upgraded Access Road

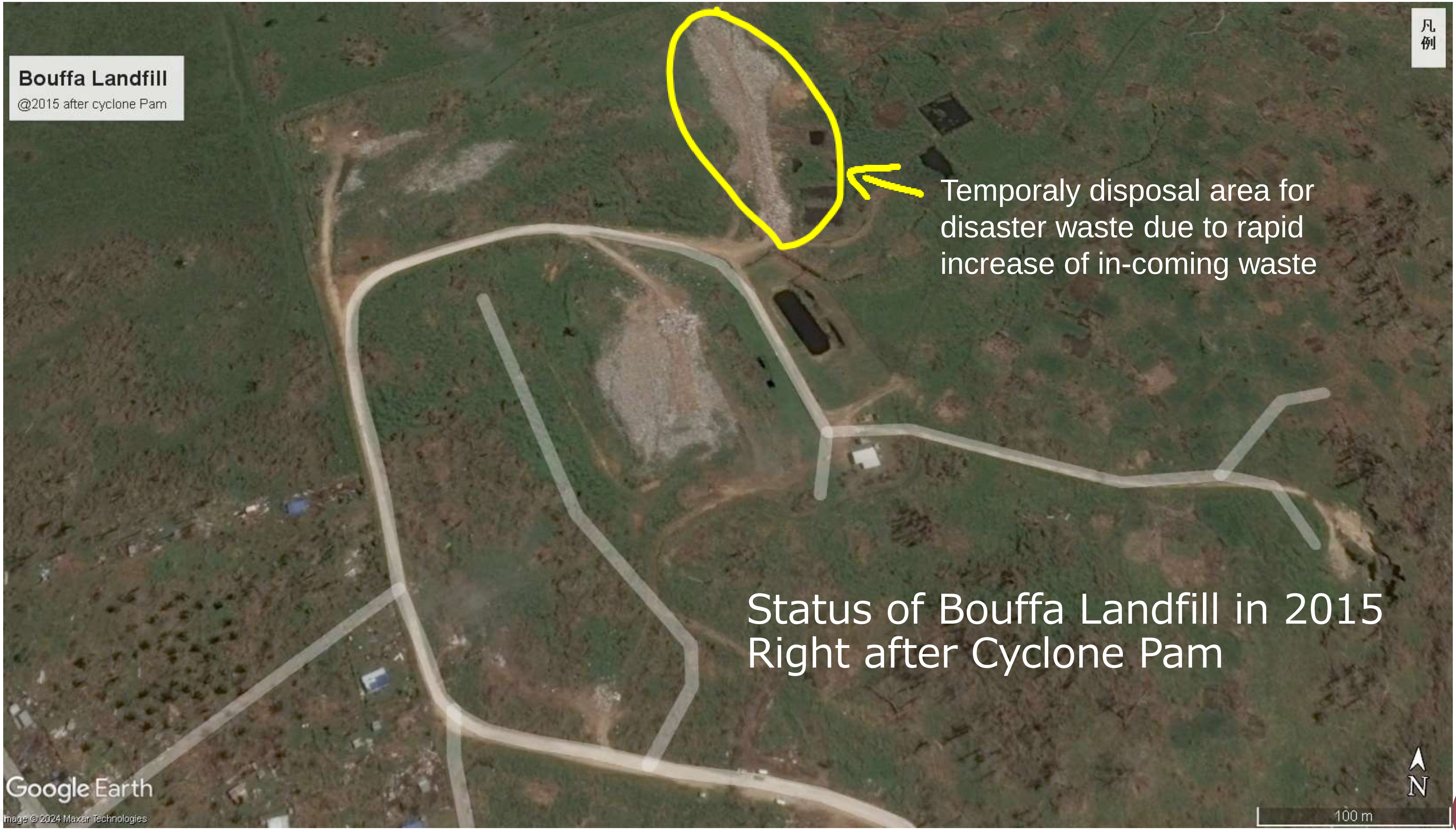


Bouffa Landfill
@2009
Status of Bouffa Landfill in 2009
(after improvements in 2008)
凡
例
Old cells
New cells
Leachate pond
Google Earth
Image © 2024 Maxar Technologies
N
200 m

Status of Bouffa Landfill in 2012




Bouffa Landfill
@2014
Status of Bouffa Landfill in 2014
凡
例
Google Earth
Image © 2024 Maxar Technologies
N
200 m


Bouffa Landfill
@2015 after cyclone Pam
凡
例
Temporaly disposal area for
disaster waste due to rapid
increase of in-coming waste
Status of Bouffa Landfill in 2015
Right after Cyclone Pam
Google Earth
Image © 2024 Maxar Technologies
N
100 m


Bouffa Landfill
@2017 Extension of additional Cell in collaboration with JICA/EU
Status of Bouffa Landfill in 2017
After extension of the additional cell in collaboration with JICA/EU in 2016-2017
凡例
Google Earth
Image © 2024 CNES / Airbus
N
100 m

Change of site conditions

Return to open dumping again ?

Improved in 2008 and was the best landfill in the Pacific in 2011

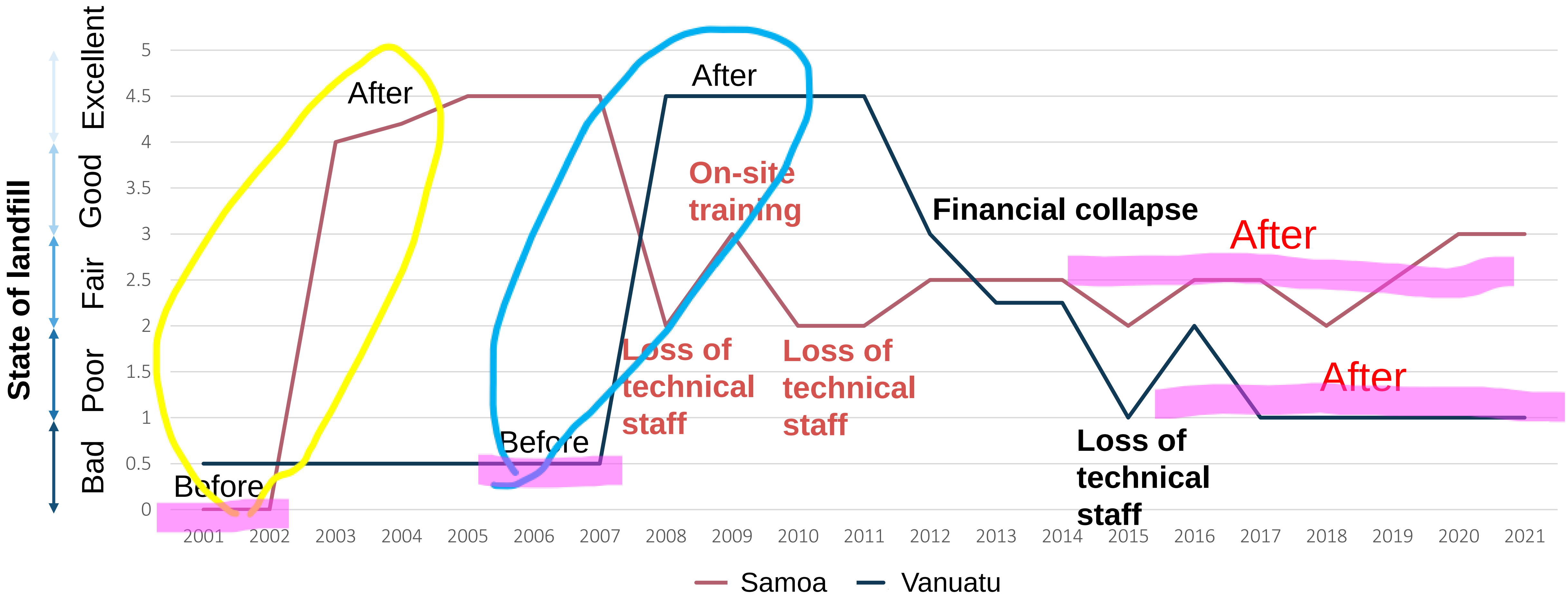
Photo: JICA/J-PRISM

J-PRISM Sub-regional Training on Landfill Management, Vanuatu, October 2011

Why the system does not work?

- **Improper design and construction**
  - Lack of understanding (or technical knowledge) on the semi-aerobic landfill system
  - Copy & paste approach
- **Improper operation**
  - Lack of understanding (or technical knowledge) on the operation
  - Lack of resources to sustain improved operation
  - Inability to bear technical costs (operation fund & skilled personnel)

Change in the State of Landfills over time
(Tafaigata in Samoa and Bouffa in Vanuatu)



Sequence of Events (bad steps)

1. Big mess

(Open dump)

2. LG requests a new landfill

3. Donor constructs a new landfill or carries out substantial improvements on the existing dump

4. Donor provides little or no training for day-to-day operation and LG requires more cost to properly operate the landfill than that of open dumping

Falling down

Because:

- **LG cannot bear the cost for operation**
- **No skilled personnel to maintain Fukuoka method**

→Return to open dumping

LG: Local government

Sequence of Events (good steps)

1. Big mess

(Open dump)

2. LG requests a new landfill

3. Donor assists LG to carry out substantial improvements on **the existing dump**

4. Donor provides sufficient technical training and follow-up, and assists LG to improve financial status or to establish an additional funding

5. LG maintains good operation with its own budget and resources

6. Donor is happy to provide additional assistance

(such as the Palau case)

LG: Local government

Republic of Palau

Rehabilitation of open dump site

Photo: JICA

Photo: JICA/MoRD

Challenges for Sustainable Operation

◆ **Being unable to bear the costs of technology**

1. Cost for maintaining technical skills (**Human resources** & training)
2. Cost for operations (**Financial resources** for payrolls, equipment, spare parts, fuel, materials, etc.)

⬇

improper operation and loss of important functions of Fukuoka method

So, the first challenge (cost for maintaining technical skills) is:

How to develop and utilize local experts:




Through on-site training and direct involvement in the site improvement process



Photo: J-PRISM

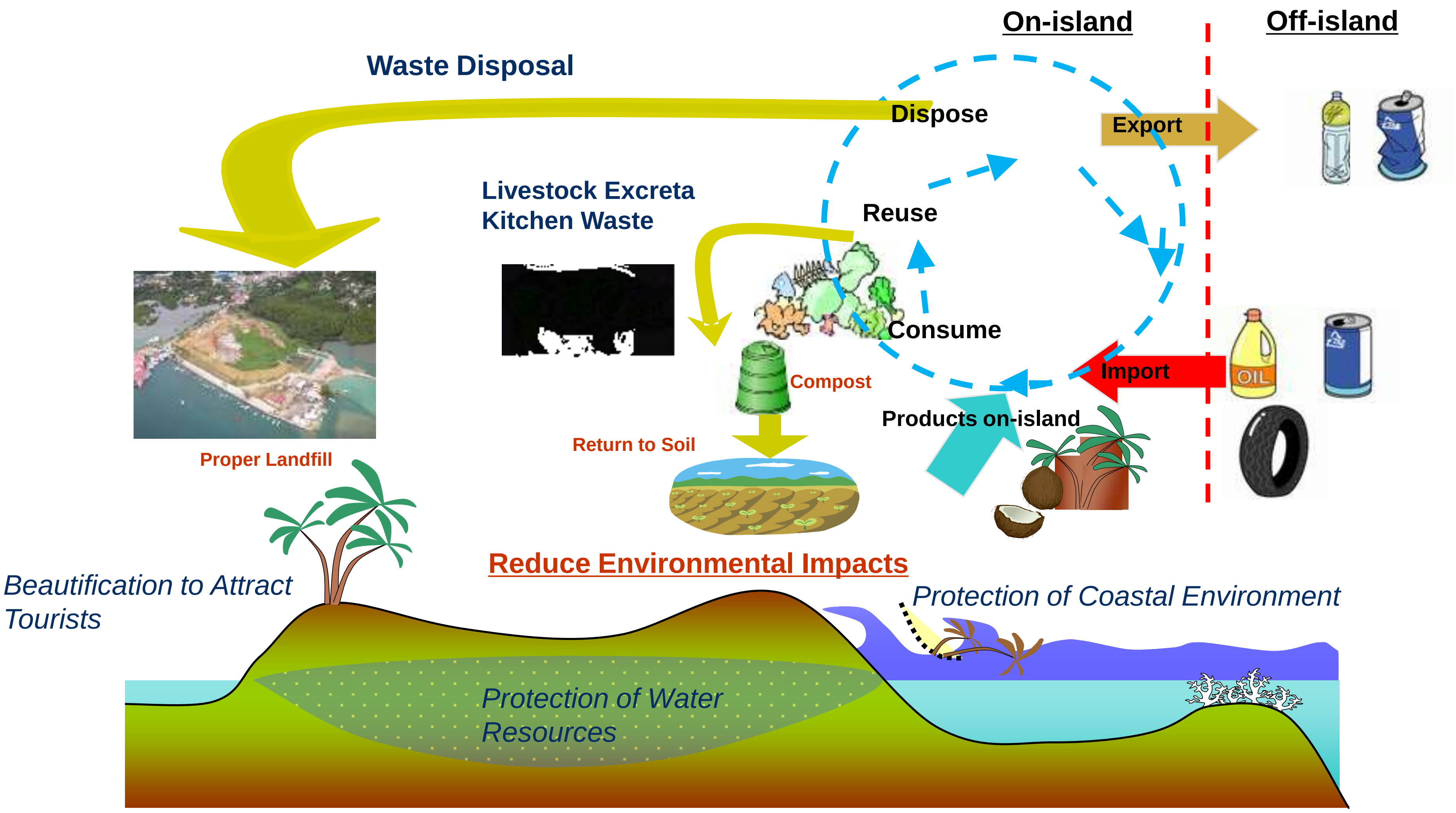
The second challenge is:

How to develop additional funding sources and improve financial system for SWM:

Through applying various economic instruments

- Taxes/Levies
- Pre-paid garbage bags
- Waste fee collection by Joint billing such as electricity charges
- Deposit-refund system (CDL)
- Landfill tipping fee
- EPR/CSR (such as Moana Taka Partnership)
- Other economic incentives, etc.

Circularity in Waste Management and Island Environment



Good luck!

Appendix D: Power Point Presentations

SESSION #3: WASTE-TO-ENERGY

- Appendix D9: Waste-to-energy options for a sustainable future
- Appendix D10: Waste-to-energy options for promoting Circular Economy
- Appendix D11: Pyrolysis Technology for Plastics and Used Oil Processing
- Appendix D12: Technology (Pyrolysis) demonstrations for Innovative Technologies in Waste-to-Energy
- Appendix D13: SWAP Used Oil Management Pilot project in Vanuatu
- Appendix D14: Presentation of a business-scale pyrolysis technology
- Appendix D15: Design of a Used Oil Storage and Reprocessing Facility
- Appendix D16: Biogas Technology
- Appendix D17: Circular Economy & Animal Feed: Experience sharing from New Caledonia

SUSTAINABLE WASTE ACTIONS IN THE PACIFIC (SWAP)

WASTE-TO-ENERGY OPTIONS FOR A SUSTAINABLE FUTURE

01 October 2024

Inia Saula
Pacific Community

SPREP PROE

Pacific Community
Communauté du Pacifique

TABLE OF CONTENTS

SPREP PROE

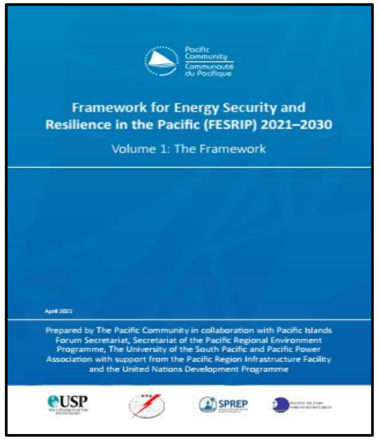
Pacific Community
Communauté du Pacifique

Session 1:

Framework for Energy Security and Resilience in the Pacific (FESRIP): 2021 – 2030

FRAMEWORK FOR ENERGY SECURITY AND RESILIENCE IN THE PACIFIC (FESRIP): 2021 – 2030

Priority A: Energy Policy, Planning and Capacity Development		
1.	Development and implementation of robust national energy policies, plans and legislation	SPC, lead; PPA for power sector
2.	Capacity development in the energy sector	USP, lead in cooperation with the other CROP agencies
3.	Database development with energy resilience/security indicators	SPC and PPA, co-leads
4.	Rectifying gender imbalance in the energy sector	SPC, lead
5.	Non-commercial household energy	SPC, lead in cooperation with USP
Priority B: Energy Sector Finance and Cooperation		
6.	Financing a regional energy framework	PIFS, with participating CROP agencies
7.	Regional support to Pacific Island territories	SPC, lead
8.	Cooperation in sustainable and resilient energy with other island regions	SPC, PPA and SPREP, co-leads
9.	Cooperation with the private sector in energy	PPA and SPC, co-leads; PIFS



A regional framework to strengthen partnership and coordinate actions

Endorsed by Pacific Leaders in August 2021 and launched at COP27 Nov 2022

Priority C: Sustainable Electric Power Development (PPA lead for grid-based electrification; SPC for off-grid/mini-grid)		
10.	Climate-resilient power generation and distribution for island grids	PPA and SPC, co-leads
11.	Overcoming technical limitations to high penetrations of renewable energy	PPA, lead
12.	Financial and management mechanisms for sustainability of outer island and remote rural electrification	SPC and PPA, co-leads
13.	Inspection and maintenance of RE technologies	SPC, lead with PPA
14.	Regional RE standards for hurricanes and natural disasters	SPC and PPA, co-leads
15.	Implementation of national goals and NDC commitments for renewable electricity	SPC, SPREP and PPA, co-leads
16.	Expanding and increasing the range of RE technologies	No overall lead; SPC for ocean energy
17.	Independent energy regulation	SPC, initial lead
Priority D: Low-Carbon Transport Energy		
18.	Land transport energy use	SPC, lead
19.	Marine transport energy use	SPC, USP and SPREP, co-leads
20.	Air transport energy use	No specific lead
Priority E: Improved Energy Efficiency		
21.	Improved energy efficiency within buildings and economy wide	No specific lead
Priority F: Petroleum and Other Liquid Fuel Services		
22.	Petroleum advisory services: fuel pricing, contracting, monitoring and biofuels	SPC, lead
23.	Petroleum advisory services: fuel storage, distribution infrastructure and miscellaneous	SPC, lead

Session 2:

Fifth Pacific Regional Energy and Transport Ministers Meeting (PRETMM) -2023 : Efate Outcome Statement

SPREP PROE

FIFTH PACIFIC REGIONAL ENERGY AND TRANSPORT MINISTERS MEETING (PRETMM) -2023 : EFATE OUTCOME STATEMENT

Pacific Community
Communauté du Pacifique

- **Financing, resource mobilisation and private sector engagement**

✓ **Item 25 Call on donors, private sector and other development partners** to urgently mobilise additional funding for the implementation of the FESRIP, Minimum Energy Performance Standards and Labelling, PEGSAP, OPERA, E-mobility program, **waste-to-energy programmes**, energy planning frameworks and tools, green hydrogen, ocean energy technologies, petroleum advisory, and to report annually to SPC on progress.

- **Innovative technologies to accelerate decarbonisation**

✓ **Item 32** Recognize the decarbonization potential of emerging technologies such as ocean energies, green hydrogen and its derivatives, geothermal, bioenergy, **waste-to-energy**, electrical vehicles and called for further analysis and enhanced development in the region.

Session 3:

Overview of waste-to-energy technologies

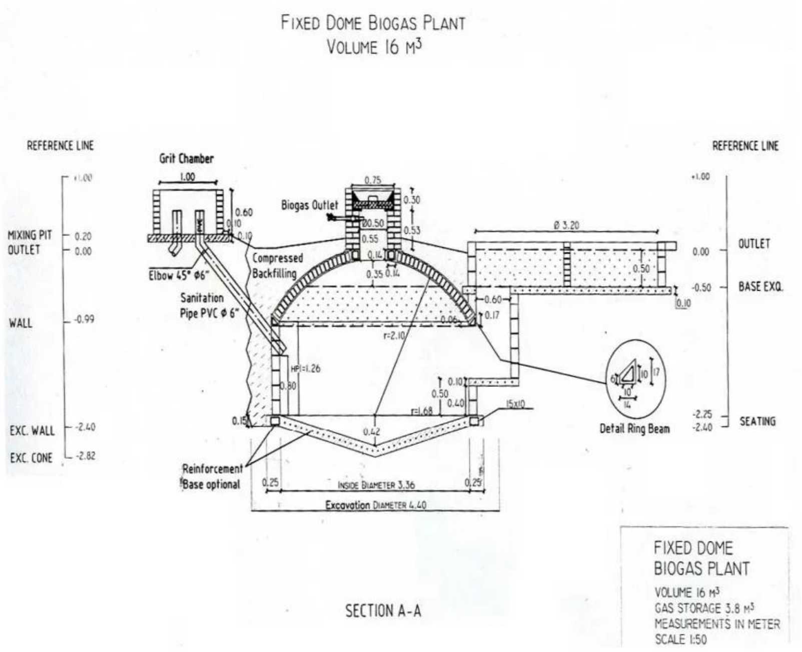
WASTE TO ENERGY (WTE) TECHNOLOGIES

- **What is Waste to Energy (WTE) Technologies**
  - ✓ These are technologies to improve the management of waste and harness the energy within the materials that are seen as garbage/trash/rubbish;
  - ✓ Any process or treatment that takes waste and converts it into energy (for the primary purpose of producing electricity – or electricity and heat – for sale or own use) using thermal and biological processes;
  - ✓ A variety of ‘processes’ are used, each of which has its own proprietary and intellectual property rights.
- **Irrespective of the technology used, we have two same outcomes result:**
  - ✓ Reduction in the mass and volume of waste disposed of to landfill; and
  - ✓ Production of energy from the non-reusable and non-recyclable fractions of the waste stream

WASTE-TO-ENERGY TECHNOLOGIES

- **Biological and Thermal technologies**

✓ Biological technology use anaerobic digestion (AD)



WASTE-TO-ENERGY TECHNOLOGIES

- **Thermal Technologies**

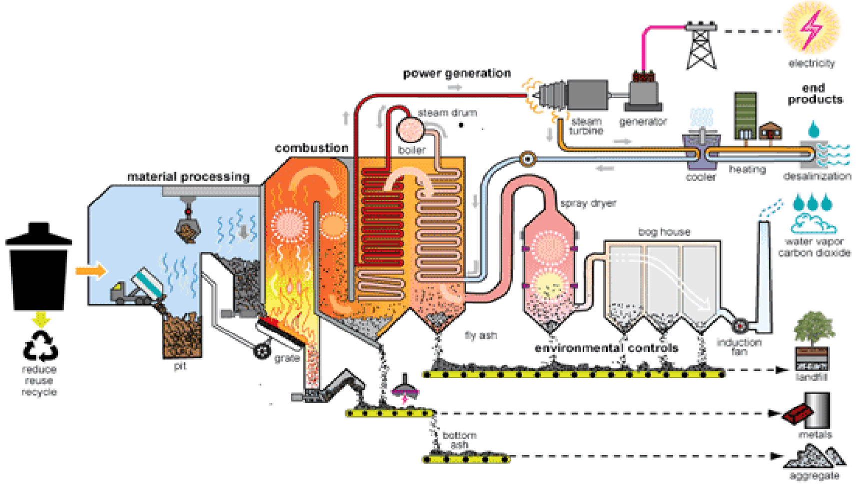
✓ Large & Small scale WtE project

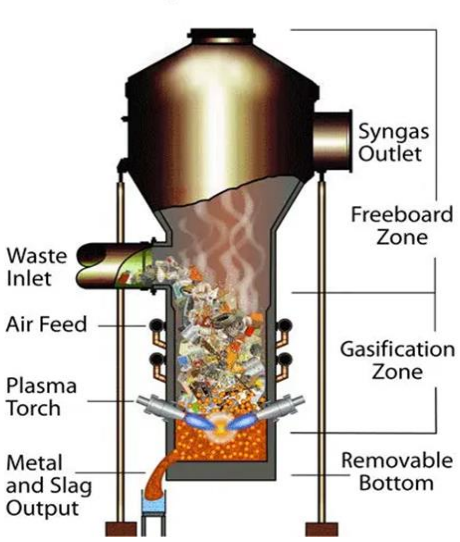
✓ The list includes

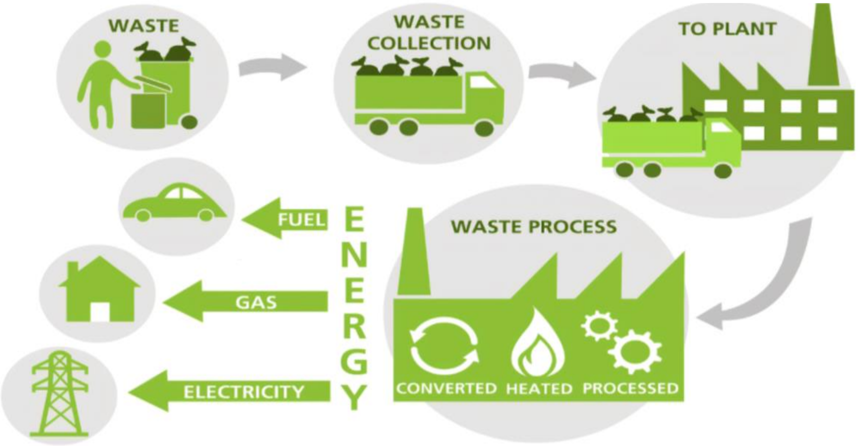
  ➢ Combustion of waste

  ➢ Gasification of waste

  ➢ Pyrolysis of waste







Session 4:

Waste to Energy Options

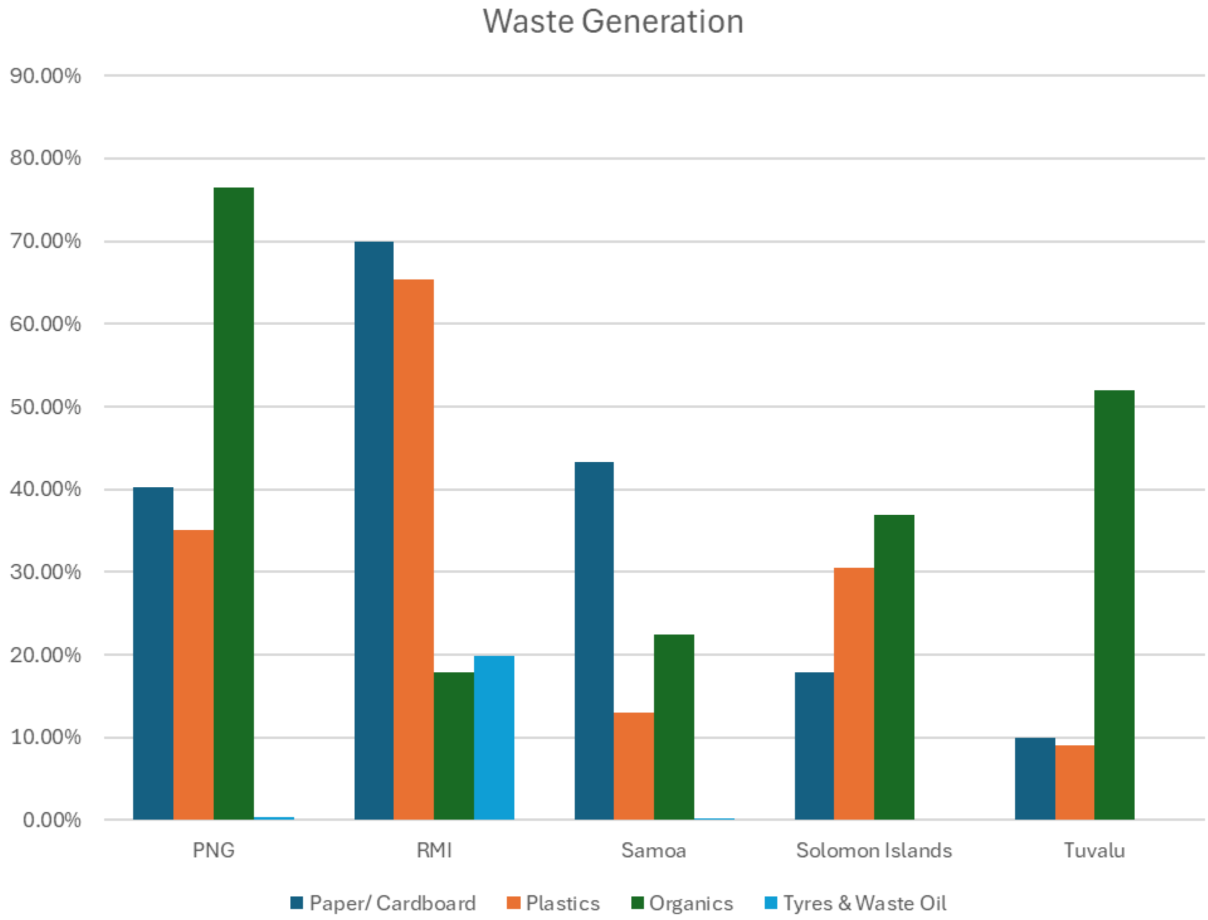
WASTE TO ENERGY OPTIONS - WASTE TO ENERGY PROJECT

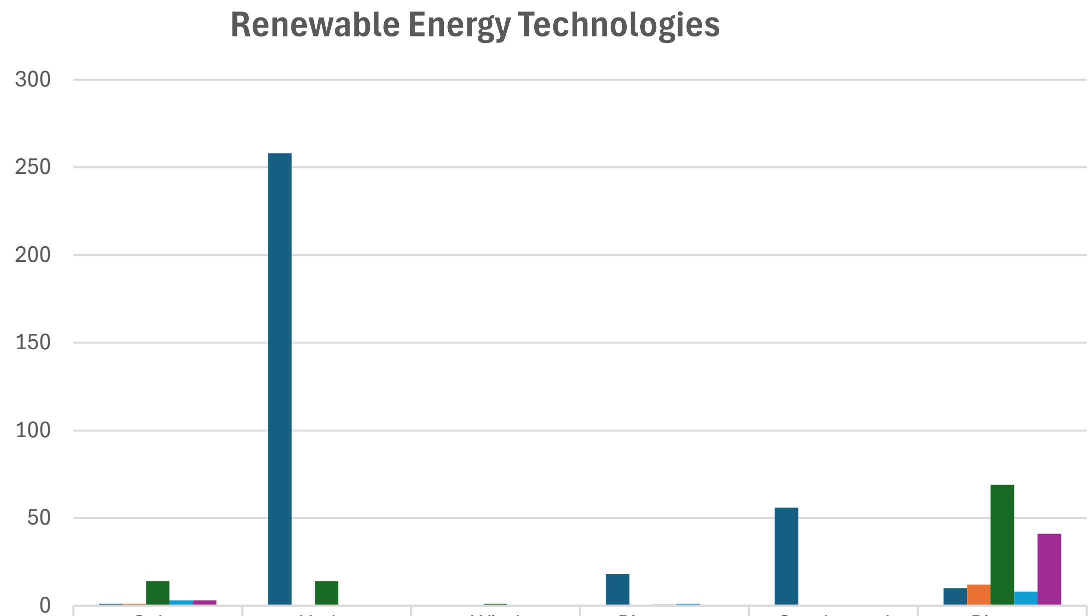
- Pacific Adoption of Waste to Energy Solutions (PAWES)
  - ✓ 5 Participating Countries (PNG, Solomon Islands, Republic of Marshall islands, Tuvalu and Samoa)
  - ✓ Baseline Assessment and Feasibility Report
  - ✓ Recruitment of Post Graduate Students to also involve in Waste to Energy pilot project
  - ✓ Development of 2 qualifications – Certificate(IV) & Diploma (VI) in Sustainable Energy

SPREP PROE

Pacific Community
Communauté du Pacifique

WASTE DATA AND RENEWABLE ENERGY TECHNOLOGIES FOR PAWES COUNTRIES





	Solar	Hydro	Wind	Bioenergy	Gepthermal	Biogas
PNG	1	258	0	18	56	10
RMI	1	0	0	0	0	12
Samoa	14	14	1	0.75	0	69
Solomon Islands	3	0	0	1	0	8
Tuvalu	3	0	0	0	0	41

PNG RMI Samoa Solomon Islands Tuvalu

SPREP PROE

WASTE TO ENERGY OPTIONS - WASTE TO ENERGY PROJECT

Pacific Community
Communauté du Pacifique

Country	Type – Rdf	Capacity	Year (2025-2032)	Location
Marshall Islands	DownDraft Gasifier	4 x 100 kWe	2025	Majuro
		1 x 100 kWe	2029	
		3 x 100 kWe	2025	Ebeye
PNG	DownDraft Gasifier	2 x 500 kWe	2025-2026	Port Moresby
		1 x 500 kWe	2031-2032	
		2 x 150 kWe	2025-2026	Lae
		1 x 180 kWe	2031-2032	
		1 x 40 kWe	2025-2026	Goroka
		1 x 40 kWe	2031-2032	

WASTE TO ENERGY OPTIONS - CONTINUED

Country	Type – Rdf	Capacity	Year (2025-2032)	Location
Samoa	Down draft Gasifier	2 x 180 kWe	2025	Upolu
		1 x 180 kWe	2025	Savaii
Solomon Islands	Down draft Gasifier	1 x 450 kWe	2025-2026	Ranadi, Honiara
		1 x 450 kWe	2030-2032	
		1 x 35 kWe	2025-2026	Auki
		1 x 25 kWe	2030-2031	
Tuvalu	Gasifier System	25 kWe	2025	

Session 5:

Success story and challenges

SUCCESS STORY - WASTE TO ENERGY PROJECT

- Tuvalu Biogas Project (2023) funded by US Government
  - ✓ 20 Home Biogas Systems installation at Funafuti atoll
  - ✓ Gas use after 5 days
  - ✓ Reducing 129 metric tonnes of CO_2 emissions annually
  - ✓ Beneficiary families save AU$80.00 to AU$85.00 per month on energy costs by using free biogas for cooking.
  - ✓ Bio - slurry (wastewater) for fertilizer
  - ✓ US $1 Million Grant secured

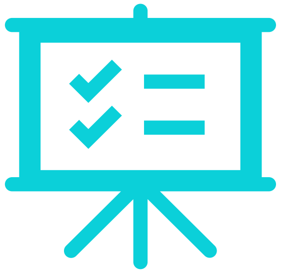
SPREP PROE

CHALLENGES - WASTE TO ENERGY PROJECT

Pacific Community
Communauté du Pacifique

- No Waste to Energy Policy
- Un-reported data
  - ✓ Animal wastes (Pigs, chicken, cows, etc)
  - ✓ Cooking Oil
  - ✓ Limited land area (atoll island countries)

    Tuvalu
- Economic of scale to do business is low
- Logistics - transportation



THANK YOU FOR YOUR ATTENTION

Waste-to-energy Options for Promoting Circular Economy

Dr Ravita D Prasad

School of Sciences

College of Engineering and Technical Vocational Education and Training

Fiji National University

PAWES – Circular Economy Workshop 30 Sept to 4th October 2024 Port Vila, Vanuatu

Outline

- Types of waste and quantity
- Technologies for WtE conversion
- Current research in waste to energy
- Challenges in implementation of WtE
- Potential Research areas

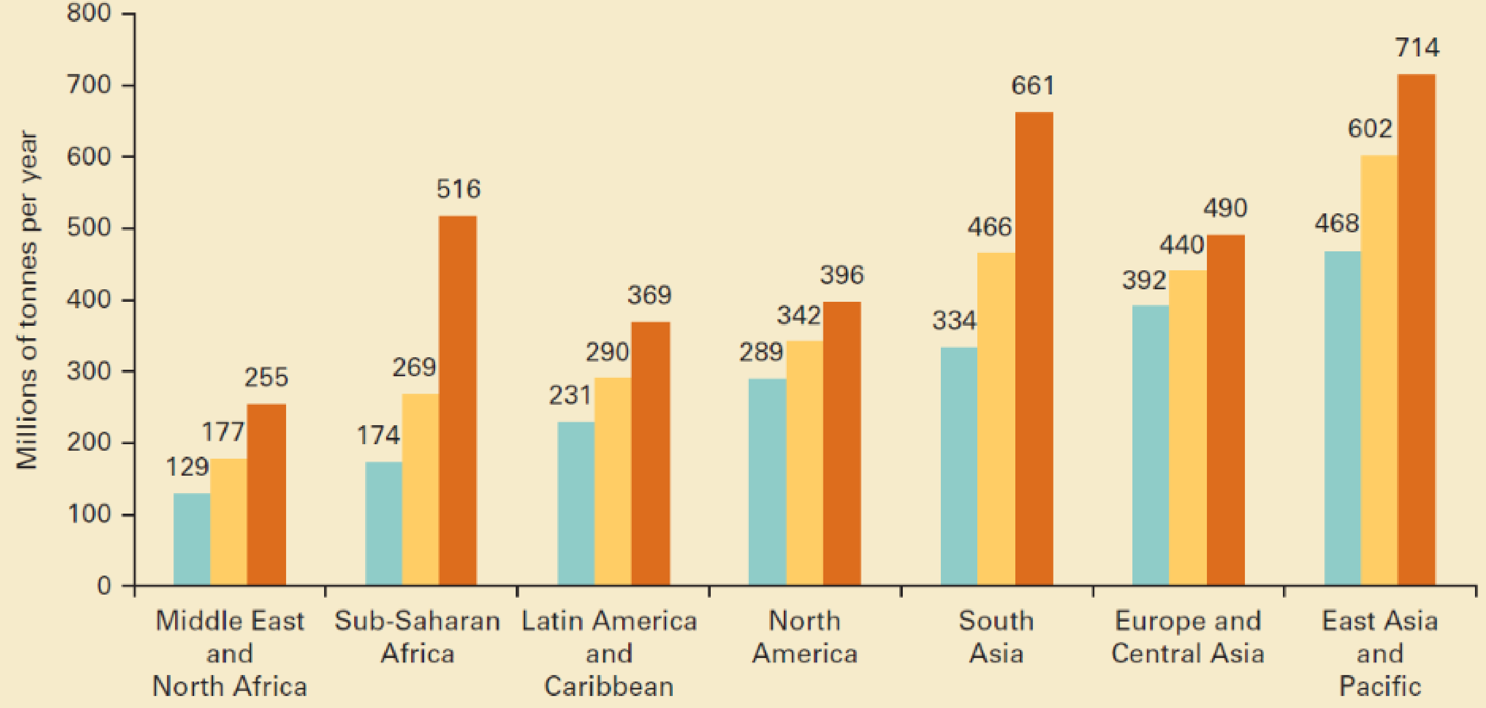
Types of Waste

- Municipal Solid Waste (MSW)
- Forest waste
- Agricultural waste
- Industrial waste
- Medical waste
- Hazardous waste
- Electronic waste
- construction and demolition waste

Municipal solid waste: Current and Projected Global waste generation

- World generates 2.01 billion tonnes of waste in 2016
  - Metal – 4%
  - Glass – 5%
  - Plastic – 12%
  - Paper/cardboard – 17%
  - Food/green waste – 44%

- Unless urgent action is taken, global MSW will increase to:
  - 2.59 billion tonnes by 2030 – 29% increase
  - 3.40 billion tonnes by 2050 – 69% increase



Source: (Kaza et al., 2018)

Worldwide, waste generated **per person per d**ay averages **0.74 kilogram** but ranges widely, from 0.11 to 4.54 kilograms.

Pacific total waste generation (tonnes/annum)

Papua New Guinea	1730800
Timor-Leste	184000
Solomon Islands	40250
Vanuatu	26500
Samoa	24195
Tonga	17200
Kiribati	16000
Nauru	15700
Palau	12410
RMI	8500
Cook Islands	4200
Niue	1100
Tuvalu	1060
Total (Tonnes per annum)	**2,081,915**

Source: https://pacwasteplus.org/wp-content/uploads/2021/12/Waste-to-Energy-Research-Report-_Formatted_Final.pdf (accessed on 19 Sept 2024)

Plastic waste generation in Pacific region

PET	55683
LDPE	32279
PVC	807
LDPE	37928
PP	20712
PS	49763
Other	71820
Total (tonnes per annum)	**268,992**

13% of the total waste generated in pacific region

Source: https://library.sprep.org/sites/default/files/2024-08/Feasibility-Study-Technologies-Process-Plastics-Waste-commodities.pdf (accessed on 19 Sept 2024)

Pacific Data on MSW generation

- Between 2016 and 2019, the Pacific region reduced the (average) municipal solid waste generation per capita with an average of 1.2 kg produced per person per day

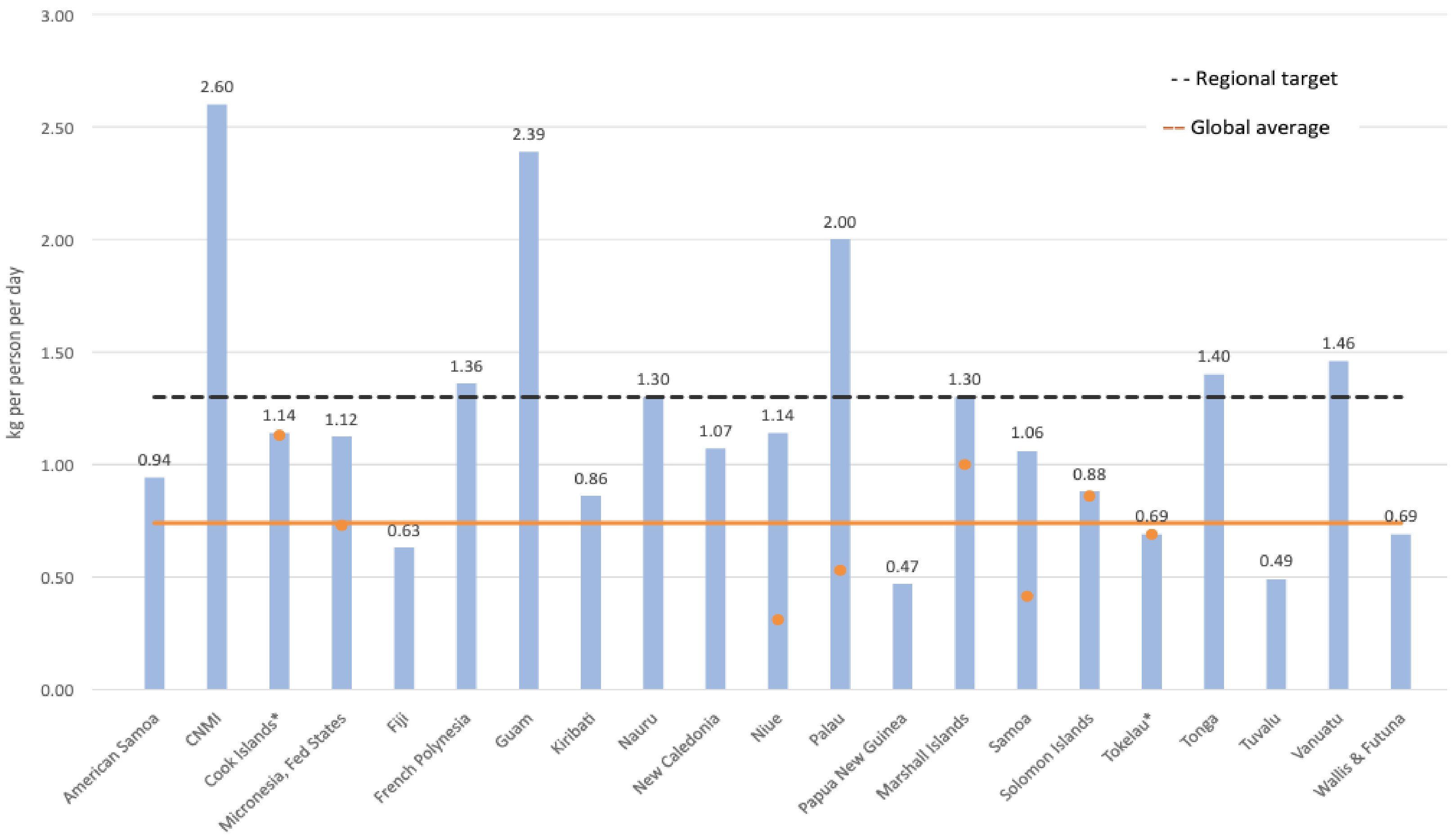
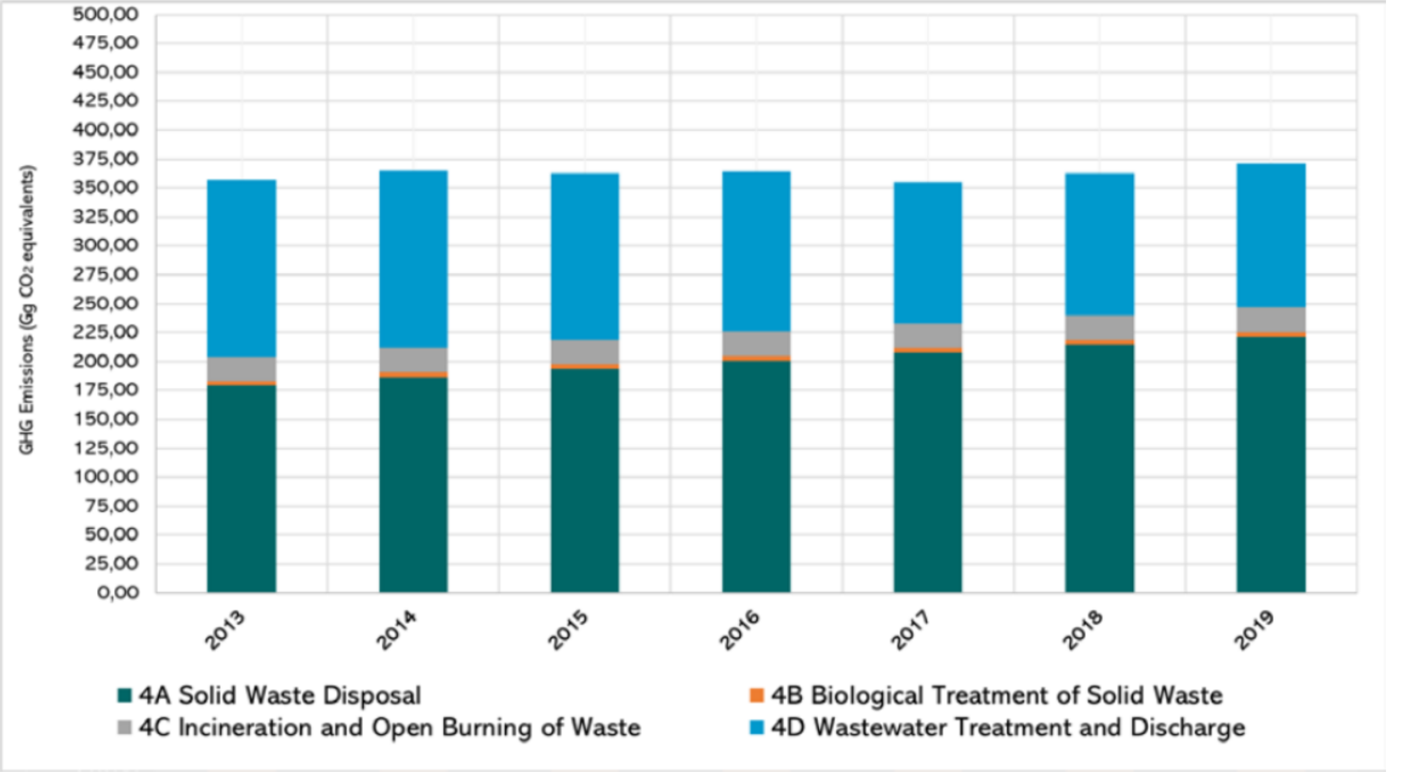


FIGURE 28.1: Municipal waste generation per person in the Pacific islands, 2019 or most recent year. Municipal solid waste includes household, commercial and institutional waste. Sources: (columns) SPREP (forthcoming), (dots) national State of Environment reports or estimates based on income status using Kaza et al. (2018) values for upper-middle income countries (Tokelau) or an averaged value of upper-middle and high-income status (Cook Islands). Dashed line: regional target; solid line: global average (0.74 kg per person per day)

Source: https://library.sprep.org/sites/default/files/2021-03/SOEC-Indicator-28-29.pdf (accessed on 19 sept 2024)

Greenhouse Gas Emissions from Waste sector

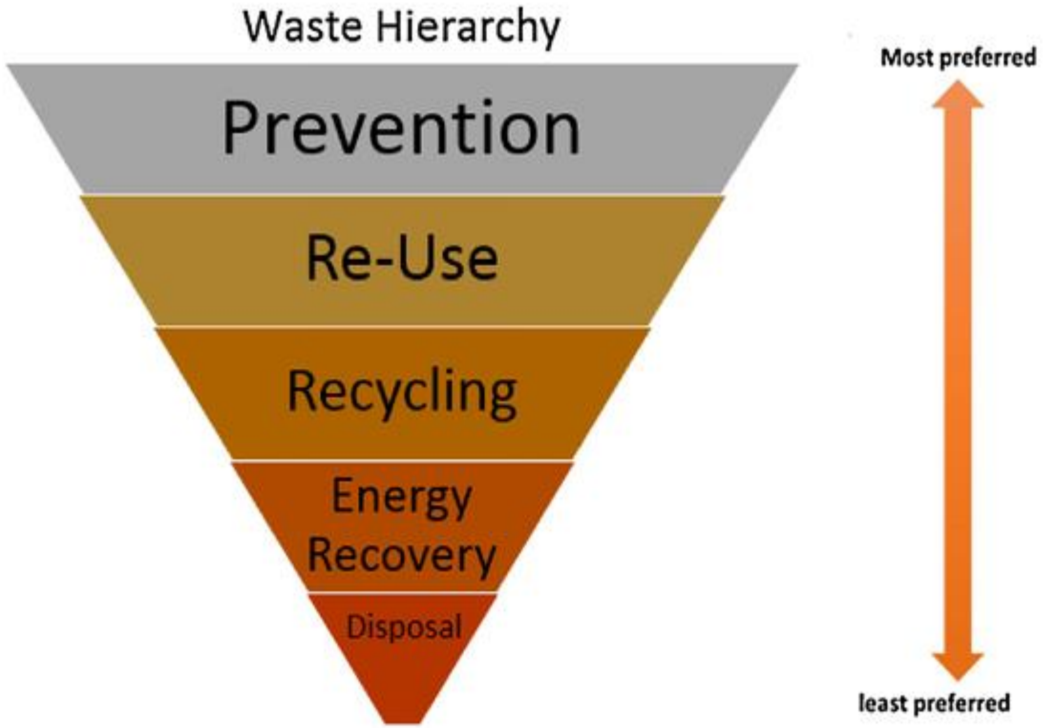
- Fiji's waste sector GHG emissions
- Solid waste and wastewater treatment plant
- Apart from waste management issues, there is also the aspect of trying to reduce national emissions to meet NDC targets set by individual PICs



Source: (GoF, 2023)

What to do with so much waste?

- After waste prevention and reuse that are mea
  to reduce the waste stream is recycling in the hierarchy of preference. After recycling is the energy recovery.
- Overall lifecycle assessments carried out by several researchers have shown that recycling the most environmentally friendly waste management option in terms of the carbon savings and costs .
- However, recycling does not provide the bene energy recovery, and materials that cannot be recycled are usually candidates for the proces energy recovery, preferable to traditional landfilling.
- The potential of WTE to recover energy from unrecyclable components of the waste stream has made it an indispensable part of the concept of circular economy that has been on the rise for over a decade.



Waste Treatment Hierarchy in Order of Preference

Source: (AlQattan et al., 2018)

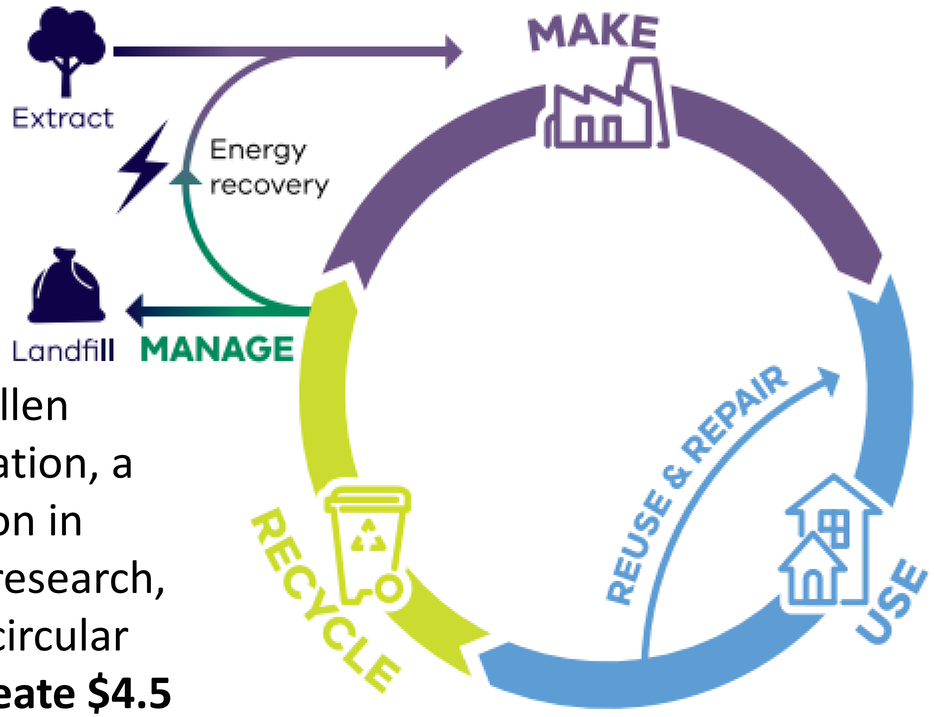
Waste to Energy(WtE) Definition

- Converting waste into valuable products such as heat, electricity or transport fuels.
- The type of waste in WTE technologies process varies from semi solid to liquid and gaseous waste.
- Previously, waste was considered useless but with the help of WTE technologies it became a heat source and is considered as a feedstock for such techniques.
- The use of waste as feedstock for WTE facility, not only saves landfill space, costs of waste disposal and management, but also makes it useful by converting it into valuable fuels, fertilizers and electricity.

Source: (Qazi et al., 2018)

WtE contributes to circular economy

Source: https://our-blue-future.org/2023/05/18/from-linear-to-circular-the-future-for-a-sustainable-blue-economy/ (accessed on 23 sept 2024)



According to the Ellen MacArthur Foundation, a leading organization in circular economy research, transitioning to a circular economy **could create $4.5 trillion in economic benefits** by 2030, while also **reducing global carbon emissions by 39%.**

Source: https://www.sustainability.vic.gov.au/grants-funding-and-investment/invest-in-victorias-circular-economy/invest-in-materials-and-infrastructure/invest-in-waste-to-energy (accessed on 23 sept 2024)

Schematic of circular economy

Source: (AlQattan et al., 2018)

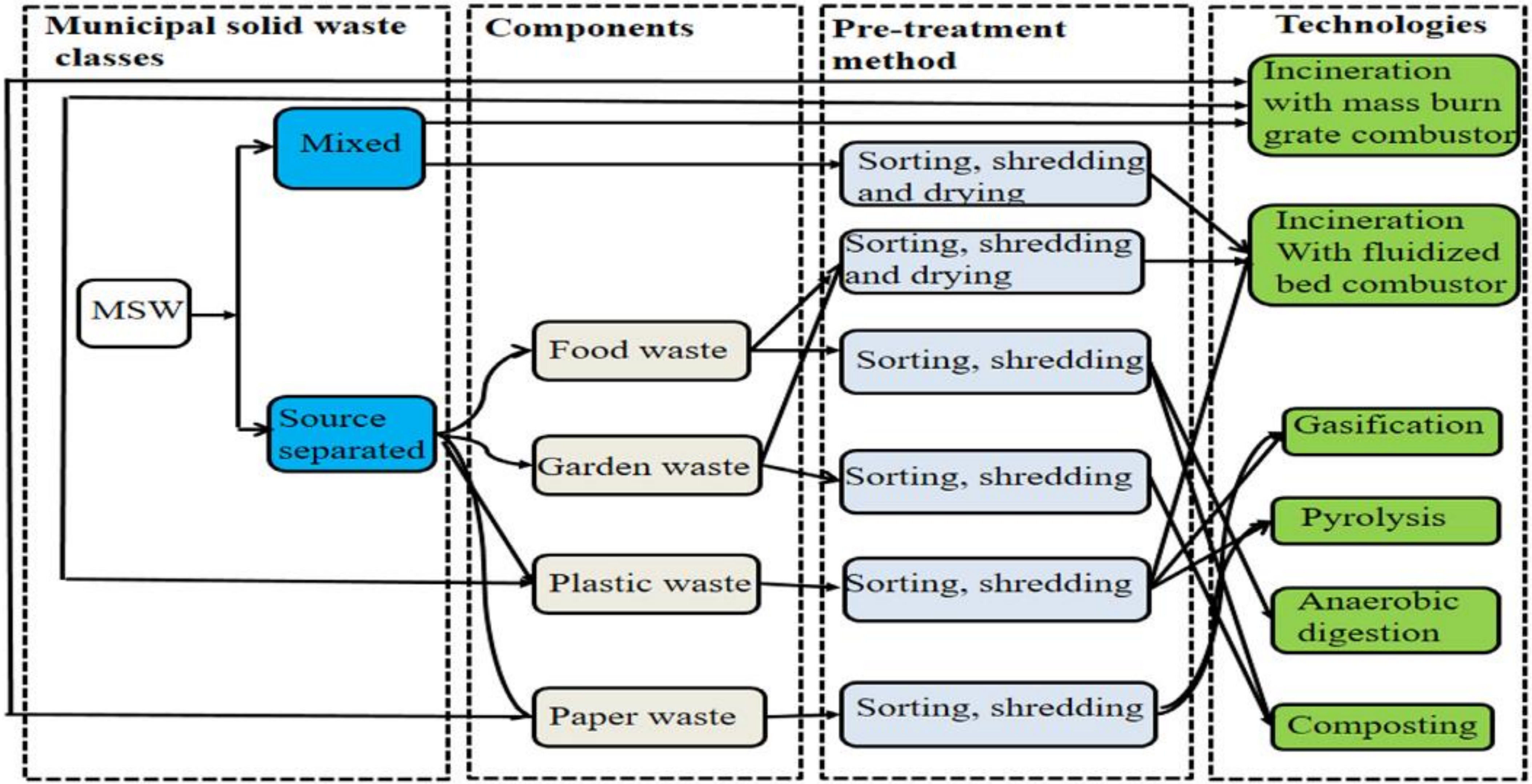
WtE technologies have allowed 3Rs to be expanded into 5R

3R: reduction, reuse, and recycling)

TO

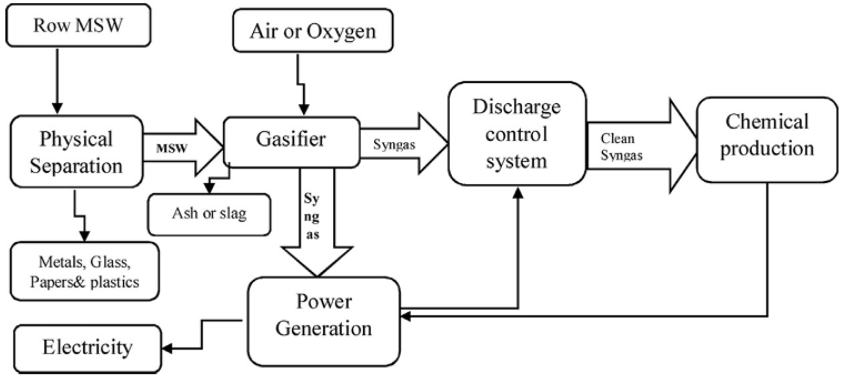
5R (reduction, reuse, recycling, recovery, and reclamation)

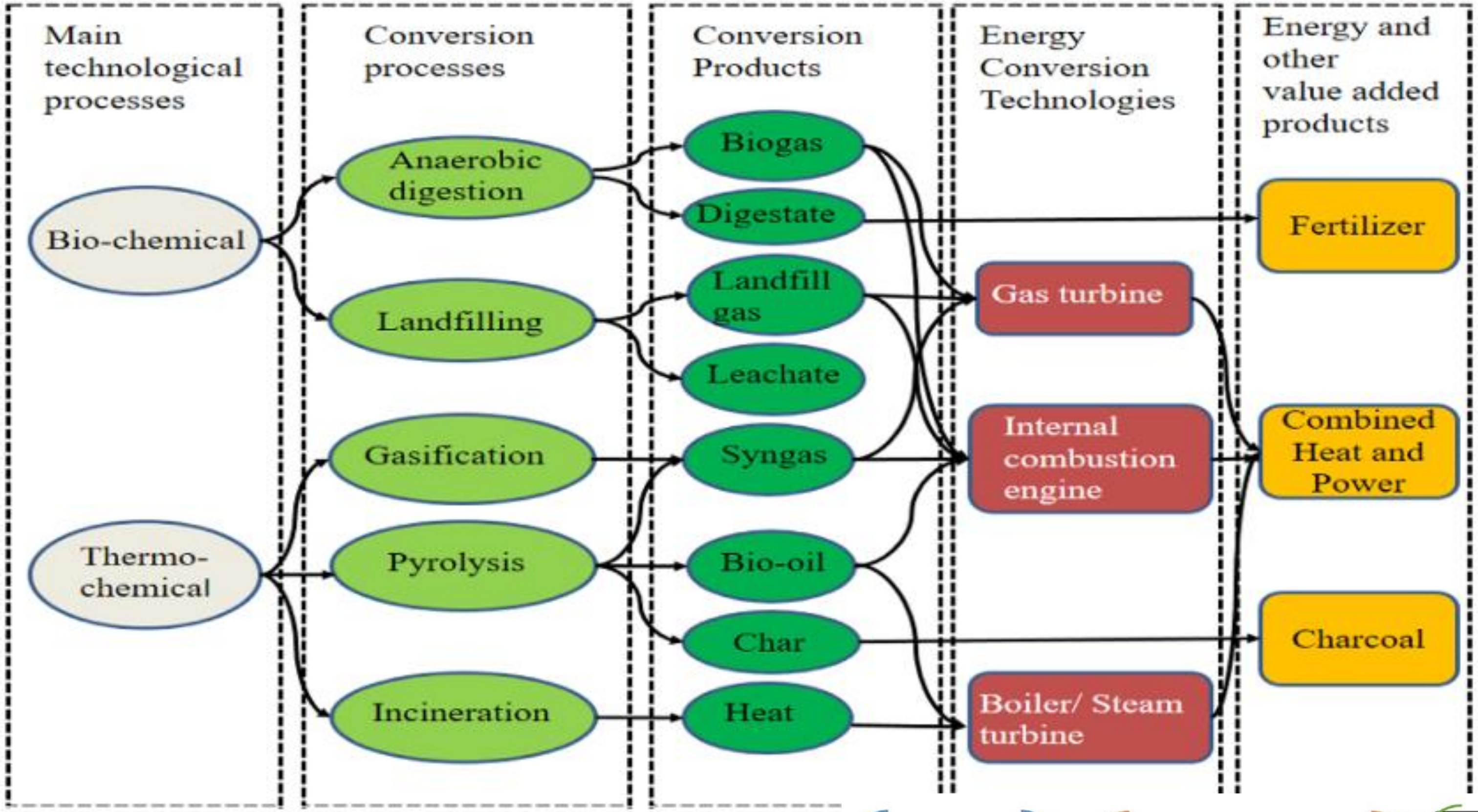
Mapping feedstock with WtE technologies

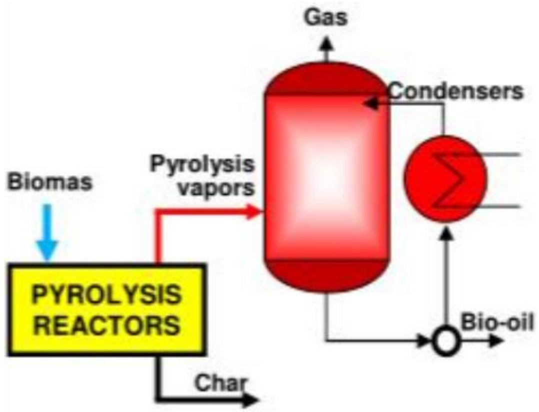


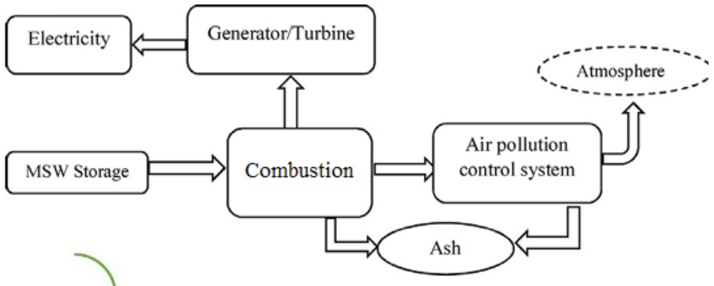
Source: (Alao et al., 2022)

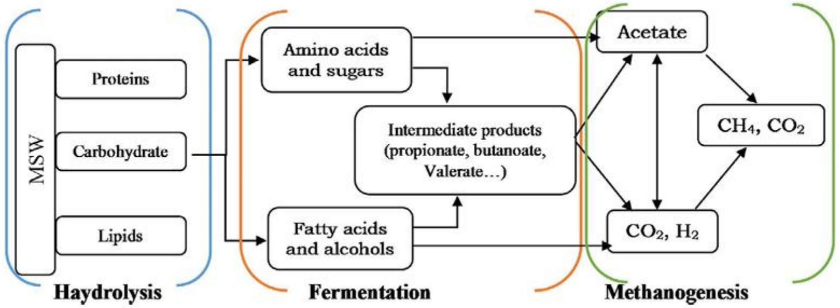
WtE technologies or routes











Source: (Alao et al., 2022)

Comparison of WtE technologies

S. No.	WtE technologies	Benefits	Limitation	Primary product	Application
1	Incineration	Suitable for high calorific value Reduce volume and mass up to 80% and 70% respectively	The high capital, maintenance, and operation costs Produces harmful pollutants generation of solid residues	Heat	Generation, electricity and steam/heat
2	Pyrolysis	Produce high-quality fuel Reduces flue gas treatment suitable for carbonous waste Decrease MSW volume up to 50–90%	High viscosity of pyrolysis High operating, maintenance and capital cost	Char, bio-oil and syngas	Electricity, production chemicals and solvents
3	Gasification	Production of fuel gas/oil, which can be used for various purpose	Immature, inflexible, less competitive technologies High risk of failure	Syngas producer gas	Generation electricity and chemicals
4	Landfill	Low cost, natural resources are recycled to soil	Soil and groundwater pollution Large land area required	Landfill gas	Electricity
5	Anaerobic digestion (AD)	Preferred for biomass with high water content Higher composition of methane (CH_4) and lower composition of carbon dioxide (CO_2) than landfill	Unsuitable for wastes containing less organic matter Lignin can persist for very extended periods of time to degrade	Biogas and dig estate	Electricity, nitrogen rich fertilizer Agricultural, and food biorefinery

Source: (Beyene et al., 2018)

Waste to Energy Applications in Fiji

- Anaerobic digesters – domestic and institutional application
- Department of Energy; Ministry of Agriculture – promote this technology

Photo credit: Naveendra Reddy

- Combustion – use forest or sawmill waste for power generation –independent power producer

Source: https://www.facebook.com/NGELfiji/photos

Current Research Focus:
Assess the impact of biogas digesters in communities as part of initiative of enhancing clean cooking energy access to rural communities.

- Project Title: Rolling out Biogas Digester Technology for Clean Cooking Energy Access in Kavewa Island in Fiji
- Homes used kitchen waste in the biogas digester
- Adv- a good way to manage kitchen green waste, women able to save time in firewood collection, more time for other income generating activities, fertiliser used in farms, selling fertiliser to other villagers, awareness of the technology and its benefits.

Current Research Focus:
Estimate the potential of waste to energy conversion

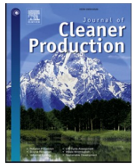
Journal of Cleaner Production 318 (2021) 128519

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

ELSEVIER



Check for updates

Prospects of Sustainable Biomass-Based Power Generation in a Small Island Country

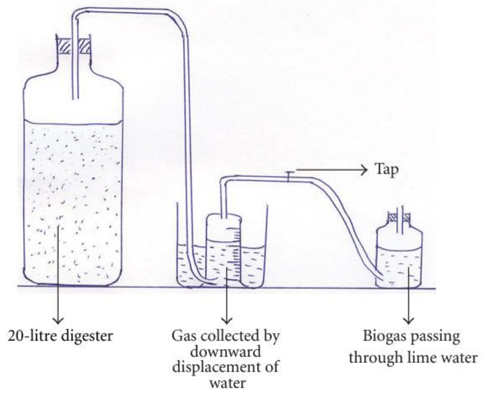
Ravita D. Prasad [a,b,*], Atul Raturi [b]

[a] College of Engineering, Science and Technology, Fiji National University, P. O. Box 7222, Nasinu, Fiji
[b] School of Information Technology, Engineering, Mathematics and Physics, The University of the South Pacific, Laucala Campus, Suva, Fiji

A B S T R A C T

Biomass resources are abundantly present in the Pacific Island Countries (PICs) but are mostly used for cooking and crop drying. Only three countries viz. Papua New Guinea, Fiji, and Samoa use biomass for power generation. This paper aims to (i) quantify the forest logging residue generated in Fiji, (ii) carry out a techno-economic and environmental assessment of a potential 10 MW biomass power plant (BPP) in Fiji and study the impact of feedstock cost (FC) on the electricity production cost (EPC) in relation to the financial viability, and (iii) discuss possible strategies to overcome challenges PICs face in developing biomass energy projects. It is found that a 10 MW BPP would require approximately 60,000 tonnes of biomass feedstock, which can be supplied by forest residue from logging in the western division of Viti Levu in Fiji. If the FC is taken as USD68.6/tonne and electricity export tariff to national grid is taken as USD0.1621/kWh, then the net present value is USD16.1 million, simple payback period is 5.6 years, and the benefit-to-cost ratio is 2.5. A sensitivity analysis reveals that electricity export tariff, availability of power plant, and feedstock costs are critical parameters affecting the NPV of the project. Various strategies such as utilising forest residues, planting short-rotation plantations in unused land, enabling policies, early stakeholder engagement, attractive electricity export tariff, and using appropriate harvesting and transportation technologies can help develop the biomass-based power sector in Fiji.

Current Research Focus:
feedstock for anaerobic digestion



Research Article

Empirical Study on Factors Affecting Biogas Production

Table 1: Rate of biogas production.

Temperature	Manure	Rate (mL/hr/litre of digester)
Room (23–28°C)	Chicken	9
	Cow	3
	Pig	1
Mesophilic (30–40°C)	Pig	2
	Cow	4
	Cow + pig	12
	Water hyacinth	2
	Kitchen waste	2
	Chicken	13
Thermophilic (50–60°C)	Cow	3
	Pig	1

Table 2: Energy content of biogas from different digesters.

Temperature	Digester input	EC (Btu/ft^3)	EC (MJ/m^3)
Room temperature	Pig	598.5	22.3
	Cow	591.2	22.0
	Chicken	543.9	20.3
Mesophilic	Pig	577.6	21.5
	Water hyacinth	616.7	23.0
	Kitchen waste	569.4	21.2
	Chicken	588.5	21.9
	Cow	559.4	20.8
	Cow + pig mix	592.2	22.1
Thermophilic	Pig	588.5	21.9
	Cow	557.5	20.8
Average		580.3	21.6

Source: (Prasad, 2012)

Energy generation potential from Wastewater treatment plant in Natabua, Fiji

- MSc student’s project (ongoing)
- Identifying appropriate technology for methane capture
- Quantifying the methane generated at the facility
- Determining the electricity generation potential

Challenges to implementation of WtE

Various processes involved:

- Waste collection,
- Waste transportation
- Conversion of waste to energy
- Use in various sectors

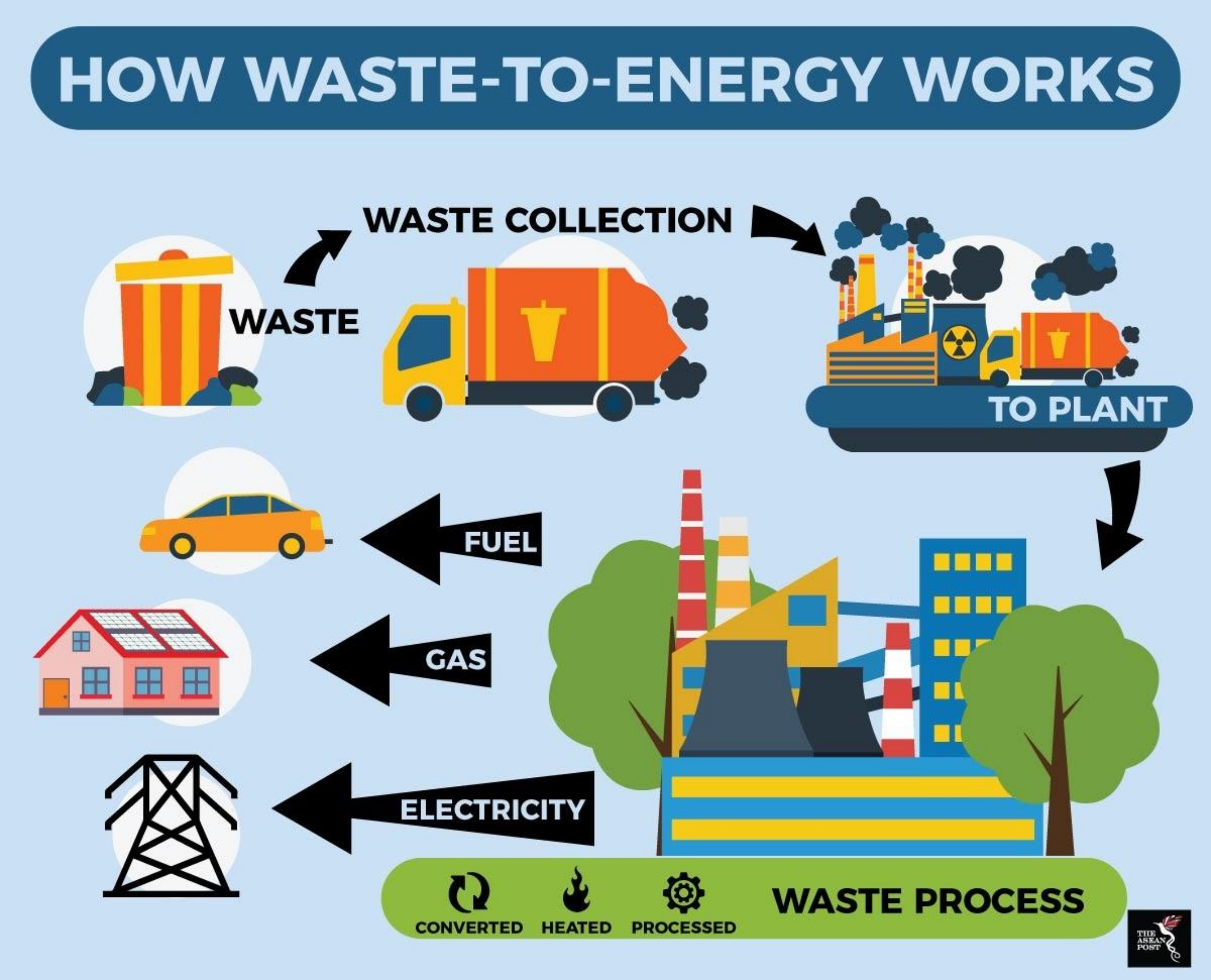
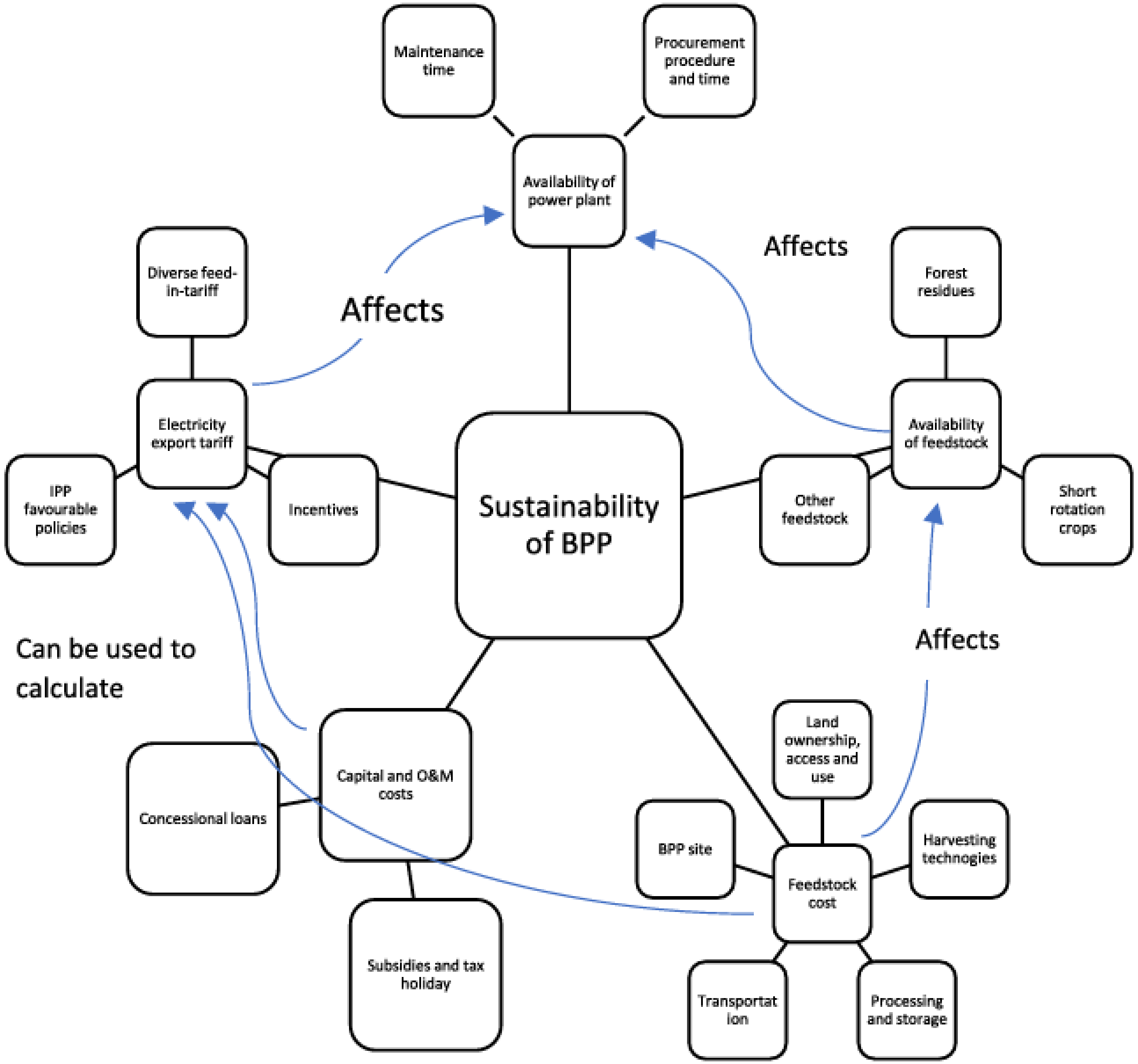


Image Source: https://www.iasgyan.in/blogs/waste-to-energy

Challenges to implementation of W2E

- **Feedstock supply** by far will be the main challenge
- Few possible strategies:
  - Key stakeholders to be involved from the very beginning of the project (from the planning stage)
  - Government support to the potential investors, land owners, truckers, etc. via appropriate policies
  - Incentives provided by the government to the collection of waste from generation site and transported to the energy generation facility



Source: (Prasad and Raturi, 2021)

Challenges to implementation of WtE

- **Awareness** amongst the users on the value of the waste and the importance of sorting waste from consumer side
- Benefits:
  - Allows efficient and effective processing of waste
  - Promotes Recycle and reuse
  - Composting of green waste
  - Improves public health
  - Reduces cost of waste disposal
  - Prevents accidents (when sorting hazardous waste)

Image Source: https://ecoresources.net.au/why-is-waste-sorting-important/

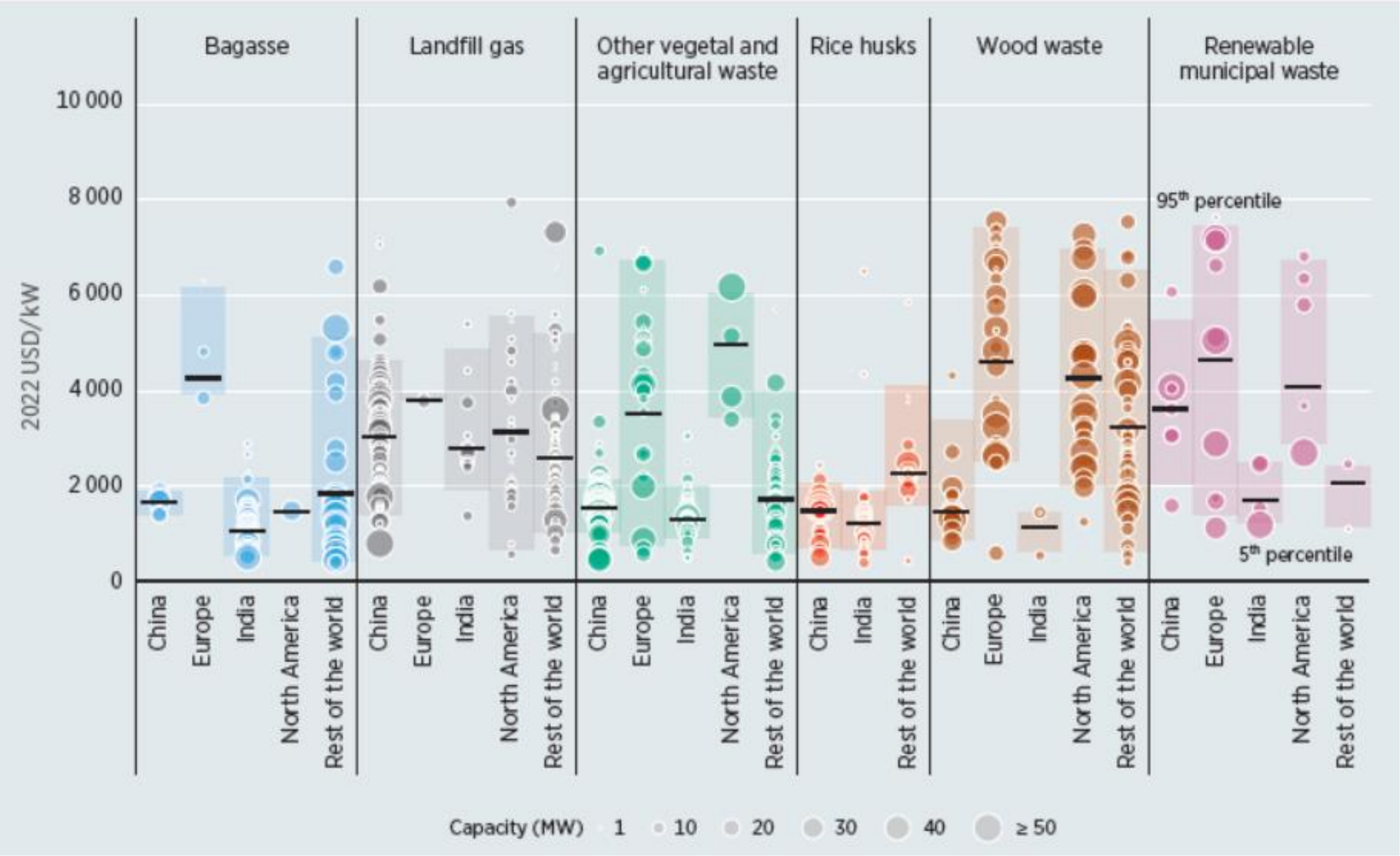
- Strategies:
  - Start from primary schools and secondary school curriculum
  - Have competitions for schools
  - Governments/donor agencies to provide incentives for awareness raising programmes.
  - Regional organization with national bodies carry out awareness programmes on: waste sorting, spotlight stories on current initiatives in the region on WtE—widely promoted in various media platforms

Challenges to implementation of WtE

- **Knowledge** of government departments on the various WtE technologies for energy harnessing
- Strategies on capacity building:
  - Development and delivery of Short courses on each WtE technology
  - Donor aid needed in development of the courses and delivery

Challenges to implementation of WtE

- **High Cost** of installing WtE technologies
- Strategies:
  - Boost potential investor confidence by having right policies in place
  - Develop lucrative incentives for private investors



Total installed costs of bioenergy power generation projects by selected feedstocks and country/region, 2000-2022

Source: (IRENA, 2023)

Potential research areas

- Renewable energy systems' components and E-waste disposal and value
- Clean energy transition will have solar PVs, wind, etc coming in the supply mix
- After its end of life-what happens to the panels and its components?
- Circular economy approach can avoid unnecessary adverse environmental impacts

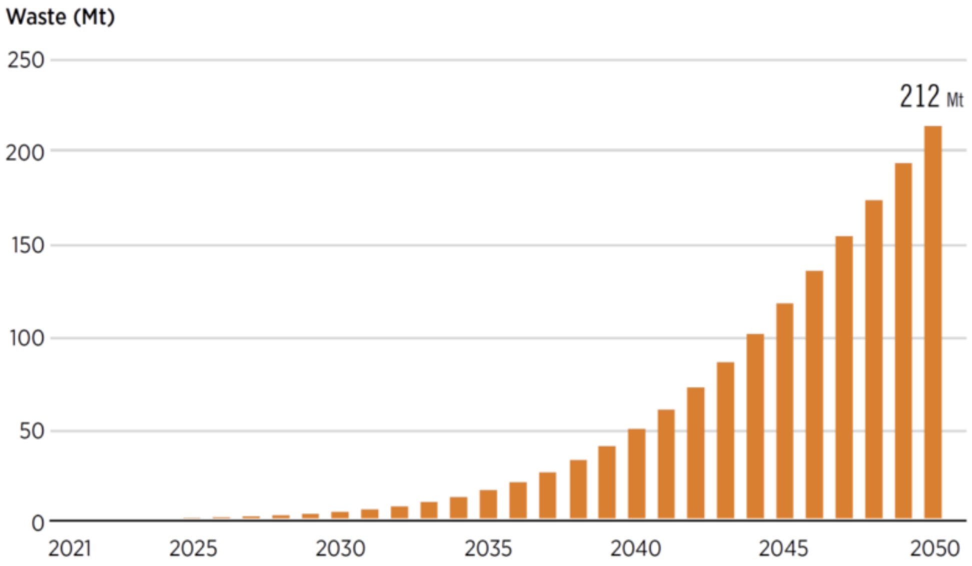


Figure: Projected cumulative waste from solar PV projects under IRENA's 1.5°C Scenario to 2050

Source: https://www.irena.org/Energy-Transition/Policy/Circular-economy

Potential Research Areas

- Biogas digesters – what is the performance of different types of commercially available biogas digester for different types of organic wastes and also the types of water?
- Combustion, Pyrolysis and gasification – how to capture the emissions during the energy generation process?
- Current biogas projects that are done – to a status report on its use, and challenges from the user end and supplier ---for promoting this technology

Concluding statements

In nature, nothing is wasted; everything has a purpose. Same should be true for our society.

Let’s make our Pacific a waste free region!

Bibliography

- SPREP, 2021. Waste to Energy Research Report. Secretariat of the Pacific Regional Environment Programme, Apia, Samoa.
- AlQattan, N., Acheampong, M., Jaward, F.M., Ertem, F.C., Vijayakumar, N., Bello, T., 2018. Reviewing the potential of Waste-to-Energy (WTE) technologies for Sustainable Development Goal (SDG) numbers seven and eleven. Renewable Energy Focus 27, 97-110.
- Kaza, S., Yao, L., Bhada-Tata, P., VanWoerden, F., 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050, Urban Development Series. World Bank, Washington, DC.
- Beyene, H.D., Werkneh, A.A., Ambaye, T.G., 2018. Current updates on waste to energy (WtE) technologies: a review. Renewable Energy Focus 24, 1-11.
- Prasad, R.D., Raturi, A., 2021. Prospects of Sustainable Biomass-Based Power Generation in a Small Island Country. Journal of Cleaner Production 318, 128519.
- Prasad, R.D., 2012. Empirical study on factors affecting biogas production. International Scholarly Research Notices 2012, 136959.
- IRENA, 2023. Renewable power generation costs in 2022. International Renewable Energy Agency, Abu Dhabi.
- GoF, 2023. National GHG Inventory Report of Fiji, Preparation of the Greenhouse Gas Inventory Report of Fiji Under the Biennial Update Report. Government of Fiji, Fiji.
- Alao, M.A., Popoola, O.M., Ayodele, T.R., 2022. Waste-to-energy nexus: An overview of technologies and implementation for sustainable development. Cleaner Energy Systems 3, 100034.

Thank you

Any questions?

ravita.prasad@fnu.ac.fj

Circular Economy Workshop Vanuatu: Pyrolysis Technology for Plastics and Used Oil Processing

Nufuels Ltd
Speaker:
Leigh Ramsey, Director

SWAP and DEPC workshop Circular Economy Port Vila, Vanuatu

30 Sept-4Oct 2024

Energy from Waste

https://youtu.be/S-AJ4wQkCDU

Nufuels Ltd

- New Zealand based company
  - sustainable waste solutions using pyrolysis
  - resource recovery – energy and materials
  - scaled technologies for remote and island communities
  - contribution to:
    - reducing climate emissions via recovered fuels
    - supporting local jobs and development, health benefits,
    - relieving community energy costs

What is Pyrolysis?

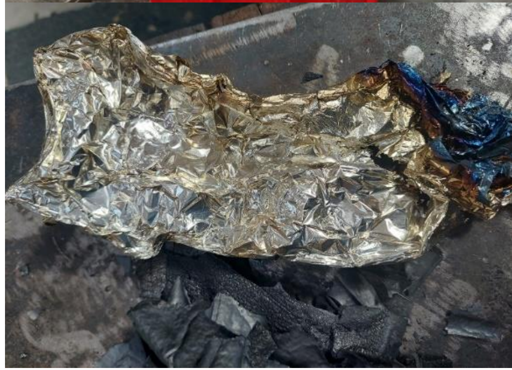
- A very ancient process – e.g. used for charcoal making

- Heat (in a closed retort - no oxygen) feedstocks containing hydro-carbons so that they ‘crack’ and turn into a vapour (not burning)

What is Pyrolysis?

- Vapour can be burnt directly as a fuel (flare)
- Or can be cooled via a condenser to produce:
  - usable gas (similar to LPG)
  - liquid fuel
    - waxy crude oil – plastics
    - diesel-like and petrol-like fuels – ULO
  - solid fuel (carbon) – depends on feedstock
  - recovered metals – depends on feedstock

It is NOT incineration or burning



Technology In Place

- Pacific Islands/Coral Sea system
    - 105 litre capacity retort –waste biomass fired (e.g. coconut husks)
    - associated rocket oven

    - focus on plastics processing - PE, PP and PET
        - Up to 10kg per cook crushed
        - up to 20kg per cook shredded

    - plastics do not have to be clean – marine plastics washed for salts

    - 10 kgs produces:
        - LPG type gas (approx. 3kgs)
        - crude oil for a burner fuel (approx. 7 kgs)

Technology Developments Ready to Be Deployed

- a ULO burner to power the cooks – instead of, or alongside, waste biomass

- established capacity to pyrolise ULO as a feedstock to produce refined fuels
    - approx. 36 litres per cook
    - approx. 50 litres if include input fuel

- refined fuels can be used for simple engines and generators
    - ULO as a co-mingled feedstock with plastics

Technology Developments Ready To Be Deployed

- modified rocket oven to include simple potable water heating capacity

- simple modifications to generators to be able to run on gas produced from process

Technology In Development (6-12 months)

- reflux column – maximises gas production ratio over liquid fuels – (proven)

- vapour recovery from process to feed back into retort as a input fuel (proven)

- development of a 250 litre capacity retort (in development)

    - gas storage (exploratory)

Environmental Impacts

Annual tonnage pollution clean-up per system

- Plastics (1 cook per day)
  - Up to 5 tonnes annually 105 litre system
  - potential up to 12 tonnes 250 litre system
- ULO (1 cook per day)
  - 13 tonnes per annum 105 litre system
  - potential up to 21 tonnes 250 litre system

Emissions

- New Zealand emissions standards for NG and liquid fuels (independent testing)
- 15-20% reduction in climate emissions as substitute fuels

Pilot Project 2018-2020

Funders:

- New Zealand Ministry of Foreign Affairs and Trade
- Nufuels Ltd
- Caritas Aotearoa New Zealand

In-country partner

- Solomon Islands Association of Vocational and Rural Training Centres
- Don Bosco Technical Institute

- Two systems
  - Munda – Youth Group
  - Sun Valley Community, Henderson

Pilot Project 2018-2020

Pilot structure

- Nufuels project management
- Co-ordinator
- Build
- Training
- Follow-up engagement

Results

- two systems built at Don Bosco TI and shipped
- confirmed energy value and community interest
- successful training and use
- Covid impacts

UNDP Project 2021-2023

Funder: UNDP

In-country partners

- Solomon Islands Association of Vocational and Rural Training Centres
- Design and Technology Centre (Mr Lindsay Teobasi) – build and training

Three systems

- Kaotave Rural Training Centre
- Divit Rural Training Centre
- St Martin’s Rural Training Centre

UNDP Project 2021-2023

Project structure

- Local build and training
- 6-9 months community support for each site
- Nufuels project management and on-going support

Results

- three systems built and in place
- successful training and use
- Covid and other impacts

Conclusions To Date

- Technology is simple and usable – future refinements will widen benefit
- Able to build locally – most materials are available and skilled labour
- Significant demand exists
- NGO partner who is skilled in community liaison and local project management
- Certainty around roll out and funding will increase project efficiencies
    - Funding scale would allow reduction of system price and project costs

Community and Enterprise Models

Community model

- works but requires on-going oversight and encouragement
- need external commitment to funding that oversight
- costed into total system cost

Enterprise Model

- social enterprise
- ‘gated’ – possible multiple units
- significant ULO focus
- possible two cooks per day – doubles energy benefit
- operators can mix wastes – ULO a key feedstock that can boost energy return

Other Potential Applications

Corporate Responsibility

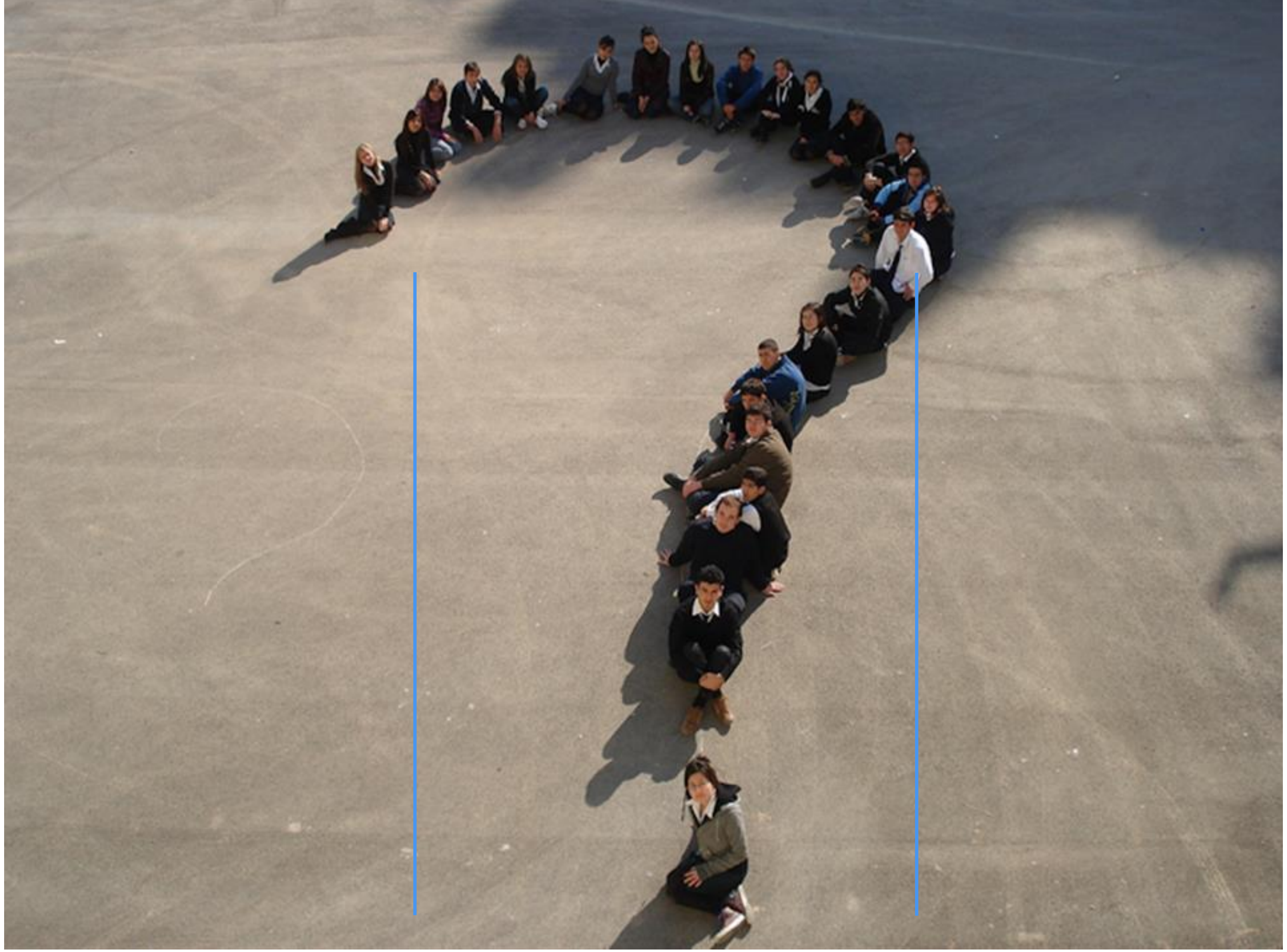
- corporates producing waste fund initial systems and operating costs on gated site
- exploring model with one New Zealand and one international company
- Early talks with two Solomon Islands companies
- link to enterprise model

Disaster Management/ Displaced Communities (e.g. Tonga Eruption)

- high volumes of plastic
- free energy, clean water and cooking fuels etc
- easy to deploy into small and remote communities – self powered

Eco-tourism

- started to explore this with eco-tourism company - Covid impact
- targeted community clean-ups – adjacent ULO dumps and plastics



Thank you ■ ■ ■ ■ Questions please

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION –

Presentation by

Lindsay Teobasi
Design & Technology Centre

1 October 2024


D&T Centre
DESIGN & TECHNOLOGY CENTRE
Clean Tech Innovations
PLASTIC RECYCLING
Solutions
WASTE TO ENERGY

OVERVIEW

- Approaches to Waste Management in Solomon Islands
  - Design & Technology Centre
  - Pyrolysis Technology

- Promote Appropriate and best waste management practices. (City Level / Ward Level, Communities/ Households)

- Key Issues / Challenges

- Way Forward – Collaboration, Partnership (Solomon Islands Government : Line Ministries, Honiara CityCouncil, Development / Donor Partners)

- Conclusion

  Video Clip (5 minutes)

OVERVIEW

About Design and Technology Centre
Waste2Energy

- DTC Waste2Energy was established to commercialise the Pyrolysis Technology Process technology in the Solomon Islands. The Process efficiently converts a variety of feedstocks (Polymers / plastics), such as, LDPE, HDPE, industry waste, and other plastics, into butane gas and crude oil/wax which can be used for heat energy

- The DTC W2E business model is focused on waste-to-landfill minimisation and energy security through sustainable heating energy, and purposefully addresses politically sensitive issues of energy, waste and environmental impacts.
- DTC Pyrolysis process technology is particularly relevant to local governments, public authorities, island nations and remote communities,
- DTC Pyrolysis technology helps a broad range of organisations realise improved economic, environmental and social value.

Key Value Proposition

1. DTC Waste2Energy provides the technology, manufacturing & sales of the Pyrolysis processing plants to organisations and institutions in the Solomon Islands and Pacific Islands.
2. DTC Waste2Energy's (W2E) aim is to address urgent environmental problems by diverting existing waste to create energy.
3. DTC W2E's solutions address key socioeconomic and environmental issues faced in the Solomon Islands and the neighbouring countries in the Pacific region, providing sustainable waste management and energy production solutions that facilitate the transition to a low emissions future and a reduced carbon footprint for stakeholders.
4. The DTC W2E Pyrolysis technology is designed to process polymers / oil-based waste materials delivering butane gas and crude oil, satisfying all regulatory requirements for Australian and New Zealand Standards.
5. DTC technology aims to help a broad range of organisations realise improved economic, environmental and social value.

BACKGROUND – *DESIGN & TECHNOLOGY CENTRE*

Our major goal is to establish a plastic design and manufacturing industry for the production of plastic products and recycling of plastic waste in an effort to protect the environment and to promote a healthy population.

DESIGN & TECHNOLOGY CENTRE ®

PLASTIC RECYCLING

BACKGROUND – *DESIGN & TECHNOLOGY CENTRE*

Waste to Energy Project

Design and Technology Centre Waste to Energy (WtE) project is a technology initiative to convert unconventional feedstocks to conventional fuels, such as Butane Gas and Crude oil for heating, using Pyrolysis Technology.

D&T Centre

Technology Education

DESIGN & TECHNOLOGY CENTRE ®

PLASTIC RECYCLING

Objectives

1. To reduce the amount of plastic wastes in Honiara by setting up a plastic recycling HUB that will enable plastics users in Honiara in collaboration with the government, stakeholders, Honiara City Council, and Private Sector to do things right. ***"If the heart is right the actions will be right".***

2. To provide employment and training opportunities for all on plastic design, and recycling in collaboration with government departments, stakeholders, HCC and Business Houses for the sustainability and controlling of plastic usage.

Approaches to Waste Management in Solomon Islands

PYROLYSIS TECHNOLOGY

Objective:

- *To provide solutions for the growing economic and ecological concerns faced by industry and government, specifically energy security, waste management and a transition to a low emission future*
- *To captalise on this unique process underpinned by the diversion of waste from landfill to the plastic recycling plant at the Design Technology Centre*

Approaches to Waste Management in Solomon Islands

Public Awareness (Homes, Institutions, Work Place and Streets)

- Plastic Recycling – 3Rs + Return

(Reduce / Recycle / Reuse / Return)

Pyrolysis Technology

ON TRIAL / TEST the operations on 3 sites in Solomon Islands - 2019

- *MUNDA – Western Solomon Province*
- *TUVARUVU – Central Honiara*
- *Sun Valley Community – DTC East Honiara*

TUVARUVU COMMUNITY


MARMITE · KREOL
22

Sun Valley Community – East Honiara

Pyrolysis Technology –
Units fabricated at the Design & Technology Centre for three Rural Training Centers (RTC)

Pyrolysis Technology
Rolled out in Educational institutions

Operation on 3 sites on Guadalcanal Province. 2021 - 2022

- Kaotave Rural Training Centre – South Seas Evangelical Church
- St. Martins Rural Training Centre – Roman Catholic Church
- DIVIT Rural Training Centre Visale – Roman Catholic Church

Pyrolysis Technology *Kaotave (RTC)*

Separating Plastics – Staff and Students

Training, Installation / Connection of the unit - 27th July 2023

Pyrolysis Technology - DIVIT RTC

3 KEY ISSUES / CHALLENGES

1. Rising Volume of the key waste streams (Polymers/Plastics, Used oil, Organic waste)

KEY ISSUES / CHALLENGES

2. Absence of appropriate system for commercial, industrial, Institutional and House hold waste which results in the poor management of these waste streams

KEY ISSUES AND CHALLENGES

3. The recycling industry is not vibrant and therefore does not contribute to significant reduction to the amount of waste disposed

WAY FORWARD

1. AWARENESS - Promotion of appropriate and best waste management practices for the protection of the Environment in working towards a Clean, Green and Healthy Solomon Islands and our neighboring pacific island countries (PICs) through the use of Pyrolysis Technology.
2. Further research & design and improvement of the pyrolysis plant to accepted Green house Gas Emission /worldwide standards.
3. Research other Waste to energy Programs such as transforming Used coconut oil to diesel fuel for use on vehicles and small inter island boats
4. Research and Bottling of the Butane gas once it has gone through the machine, proper packaging and sell to communities.
5. Support the Implementation of awareness and educational related initiatives and projects focusing on waste reduction, reuse and recycling, treatment and proper disposal of waste.
6. Advocacy, collaboration and partnering with Solomon Islands Government through - MECDM, MMERE, HCC, Development /Donor Partners and Private Sector in promoting and implementing cleanliness in Honiara city and provincial centers.

CONCLUSION

The Solomon Islands, like other Pacific Islands Countries (PICs) are susceptible to global challenges associated with solid waste management and energy security.

The capacity to manage waste produced is trailing its rapid development and population growth in the Solomon Islands. In addition, large section of its rural communities lack access to clean and affordable energy sources. It is indeed an innovative approach to try and address the lack of energy with abundance of waste in progressing towards the objectives of the Sustainable Development Goals

Proper Waste management is very crucial if we are to solve the problem, especially plastic waste which starts on land and ends up in our oceans .

We believe that transformation of ‘waste’ to something useful and of value is of great worth. Our revolutionary approach to sustainable development is crucial right now and we are hopeful that the pyrolysis technology is a solution to this problem.

CONCLUSION

The call for all Stakeholders including:

- Families & Households,
- Institutions & Communities,
- the Government, Development & Donor partners, Business Houses for better collaboration for the implementation of Recycling and Waste Management activities both in technical and financial support.

Together we can make a lasting change and a better future for our young generation

Tagio Tumas

(Thank you)

Recycle Waste plastics to Butane Gas

Used Oil Pilot Project in Vanuatu

CORE ISSUES about USED OIL for Vanuatu

- Used oil is a growing environmental challenge – one of largest waste generated
- No formal system to address most of the generated used oil
- Absence of used oil management infrastructure and system (collection, storage, treatment, and proper disposal)
- Sustainability of used oil management system
- Legacy waste (old stockpile)
- Inadequate data – not monitored
- Limited knowledge and skills on used oil management
- Reliable information on importation of hydrocarbon products

ADDRESSING THE CORE ISSUES FOR VANUATU

- Establish a system of handling, collection, transportation, storage and recycling of used oil
- Enhancing the local capacity to manage used oil including knowledge on the potential health and environmental risks of unmanaged used oil
- Establish a partnership with the private sector to attract more funding support and address legacy waste oil and continuously generated used oil
- Consider on-site processing of used oil to produce economically viable product.
- Provide a stimulus to implement economic instruments such as ARFD/PSS to sustain funding requirements
- Have a used oil data tracking system to allow the government to make more informed decisions

THANK YOU

BESTON GROUP
CO.,LTD

TDU REPORT

BESTON

RECYCLING FOR BETTER LIFE!

Contents

Oil Sludge Types

In the process of oil exploration, production, storage, transportation, refining and other links, a large amount of oily sludge is produced every year. The oil content in oily sludge is 5%-50%, and it contains polycyclic aromatic hydrocarbons, heavy metals and other pollutants. It is toxic and flammable, polluting the atmosphere, soil and water resources, and causing serious harm to the ecological environment and human health. Oily sludge is produced in many ways and has complex components, which brings great difficulties to its disposal.

Oil-based mud

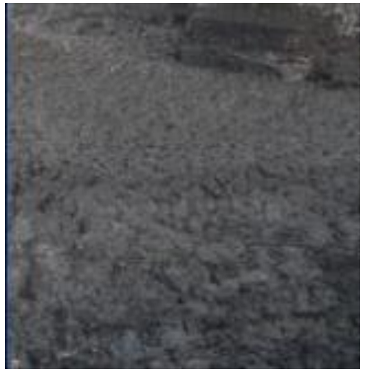
Oil-bearing cuttings

Oil pit sludge

Split oil sludge

Tank bottom sludge

Refining oil sludge



Resource	Type	Water content %	Oil content %	Solid content %
Drilling oil production	Oil-based drill cuttings✓	8-15	15-25	60-80
	Sludge during oil production✓	40-50	10-20	30-40
	Spilt oil sludge✓	5-25	5-10	70-90
Crude oil gathering and transportation	Landed oil sludg✓	5-25	5-10	70-90
	Tank bottom sludge✓	40-70	20-40	5-40
Refinery sludge	Sludge from oil separation✓	60-70	10-15	25-35
	Scum	75-90	5-10	3-10
	Activated sludge	75-85	< 5	10-20

✓ means can be processed by Beston technologies.

Global sludge treatment Policy

United Nations Environment Program (UNEP) regulations
Countries are required to take measures to standardize sludge disposal practices and prevent environmental pollution.

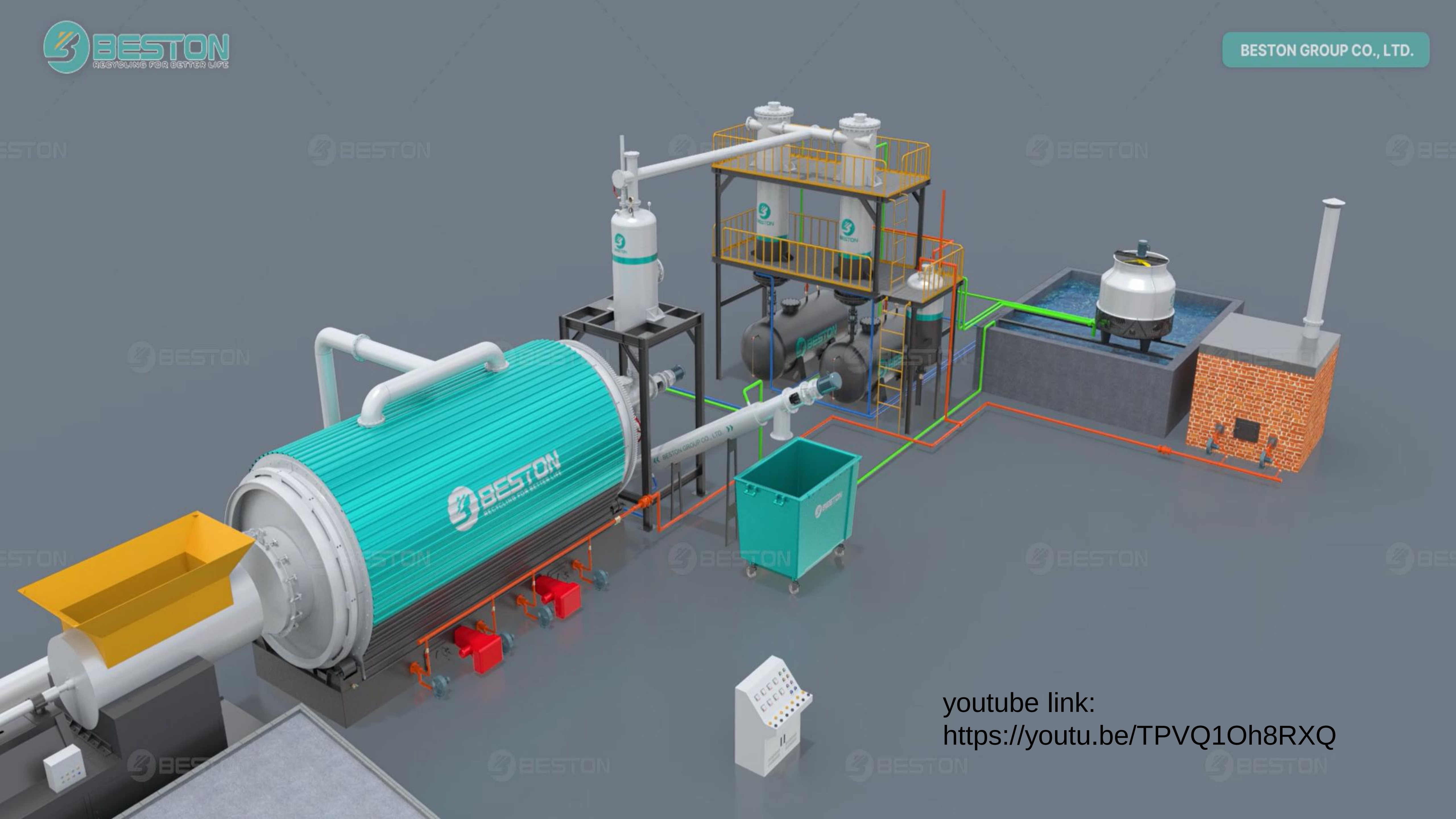
EU sludge disposal directive
It stipulates standards for the collection, transportation, handling and disposal of oil sludge and requires member states to strictly implement them.

USA
Both the federal government and state governments have introduced strict sludge disposal regulations, requiring companies to handle the sludge they generate in compliance with regulations.

China
The national and local governments have successively issued a series of regulations related to sludge treatment, standardizing the development of the sludge treatment industry.

Treatment Comparison

Technology	Normal temperature solvent extraction	Chemical hot washing treatment	Incineration	Pyrolysis	Biological method
Environmental protection	requires the addition of an extraction agent	requires the addition of chemicals and a large amount of waste water	Easy for secondary pollution such as dust, dioxins, and So2, resulting in high carbon emissions	no need to add any chemicals, and all emission indicators are better than relevant national standards.	Risk of secondary pollution
Resource recovery	Oil products and extraction agents can be partially recovered	Recycle and reuse most of the oil products	Unable to recycle oil	Except for the self-use part of the system that producing non-condensable combustible gas, the rest of the oil can be recycled	Long treatment cycle, poor treatment effect on cycloalkanes and aromatics
Energy consumption	Higher energy consumption	Higher energy consumption	Most of them require the addition of combustion accelerants, and consume high energy	Lower energy consumption	low
Technical difficulties	different sludge require different organic solvents for extraction. Process complicated and difficult industrial scale	Not suitable for treating oil sludge with complex components and high degree of emulsification, and the screening and use of chemical reagents have high technical content.	The operation requirements of process technology are high, and the pollution prevention technology is difficult.	Need to overcome the industrial problems such as coking and sealing in the main engine.	Complicated and immature
Processing cost	The dosage of extractant is large, high cost	High disposal cost	High disposal cost	Low disposal cost	General grade



youtube link:
https://youtu.be/TPVQ1Oh8RXQ

EIA

The noise within 100 meters of the equipment is about **60Db**, the gas pollution is mild, the waste liquid (mainly water) is generated about **1m³/day**, and the waste solid is non-harmless dust after pyrolysis (oil content below **0.3% that can be landfilled**, which is very important to the project.). There is **no pollution within 5 kilometers around.**

BLJ-16 Oil Sludge in Lybia

SUCCESSFUL CASE	
CLIENT BACKGROUND	The sludge treatment service company needs to help its service customers deal with tank bottom sludge and oil field sludge.
PROBLEMS FACED	The water content of the cracked oil produced by cracking the sludge is too high, 30% oil and 70% water.
WHATS THE CLIENT WANTS TO ACHIEVE	•Process the sludge, obtain profits, and earn service fees. •Protect the environment and reuse resources.
SOLUTION	BLJ-16 TDU+ Shaftless spiral.
VALUE ADDED	Reduce environmental pollution and improve the company's position in the industry.
CLIENT testimonials	•Feedback on product/service: Add a scale measurement to the reactor, and also use sampling points to check whether the material reacts from time to time. . •Overall impression of BESTON company/brand: Excellent quality, timely problem solving online. . •Will recommend BESTON products/services to others because it ranks first in the global market.

BLJ-16*3 Oil Sludge in Malaysia

SUCCESSFUL CASE	
CLIENT BACKGROUND	One of the licensed scheduled waste contractors and management companies in Malaysia approved by DOE (Department of Environment). The company was established to provide waste management services and collection. Suitable for all kinds of scheduled waste generated by public, commercial, light industry and heavy industry.
PROBLEMS FACED	Waste sludge and plastic from local factories were collected and required to be disposed of.
WHATS THE CLIENT WANTS TO ACHIEVE	• Charge the company's processing fee. • Obtain government subsidies.
SOLUTION	3 sets of BLL-16+ independent de-dusting systems, the oil produced is used as fuel for heating equipment. The waste residue generated is processed through solidification equipment.
VALUE ADDED	• Provide new solutions to local governments and protect the environment. • Enhance corporate influence and image.
CLIENT testimonials	Client recognize our technology and services very much and hope to create benchmark projects and long-term cooperation.



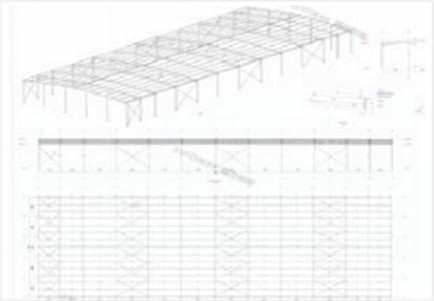

Other Working Sites

Inner Mongolia

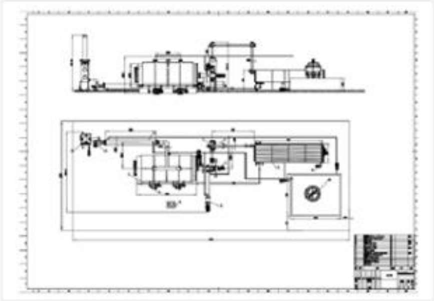
Hu Bei

South Sudan

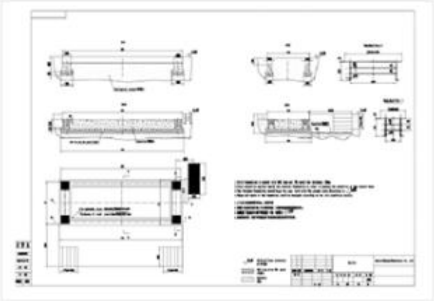
There are a couple of technical documents we will provide in sequence:



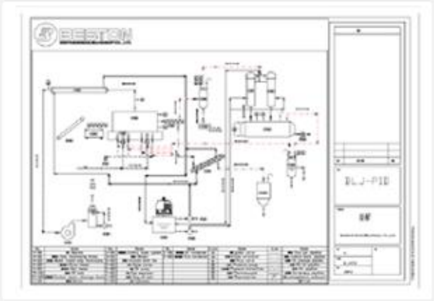
01 Client's Project Site



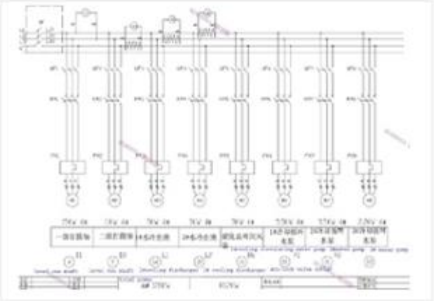
02 Layout Drawing



03 Foundation Drawing



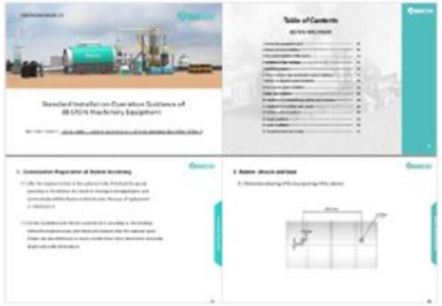
04 PID Drawing



05 Electrical Drawing

06 3D Layout

07 Installation Schedule

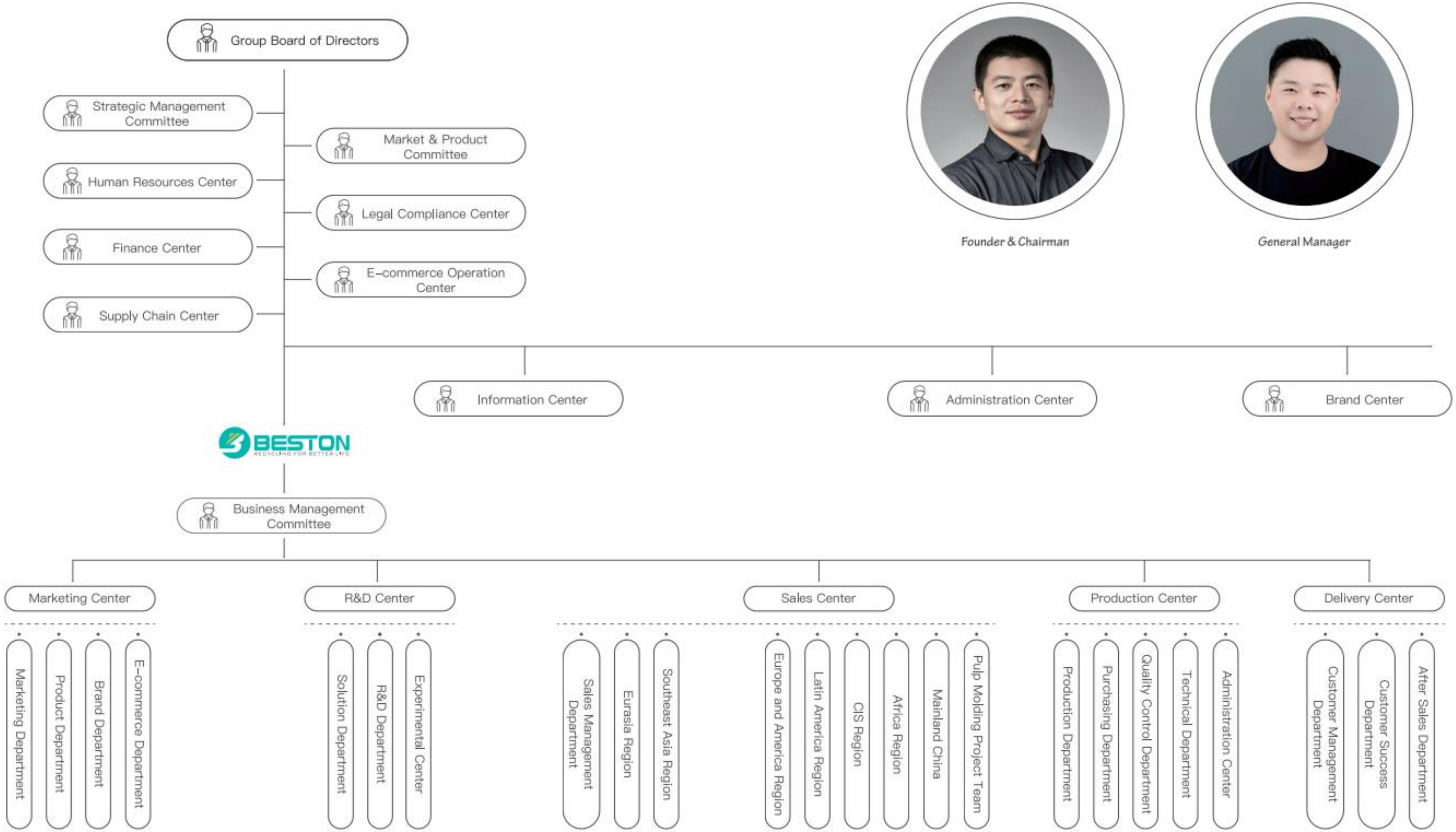


08 Installation Manual

09 Operation Manual

10 Maintenance Manual

ORGANIZATION



Founder & Chairman

General Manager

BESTON GROUP

Established in 2013, responsible for the promotion of resource regeneration solutions, equipment manufacturing and project implementation in the global market.

Supplier of complete solutions for solid waste treatment，Manufacturer of related equipment.

No. 1 of China's exports in this field

Strategic partner of Reliance Industry Limited (Ranked 88th among the Fortune Global 500, biggest company in India), potential cooperation with Shell and Exxon Mobile，etc

- 11 years of development
- Employees 400
- Modern factories of over 200,000 ㎡
- Comprehensive organizational structure
- Products and service are widely sold in more than 130+ countries and regions .


BESTON
北工机械—资源再生，让生活更美好
Providing safe solutions and high-quality services


BESTON
THANKS
RECYCLING FOR BETTER LIFE!

BESTON

Contact

Ally Wang

WhatsApp 联系人

Whatsapp

Wechat

+86 185 6998 1862

www.bestongroup.com

allywang@bestongroup.com

DESIGN OF USED OIL STORAGE AND REPROCESSING FACILITY

A Public Private Partnership between (PPP) Vanuatu Department of Environmental Protection and Conservation (DEPC) and Ocean Environmental Services (OES)

WASTE OIL VANUATU BACKGROUND

- Used Oil Assessments in the Pacific → 2011 - 2018
- Vanuatu Waste Oil Audits → 2013
- Used Oil Management Plan for Vanuatu → 2014
- Improved Used Oil Management in the Pacific → 2018
- Vanuatu National Used Oil Management Plan → 2022
- National Used Oil Management Plans were also developed for Samoa, Solomon Islands and Tonga in 2022

- Used oil is defined as any petroleum-based or synthetic oil or fluid that, through contamination or degradation, has become unsuitable for its original purpose due to the presence of impurities or loss of original properties.
- This covers all used oil consistent with the classification of hazardous waste under the Waigani and Basel Conventions.
- This includes any semi-solid or liquid product consisting totally or partially of mineral oil or synthesised hydrocarbons (synthetic oils), oily residues from tanks, oil-water mixtures and emulsions.
- These may be produced from industrial and non-industrial sources where they have been used for lubrication, hydraulic movement, heat transfer, electrical insulation or other purposes and whose original characteristics have changed during use, thereby rendering them unsuitable for further use for the purpose for which they were originally intended.

USED OIL DEFINITION

- The recent study had estimated 637,000 litres of Oils and Lubricants imported annually into Vanuatu.
- The exact number is hard to quantify based on the Tariff codes and importation descriptions.
- Oils can include Petroleum Oils, Grease, Lubricating Oil & "Others"
- It was estimated that 50% of the Oil is used up in the "normal" use in running engines. Vanuatu has a high use of 2 Stroke motors in the form of Chainsaws and String cutters where the Oil is mixed directly with fuel for engine operation.
- Based on previous studies and calculations the potential volume of Used Oil in Vanuatu available for this process is between 280,000 and 380,000 litres
- The study confirmed unsafe practices and storage of Used oils in Vanuatu
- People were mostly unaware that commonly used practices were potentially detrimental to the environment – EDUCATION and COMMUNICATION are key to getting general public and stakeholder buy-in.

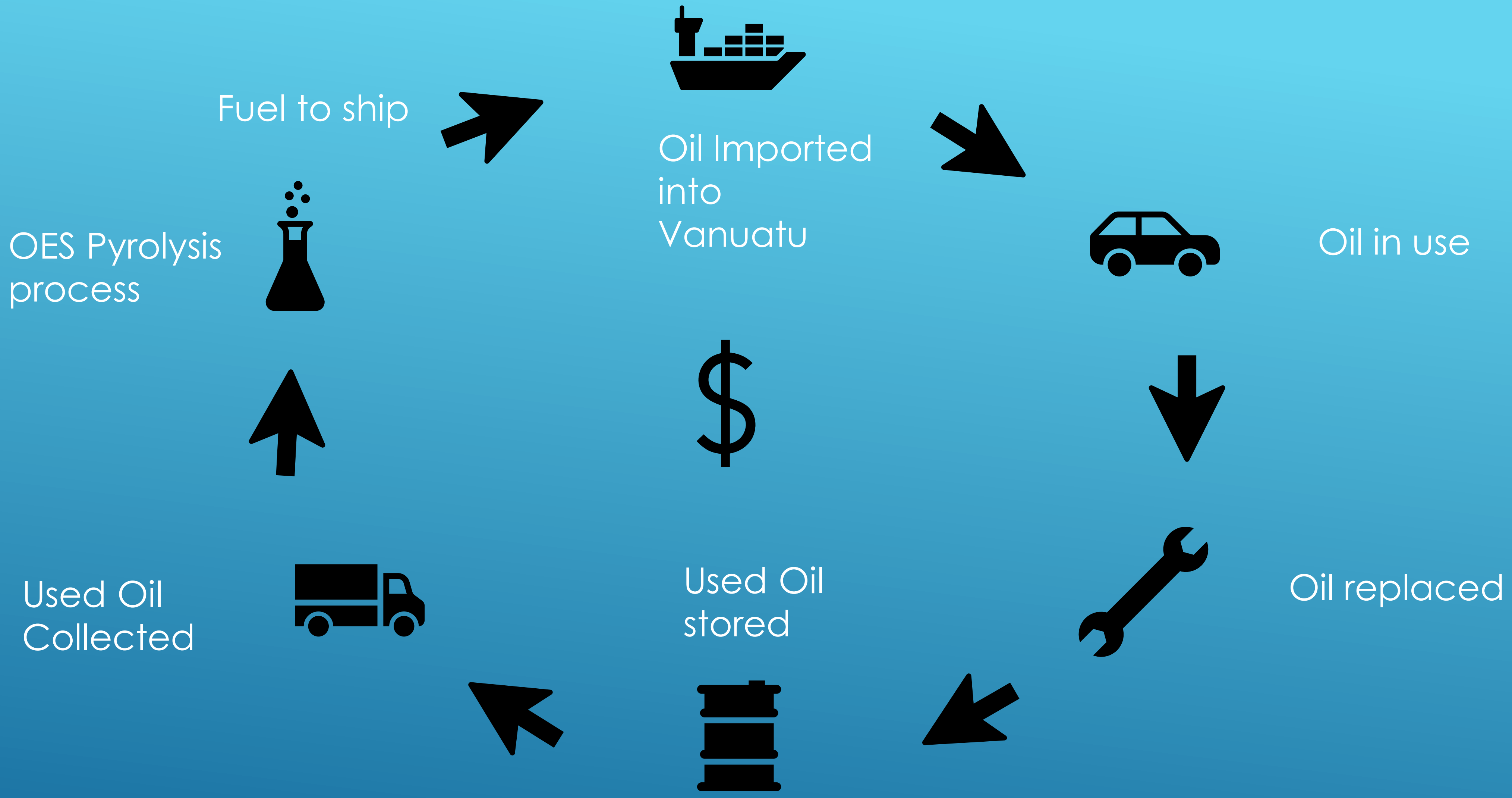
SOME FACTS

VANUATU USED OIL STORAGE

- Inclusion in general rubbish
- Poured directly into stormwater drains
- As a weed killer / suppressant
- Burnt with other waste
- Ground marking of sports fields
- Preservative use in timber from rot and insect infestation
- Dust suppression on Coral roads
- Rust prevention

ENVIRONMENTALLY UNACCEPTABLE USES OF USED OIL



USED OIL VANUATU POTENTIAL PROCESS (ADVANCE RECOVERY FEE MODEL)

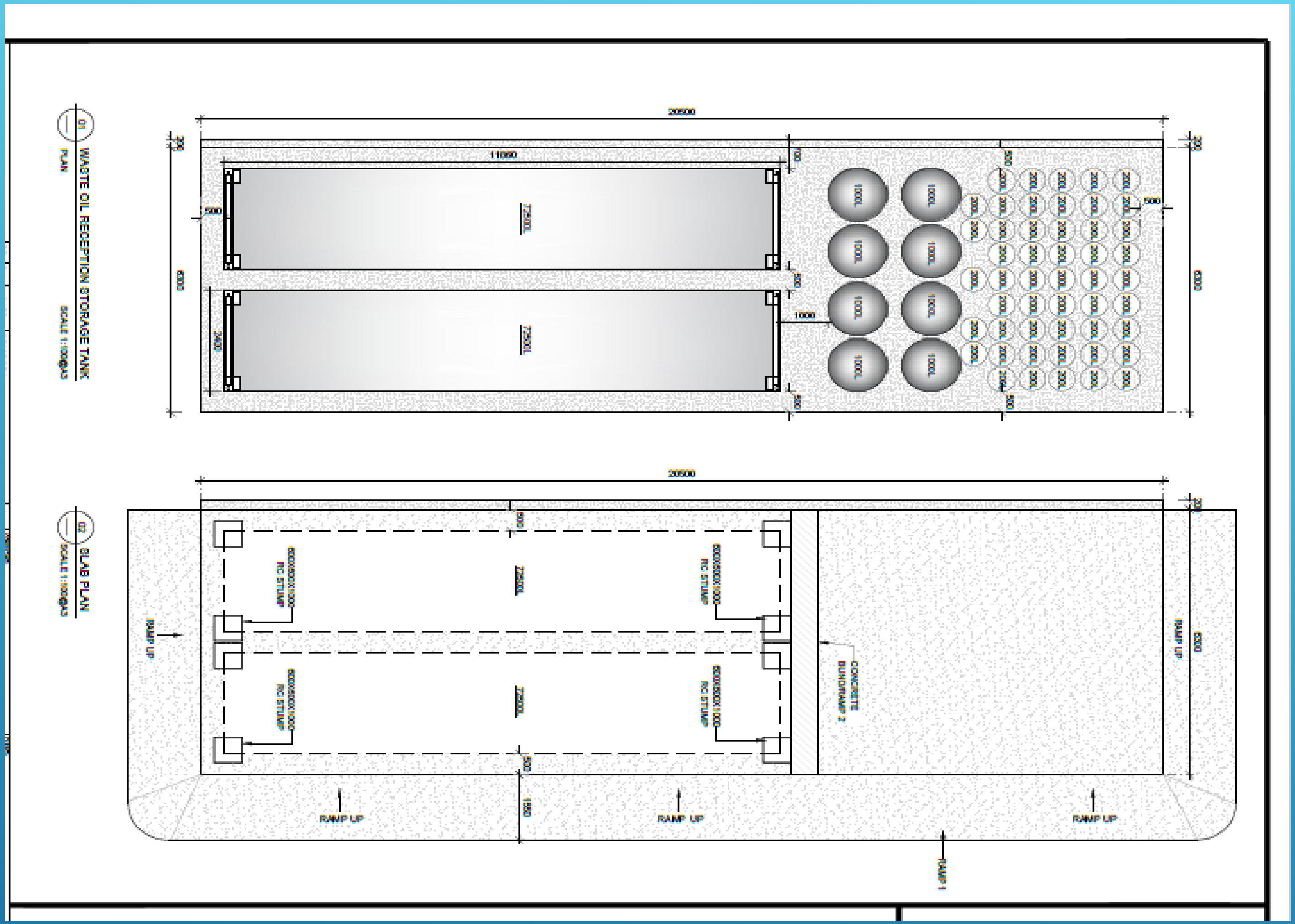
- People – Local Housing & Villages
- Water Sources
- Air Pollution
- Noise Pollution
- Groundwater contamination
- Wildlife Habitat
- Existing land use
- Significant area (Reserves or Protected)
- DEPC Conducted Full Environmental Impact Assessment
- Good recorded processes and training with staff prior to emergency (Drills)
- Fire Protection – Engage the local Fire Department prior to any emergency
- Safety – Dedicated PPE & Spill Kits & Equipment (Onsite & Checked)

ENVIRONMENTAL CONSIDERATIONS

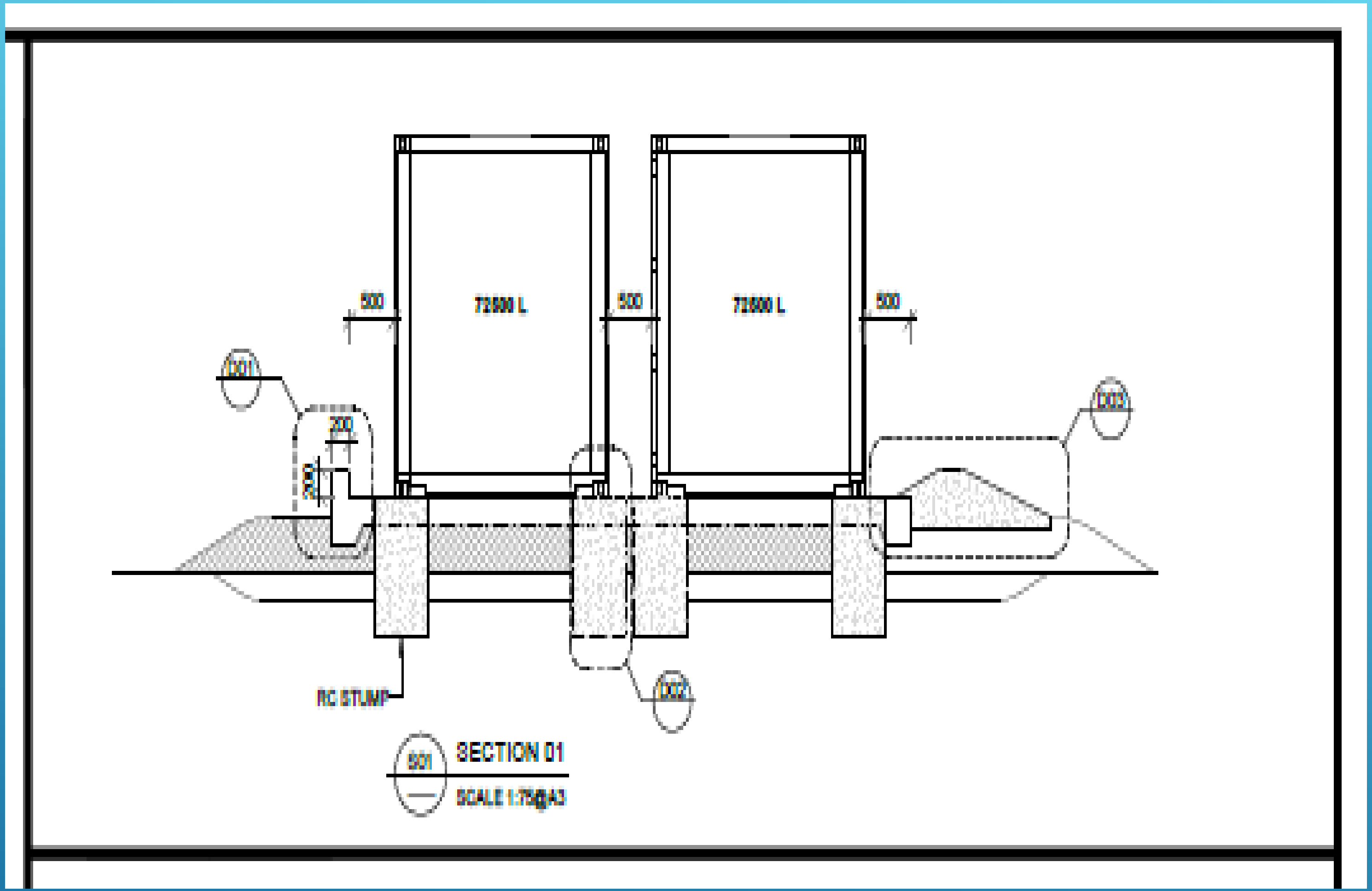
- OES help to source containers directly from a previous supplier in China
- 72,500-litre capacity, double-walled carbon steel construction
- Size = 12.4m x 2.4m x 2.9
- 8mm inner and outer skin
- Quick lock container feet
- Export on exchange if necessity dictates – Plant failure or Cyclone Damage etc

USED OIL VANUATU STORAGE FOR PYROLYSIS PROCESS

USED OIL VANUATU STORAGE FOR PYROLYSIS PROCESS



- Provision for 205lt Drums although we expect most Oil will be delivered via exchange in Double Skinned 1000 litre containers from suppliers or directly from a Suction truck.
- Plans include covering the area for drum and 1000 litre container storage. Stage #2
- Less transfer of Oil from small containers is preferred. Reduced risk of spills during transfer



- Bunded Ramp access for Forklift if required. (Hiab crane)
- Containers will be secured via container locks embedded into the stumps.
- 200mm Pad depth with 1000mm locking stumps into the pad.
- Concrete 30 MPA in accordance with National building codes.

USED OIL VANUATU STORAGE FOR PYROLYSIS PROCESS

- Plan for the worst - Aim for the best
- Engage suitably experienced team - Specialist product and requirements
- EIA initial review of the site prior to Official request for EIA (Time delays & $)
- Stakeholder engagement - Follow up & follow through (Consultant fatigue)
- Use experienced & trusted suppliers - (You get what you pay for)
- Best Practice examples - (Technology, Process, People)
- Share and discuss with your peers

KEY TAKEAWAYS TO SUCCESS

TANKYU TUMAS

Biogas Technology

Dr Ravita D Prasad
School of Sciences
College of Engineering and Technical Vocational Education and Training
Fiji National University

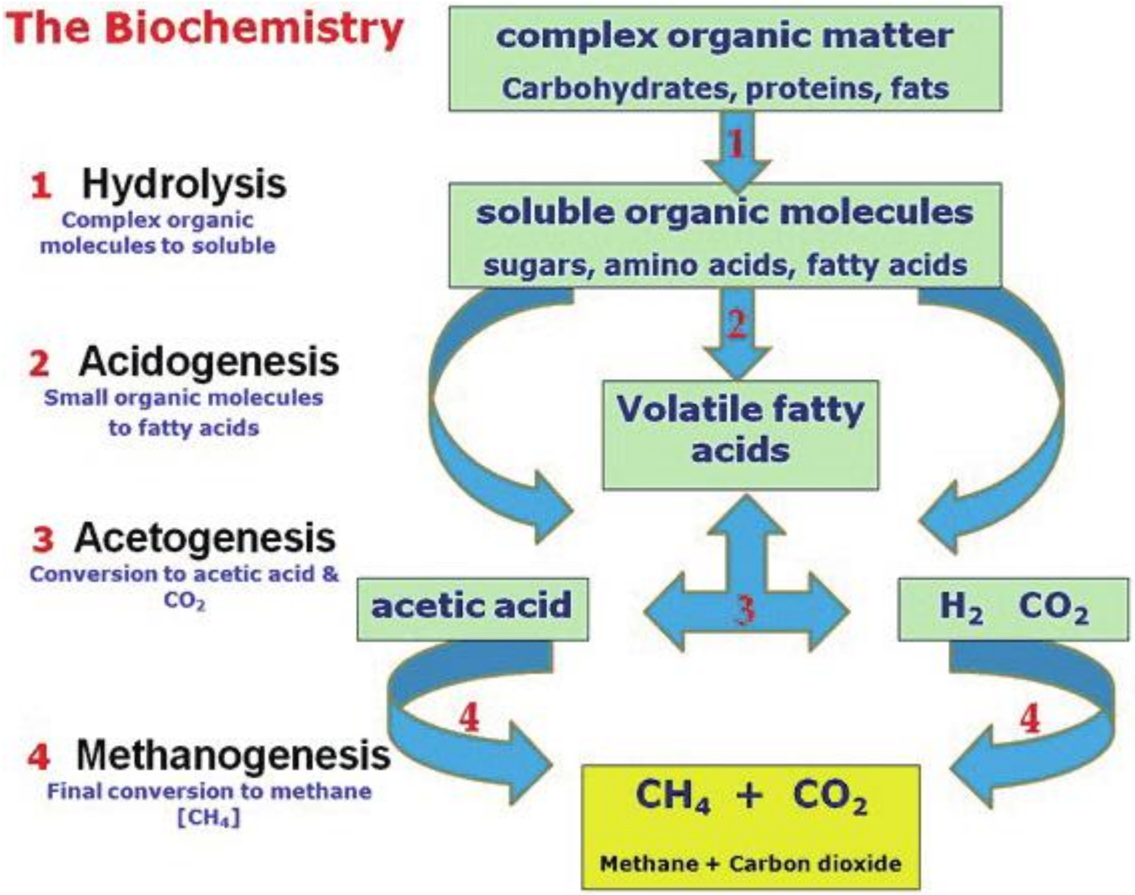
PAWES – Circular Economy Workshop 30 Sept to 4th October 2024 Port Vila, Vanuatu

Outline

- Anaerobic digestion
- Work done in the Pacific
- SDGS linkages
- Challenges
- Future research

Anaerobic Digestion

- This is where organic matter is broken down into methane gas and other gases from a series of biochemical processes.
- The product is biogas
- By-product is liquid slurry (digestate)



Source: https://rutherfordrenewables.co.uk/what-is-anaerobic-digestion/

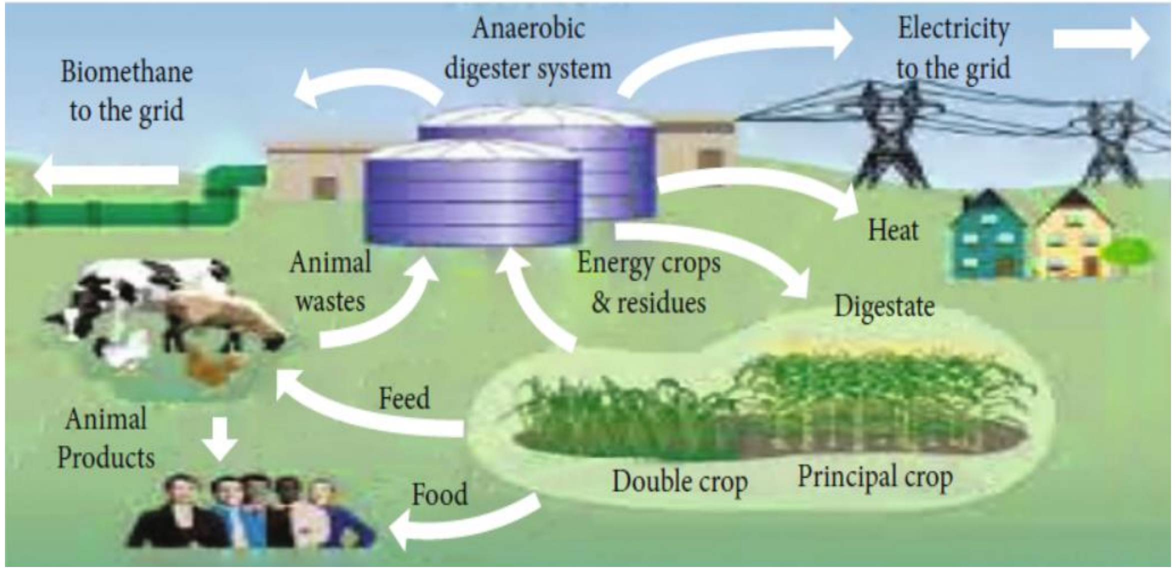
Biogas composition

	Element	Composition (%)
1	Methane	30-80%
2	Carbon dioxide	20-45%
3	Nitrogen	1-10%
4	Ammonia	0-0.05%
5	Moisture	2-8%
6	Hydrogen	0-3%
7	Hydrogen sulfide	0.1-0.5%
8	Oxygen	0.1-3%
9	Ammonia	0-0.5%
10	R_2SiO	0-0.5 mg/m^3
11	C_xH_y	0-1%

(Kabeyi and Olanrewaju, 2022)

Anaerobic Digester

- An Anaerobic Digester is a unit designed for processing organics through the process of anaerobic decomposition.
- These containers house a variety of organics along with the organism needed to convert these items into biogases, which can be used as an energy alternative.
- These digesters have provided an opportunity for waste reduction.
- At the same time, it prevents methane from entering the atmosphere.
- Methane is used for multiple purpose: heat, electricity and other industrial use



Biogas yield

Gas yields and methane contents for various substrates at the end of a 10-20 day retention time at a process temperature of roughly 30°C

(Kabeyi and Olanrewaju, 2022)

Substrate	Gas yield (L/kg Vs*)	Methane content (%)
Pig manure	340-550	65-70
Cow manure	90-310	65
Poultry droppings	310-620	60
Wheat straw	200-300	50-60
Rye straw	200-300	59
Barley straw	250-300	59
Oats straw	290-310	59
Corn straw	380-460	59
Flax	360	59
Hemp	360	59
Grass	280-550	70
Elephant grass	430-560	60
Sunflower leaves	300	59
Agricultural waste	310-430	60-70
Fallen leaves	210-290	58
Algae	420-500	63

Energy content of biogas from different feedstock

	Type	Biogas yield per ton of fresh matter (m^3)	Electricity produced per ton of fresh matter (kW h)
1	Cattle dung	55–68	122.5
2	Chicken litter/dung	126	257.3
3	Fat	826–1200	1687.4
4	Food waste (disinfected)	110	224.6
5	Fruit wastes	74	151.6
6	Horse manure	56	114.3
7	Maize silage	200/220	409.6
8	Municipal solid waste	101.5	207.2
9	Pig slurry	11–25	23.5
10	Sewage sludge	47	96.0

(Kabeyi and Olanrewaju, 2022)

Factors affecting biogas production

Temperature - mesophilic bacteria work well at a temperature range of 25-40°C

pH – optimum range of 6.8 to 7.2

Carbon to nitrogren ratio - A ratio from 20 to 30 is recommended

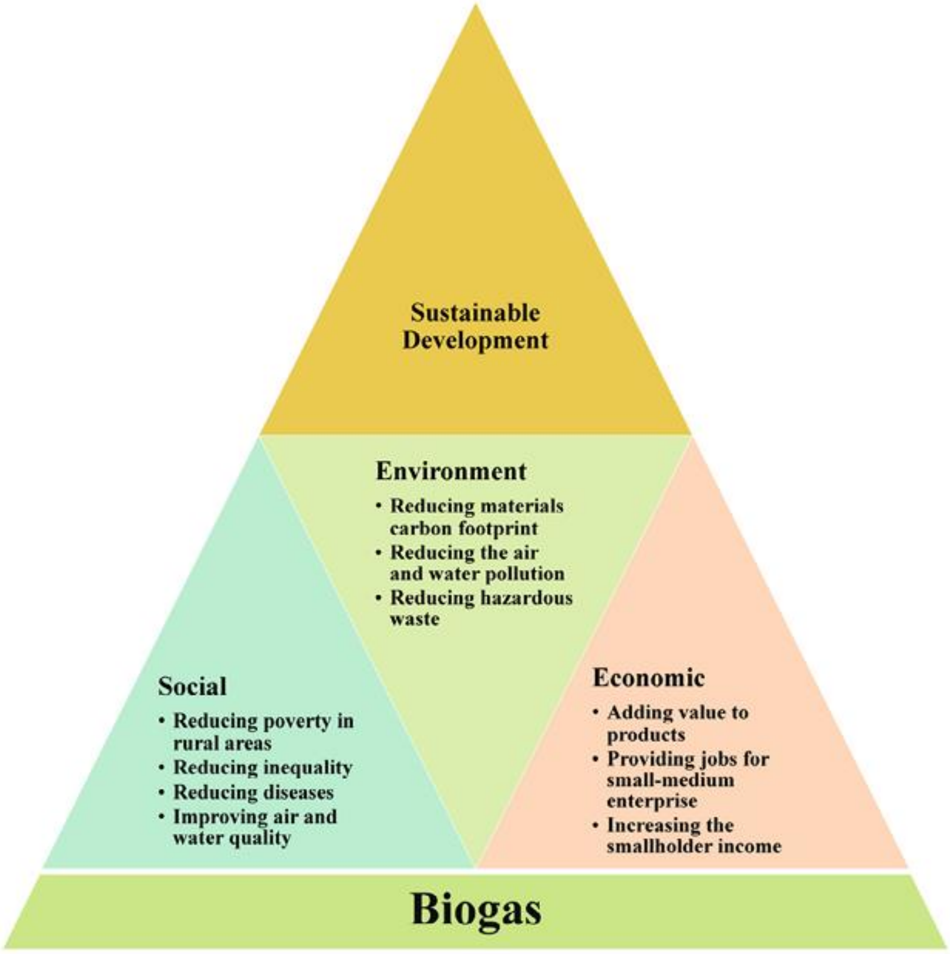
Loading time – High loading rates are desirable for higher methane production.

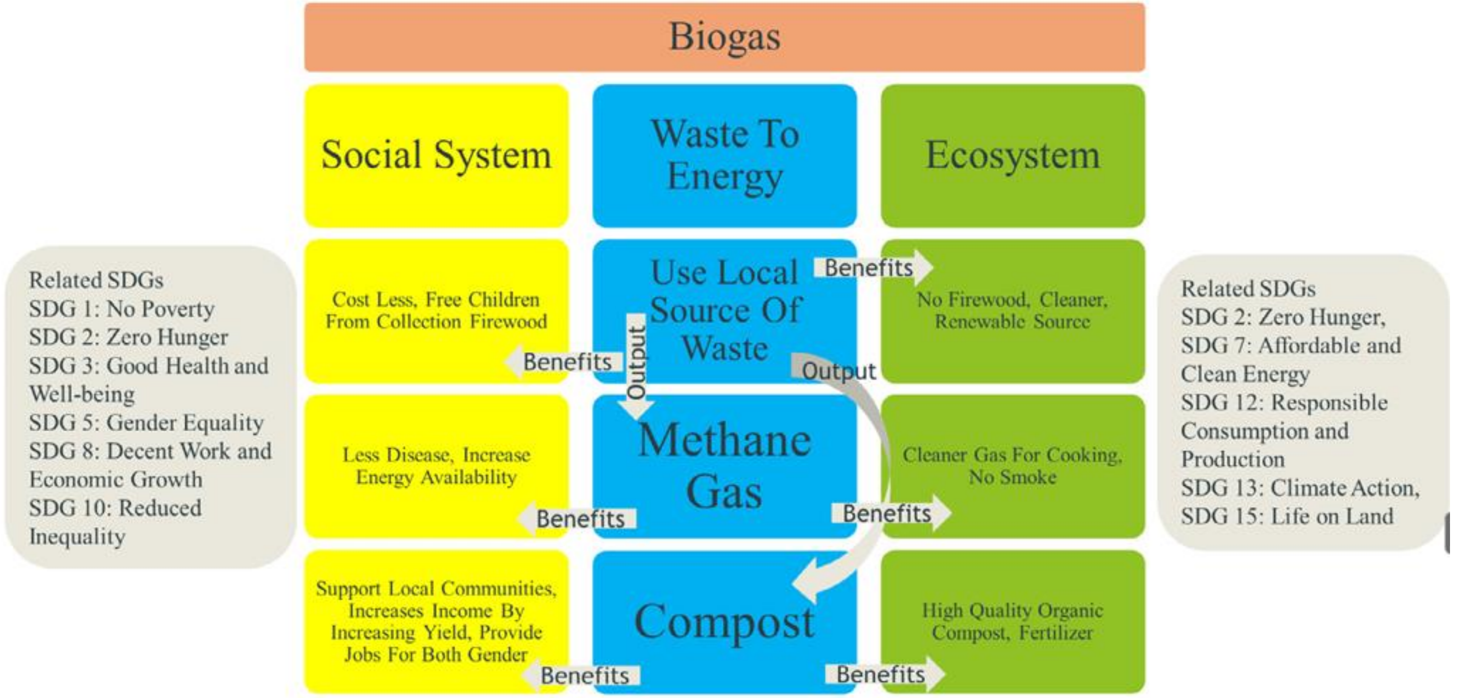
Digester Instrumentation – measure output levels and conditions inside the digester to identify any abnormabilities that may affect biogas yield.

Domestic and institutional applications in PICs

- Fixed dome
  - High cost of installation, labour intensive but climate resilient
- Floating drum
  - Easy to build but it gives out smell
- Pre-fabricated biogas digester
  - Easy to install
  - Latest in the market (need to be assessed

Biogas digesters and sustainable development





(Obaideen et al., 2022)

Challenges to biogas digester

Feedstock supply

Fresh waster availability

High upfront cost

Making it climate resilient

Awareness

Capacity building

Some future research areas

- Can seawater be used in biogas digesters?
- What is the status of the past biogas digesters installed in the region? What are the lessons learned?
- Business models for adopting biogas digester

Bibliography

- Kabeyi, M.J.B., Olanrewaju, O.A., 2022. Biogas production and applications in the sustainable energy transition. Journal of Energy 2022, 8750221.
- Obaideen, K., Abdelkareem, M.A., Wilberforce, T., Elsaid, K., Sayed, E.T., Maghrabie, H.M., Olabi, A., 2022. Biogas role in achievement of the sustainable development goals: Evaluation, Challenges, and Guidelines. Journal of the Taiwan Institute of Chemical Engineers 131, 104207.

Thank you

Any questions??

Circular Economy & Animal Feed

Regional Workshop: A Circular approach to waste management in the Pacific: Creating resources from waste and pollution, Vanuatu

30 September – 4 October 2024

VALORGA

Valorisation locale des matières organiques

Three examples of Waste Recovery in New Caledonia

1. Slaughterhouse Waste Recovery
2. Fishing Waste Recovery
3. Agricultural and agri-food Waste Recovery

Slaughterhouse Waste Recovery

New Caledonia

OCEF

Background

- OCEF: Office de Commercialisation et d'Entreposage Frigorifique (Office of Commercialization and Cold Storage)
- An industrial and commercial public entity
- OCEF's mission is to regulate the agricultural markets, particularly for meat and potatoes, through purchasing, processing and marketing local produce and importing complementary supplies to meet territory needs.

VALORGA
Valorisation locale des matières organiques

Slaughterhouse Waste Recovery

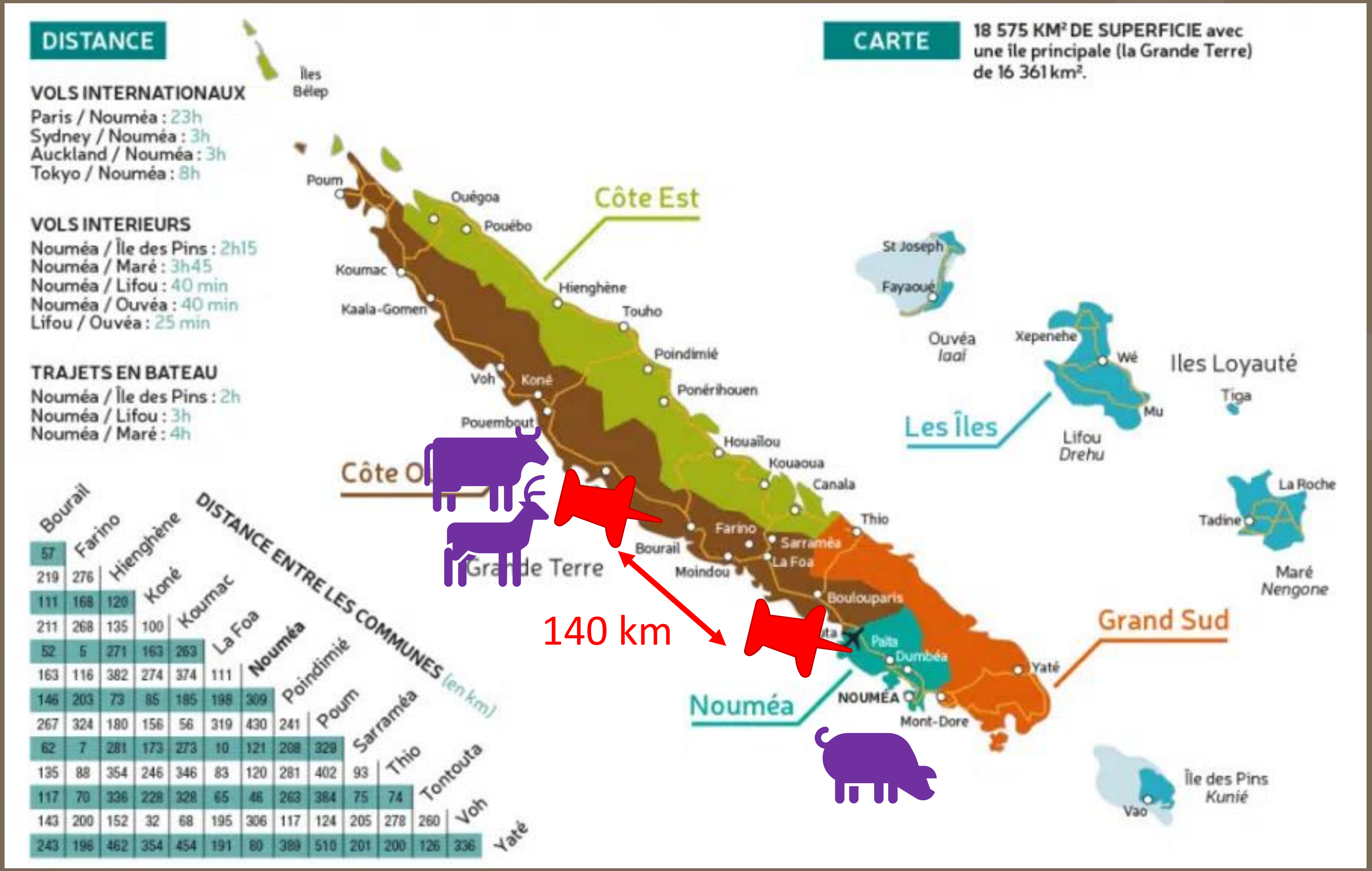
New Caledonia

OCEF

Context

Manage two public slaughterhouses, which annually process :

- 12 000 cattle
- 24 000 pigs
- 3 000 deer



Slaughterhouse Waste Recovery

New Caledonia

Slaughterhouse Waste

Bourail Slaughterhouse (data 2023) : **1,863 T of waste, including:**

- **824 T currently recovered** (heads, bones, blood, cutting waste)
- 539 T mainly skins
  → buried on site with lime
- 500 T stercorary matter
  → spread

Ongoing recovery Project to be launched in 2025

Païta Slaughterhouse : 240 T → buried at waste disposal site

VALORGA
Valorisation locale des matières organiques

Slaughterhouse Waste Recovery

New Caledonia

Products

- 824 T of recovered waste
  - 181 T meat and bone meal → Sold to feed manufacturers for the animal feed (pigs, poultry, aquaculture), covering around 20% of needs.
  - 110 tonnes of tallow → 80% reused internally for boiler feed + 20% sold to feed manufacturers as a binder for animal feed.
  - 26 tonnes of blood meal → sold to feed manufacturers for animal feed (more difficult to market) + studies ongoing to propose as fertilizer (regulatory challenges).

VALORGA
Valorisation locale des matières organiques

Slaughterhouse Waste Recovery

New Caledonia

Process

Batches of 1.5T to 2T of incoming material:

- Grinding: 50% viscous waste & 50% solid waste

Slaughterhouse Waste Recovery

New Caledonia

Process

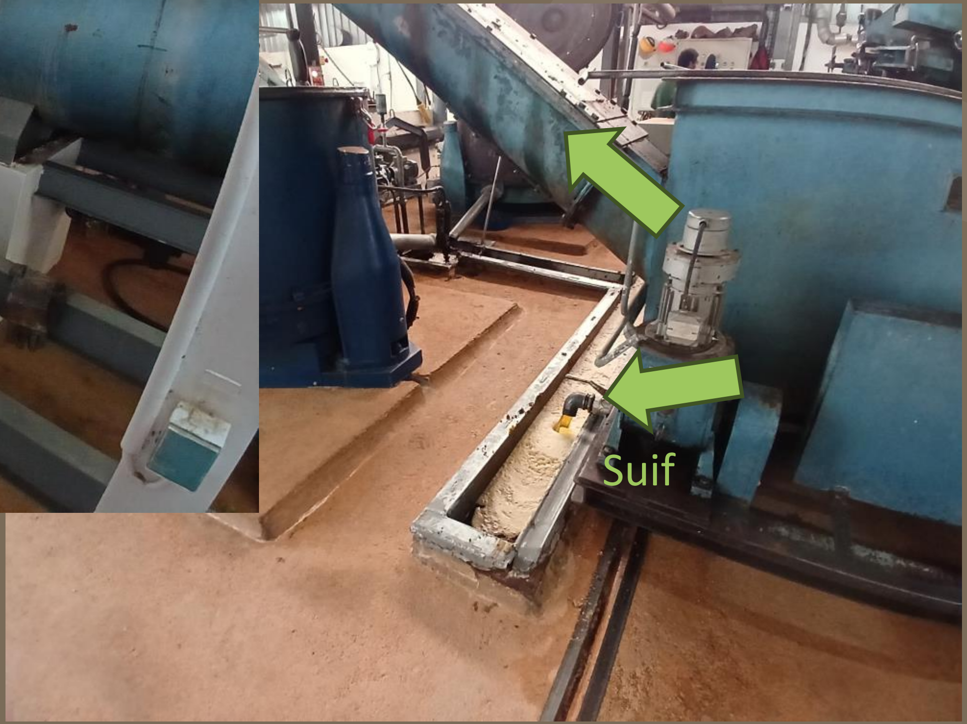
- Cooking: 3-4 hours at around 100°C (6-8 hours for blood)
- Sanitized: 132°C for at least 2 min

Slaughterhouse Waste Recovery

New Caledonia

Process

- Pressing → tallow



Slaughterhouse Waste Recovery

New Caledonia

Process

- Centrifugation

Slaughterhouse Waste Recovery

New Caledonia

Process

- Resting, cooling
- Grinding
- Bagging

Slaughterhouse Waste Recovery

New Caledonia

Process

- Storage
- Labelling
- Quality Control (1/week)
    - Microbiological analyses
    - Physicochemical analyses

Slaughterhouse Waste Recovery

New Caledonia

Global Overview

- New Caledonia free of bovine and porcine diseases
  - → Simplifies SPA management
- Economically unprofitable system
- 39% of waste currently recovered
- Fertilizer market (compost/organic): regulatory framework under development.

Fishering Waste Recovery

New Caledonia

RECYF

Context

1 400 T of fish waste, including almost 900 T from deep-sea fishing

- Process follows the same steps:

Grinding > Cooking > Pressing > Drying > Grinding

- In operation since December 2023

Fishering Waste Recovery

New Caledonia

Recovered products

- Production of:
  - 300 T of fish meal
  - 50 T of fish oil
- Use: Animal Feed (aquaculture, poultry, pigs)
- Goal: Valorization as organic fertilizer

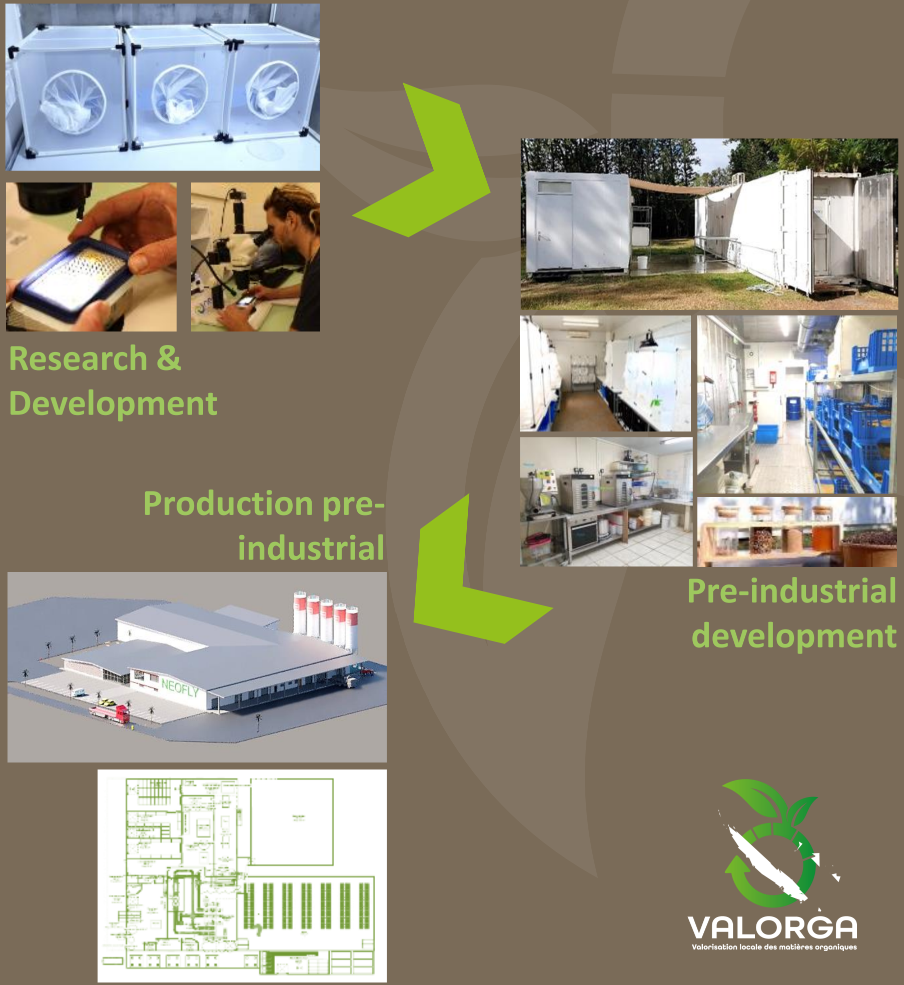
To learn more: RECYF NC

Agricultural and Agri-food Waste Recovery

New Caledonia

Context

- Near-total dependency on imports: proteins, lipids, fertilisers
- Bioconversion by Black Soldier Fly (BSF) = local, high-quality, low-carbon nutrients
- 2021 : Start-up creation
- 2021-2025 : R&D and pre-industrial development
- 2025-2027 : industrial rollout
- 2027 : plant commissioning and industrial production



Agricultural and Agri-food Waste Recovery

New Caledonia

Targeted waste (6,500 T)

- Potato sorting residues
- Brewery waste
  - Grains
  - Yeast
  - Other residues
- Agro-food sector residues
  - milliers
  - bakeries and pastry factories
  - Collective catering
  - Unsold market produces (unfit for human consumption)

Agricultural and Agri-food Waste Recovery

New Caledonia

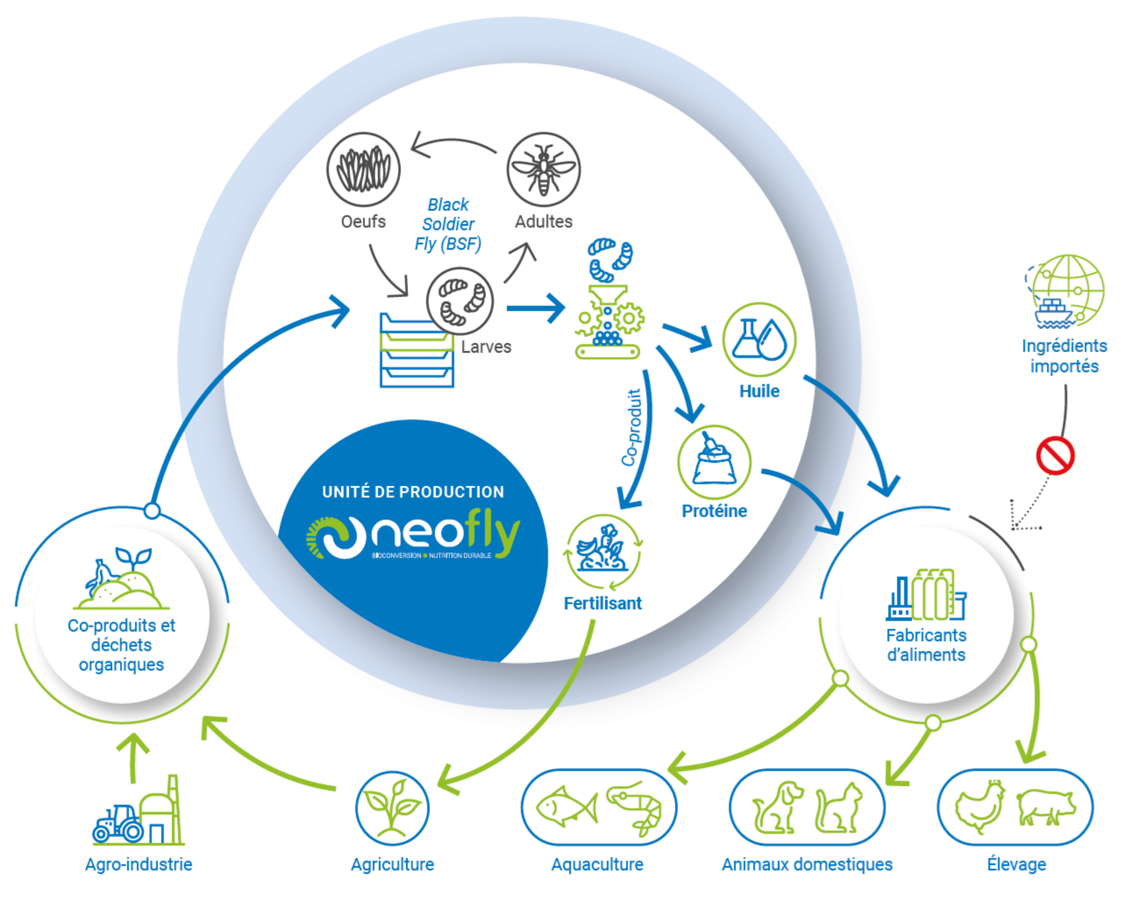
Process Overview

BSF Breeding and Bioconversion :

- Bioconversion: 2-week cycles to larvae harvest
- Reproduction: 6 to 7-week cycles

Larvae Transformation:

- Sieving > Blanching > Drying > Grinding > Pressing > Conditioning



Agricultural and Agri-food Waste Recovery

New Caledonia

Finished Products & Target Industries

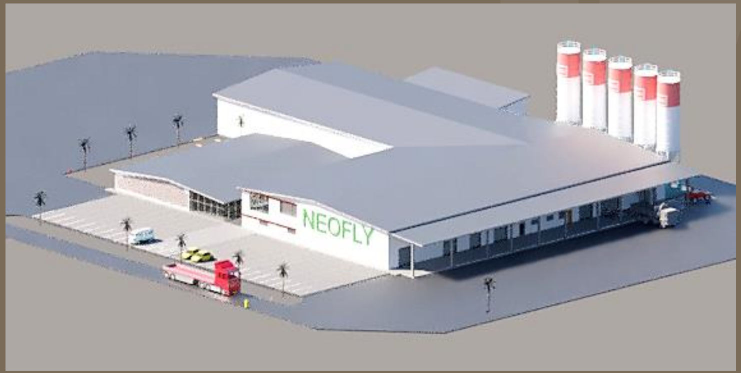
- Protein-Rich Meal
  - 500 T
  - Animal feed (aquaculture, poultry, pigs, pets)
- High-Quality Oil
  - 150 T
  - Animal feed (aquaculture, poultry, pigs, pets)
- Organic Fertiliser
  - 2,000 T
  - Agriculture, forestry, revegetation, gardening centres

Agricultural and Agri-food Waste Recovery

New Caledonia

Futur Outlook

- Continuous process improvement for this high-potential sector.
- Contribute to regulatory developments on organic products and their usage.
- Strengthen partnerships with local stakeholders to test and promote final products.
- Finalize design, financing, and construction of industrial production units.



To learn more: NEOFLY NC

VALORGA

Valorisation locale des matières organiques

Thank for your attention

Contact Us:

valorga@valorga.nc

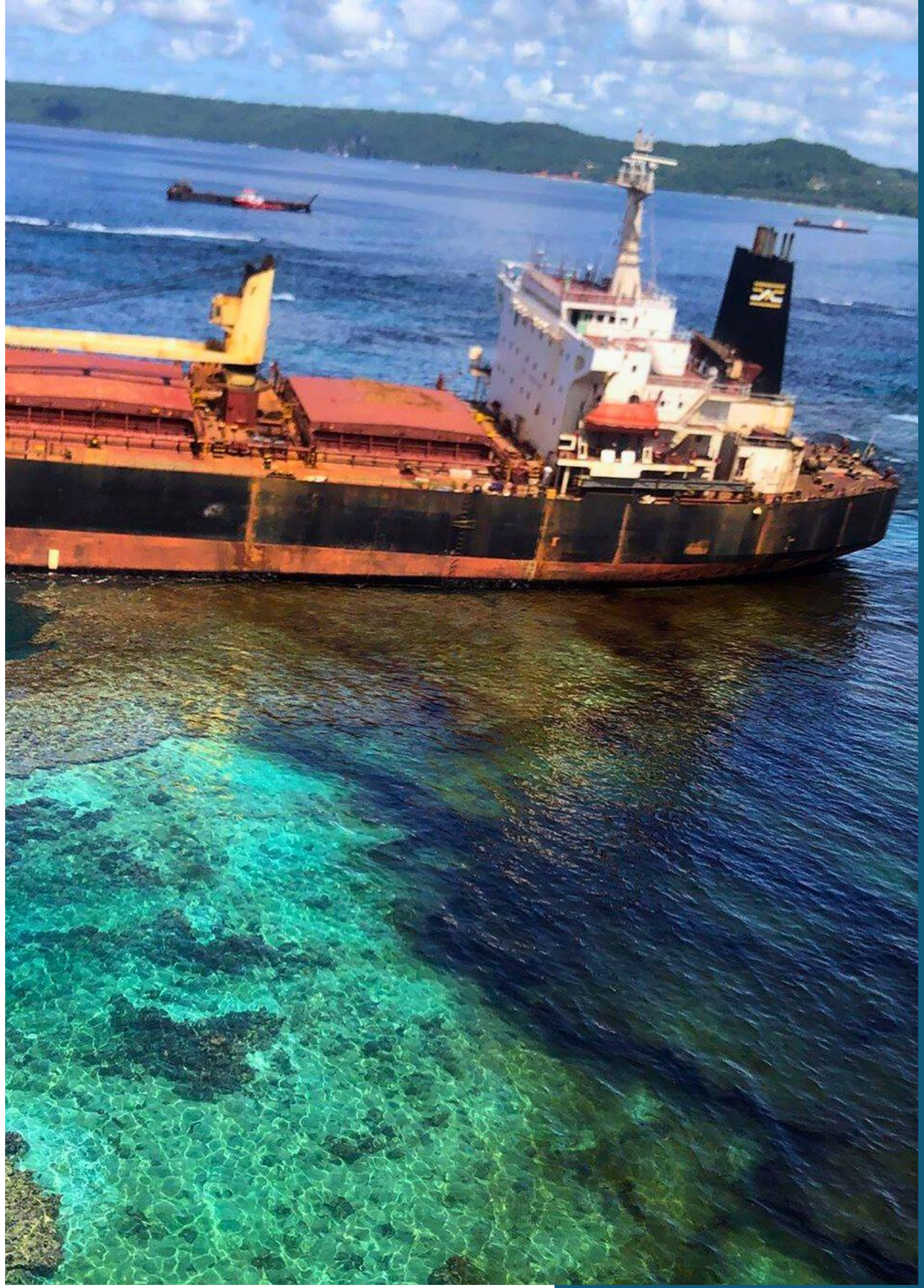
www.valorga.nc

Valorga NC

Appendix D: Power Point Presentations

SESSION #4: EMERGENCY RESPONSE TO OIL OR CHEMICAL SPILLAGE

- Appendix D18: Experience sharing from Ocean Environmental Solutions on Oil Spill Response in the Solomon Islands
- Appendix D19: Waste Ship Happens
- Appendix D20: PacPlan and Emergencies
- Appendix D21: Landfarming in Samoa



MV Solomon Trader Oil Spill Response

At Rennell Island, Solomon Islands

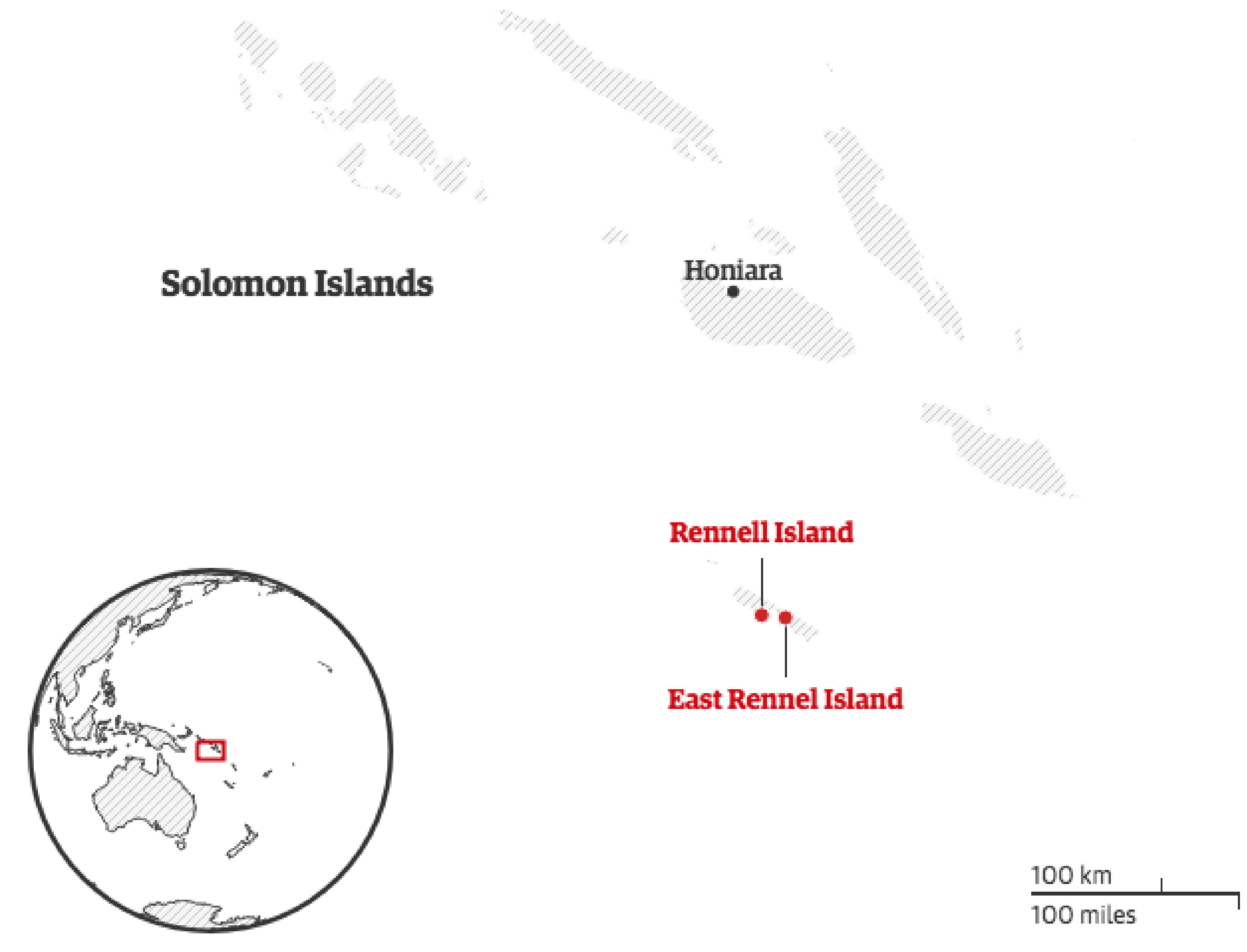
Presented By

Andrew Bohn, Ocean Logistics Limited

The Solomon Trader Oil Spill Incident

Overview of the 2019 Incident

- The bulk carrier MV Solomon Trader ran aground off Rennell Island on **February 5, 2019**, during Cyclone Oma.
- The vessel spilled **over 80 tons** of heavy fuel oil, which spread across the waters and coastline, severely affecting marine life and coastal communities.
- The affected area was in proximity to the **East Rennell World Heritage Site**, recognized by UNESCO for its unique ecosystem.
- Cleanup efforts faced significant delays due to the remote location, limited local resources, and a slow response from the shipowner and insurer (Ocean Conservancy)



Scale of the Spill and its Impacts

- The spill spread across a **3-mile-wide area** of the ocean, contaminating the surrounding ecosystem, affecting marine life, and polluting local fresh water sources (Ocean Conservancy)

- Local fishing communities were forced to halt fishing activities, leading to food shortages, as villagers depended on fish and fresh water from nearby springs for sustenance (Mongabay)

- The damage to the sensitive marine environment posed long-term recovery challenges (Ocean Conservancy)

First Response Actions

Ocean Logistics Limited's Deployment:

- Ocean Logistics Limited (OLL) was engaged in late February 2019 by **Resolve Marine**, an American salvage company, to assist with the response.
- OLL mobilized its vessels and crew to participate in the spill containment and recovery efforts, working alongside Resolve Marine and other international teams.
- OLL provided vital tug and barge support to aid the salvage operations.

First Response Actions (Cont.)

Coordination with Resolve Marine and Local Authorities:

- OLL played a key role in coordinating efforts with **Resolve Marine**, the Solomon Islands government, and other stakeholders.
- OLL's knowledge of the region and logistics capabilities were crucial for managing the difficult access to the remote spill site.
- Local authorities and international partners worked closely to address the spill and its impacts on local communities and ecosystems.

First Response Actions (Cont.)

Containment and Mitigation Strategies:

- The initial response focused on limiting further leakage by using containment booms to prevent oil from spreading further into the coastal environment.
- Skimmers were deployed to remove oil from the surface, while absorbent materials were used to minimize shoreline contamination.
- OLL's vessels supported the deployment of these containment measures and helped ferry equipment and personnel to the remote spill site.

First Response Actions (Cont.)

Oil Spill Work Completed in Rennell Island:

- Manual cleanup of contaminated shorelines was carried out, with specialized teams removing oil from rocks and beaches.
- OLL's barges and support vessels were instrumental in transporting waste materials and ensuring the safe removal of recovered oil and debris from the site.

Key Operational Challenges

Resource Limitations

Shortage of equipment and personnel, especially in a remote location.

Logistical Issues

Challenges in deploying resources to the remote Rennell Island, delays in mobilization, and limited accessibility.

How We Overcame Challenges

Innovative Approaches

- OLL and Resolve Marine utilized innovative containment and salvage techniques to control the spill.

Collaboration and Resource-sharing

- Cooperation between OLL, Resolve Marine, local authorities, and other international agencies in achieving success.

Key Takeaways for the Pacific Region

Importance of Preparedness

Stress the importance of having well-prepared response teams, equipment, and clear communication channels for handling oil spills.

Recommendations for improving regional response capacity

Propose ideas for how Pacific Island countries can improve their oil spill response infrastructure, training, and coordination.

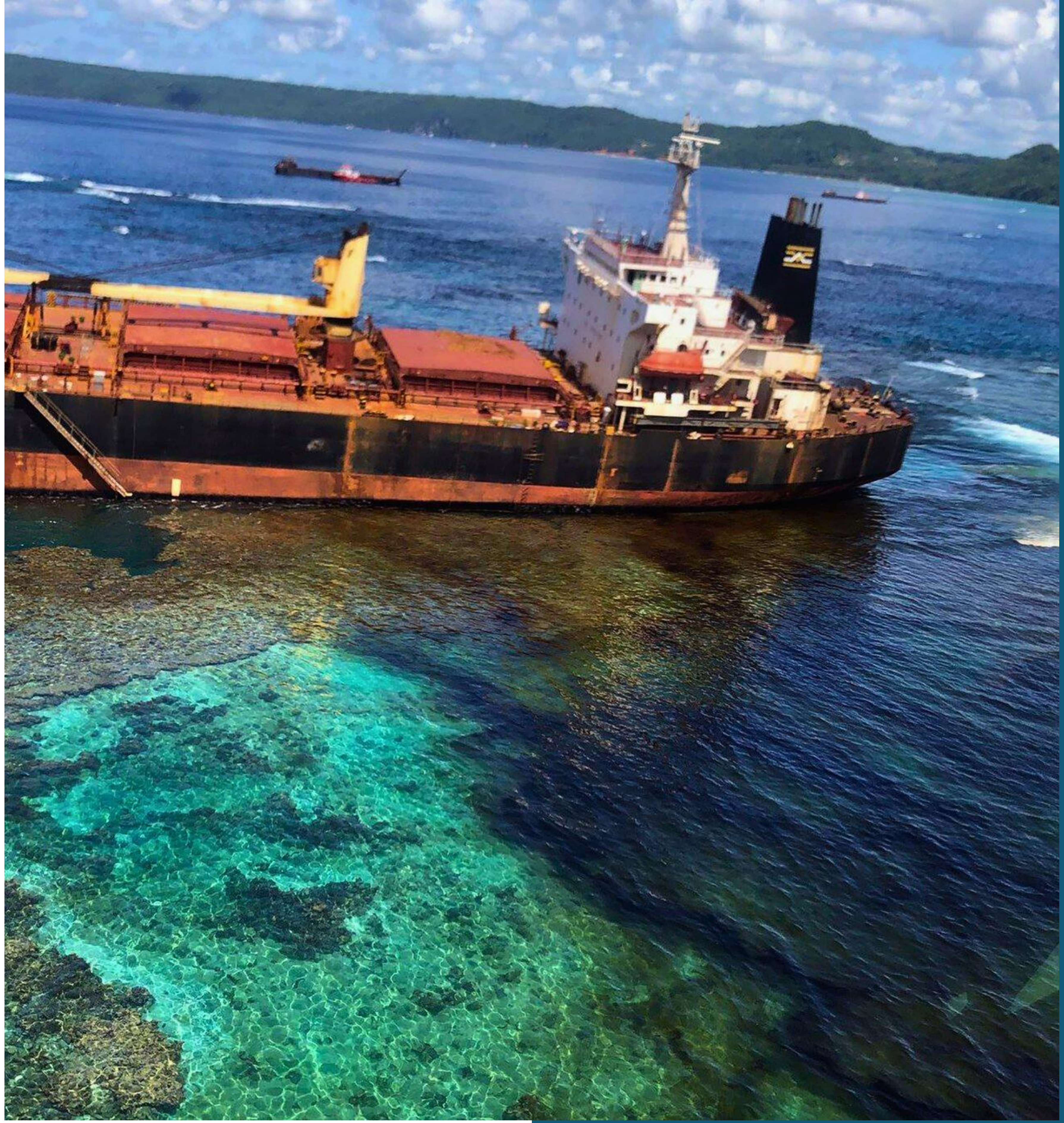
Strengthening Pacific Oil Spill Preparedness

Final thoughts on ensuring future readiness

Discuss the need to learn from the MV Solomon Trader spill to prevent future disasters.

Collaboration and proactive planning

Urge regional cooperation for stronger preparedness and proactive planning in the Pacific.



Thank you

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC:
CREATING RESOURCES [AND Opportunities, and Challenges] FROM WASTE AND POLLUTION

Iririki Island Resort, Vanuatu
30 September – 4 October 2024

Session #4:Emergency response to oil or chemical spillage

Paul Irving, PacPlan Officer
pauli@sprep.org

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC:
CREATING RESOURCES [AND Opportunities and Challenges] FROM WASTE AND POLLUTION

Iririki Island Resort, Vanuatu
30 September – 4 October 2024

Session #[illegible]: Emergency response to oil or chemical spillage

Paul Irving, PacPlan Officer
pauli@sprep.org

Thank goodness you are here!

A ship-fire-cargo threat waste exercise activity

- Hickson Siba, VMSA, as On-call Marine Pollution Officer, has called you as you are all meeting at Irikiki, in Port Vila.
- It's 0930. Hickson is referencing a TV news report from Australia of a container ship in trouble off Port Vila. We will play the video in a moment.
- VMSA and the Minister of Infrastructure will be convening a national response meeting at 1030 at the Emergency Operations Centre.
- A likely outcome will be burnt cargo debris overboard. Experts estimate losing as many as 50 burnt containers overnight and the contents of another 600 over coming days.
- The debris (wrecked containers and their burnt and unburnt contents, will likely wash up along washing up along the south Efate coastline. Estimates suggest anything from 300-1500m3 over th next week.
- So, waste management will likely be a hot topic for consideration.


THE UPDATE
MORNING NEWS

Local drone pilot shows smoke billowing and crew drenching containers with automatic fire hoses

Local fisherman's photos show smoke and flame billowing from the side of the vessel.

You know you will be asked to take charge of the waste management once the shoreline teams start collecting and dumping it a key coastal land locations.

What issues or messages or questions or proposals will you take to the meeting, from a waste management perspective?

May be one of each:

One key question.
One key issue.
One key proposal.

Questions?

Issues?

Proposals?

PacPlan Resilience Project 2022-25

REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES [AND OPPORTUNITIES, AND CHALLENGES] FROM WASTE AND POLLUTION

IRIRIKI ISLAND RESORT, VANUATU
30 SEPTEMBER – 4 OCTOBER 2024

SESSION #4:EMERGENCY RESPONSE TO OIL OR CHEMICAL SPILLAGE

Paul Irving, PacPlan Officer
pauli@sprep.org

An oil spill?

Session #4: Emergency response to oil or chemical spillage

PacPlan Resilience Project 2022-25

Australian AID

SPREP PROE

IMO

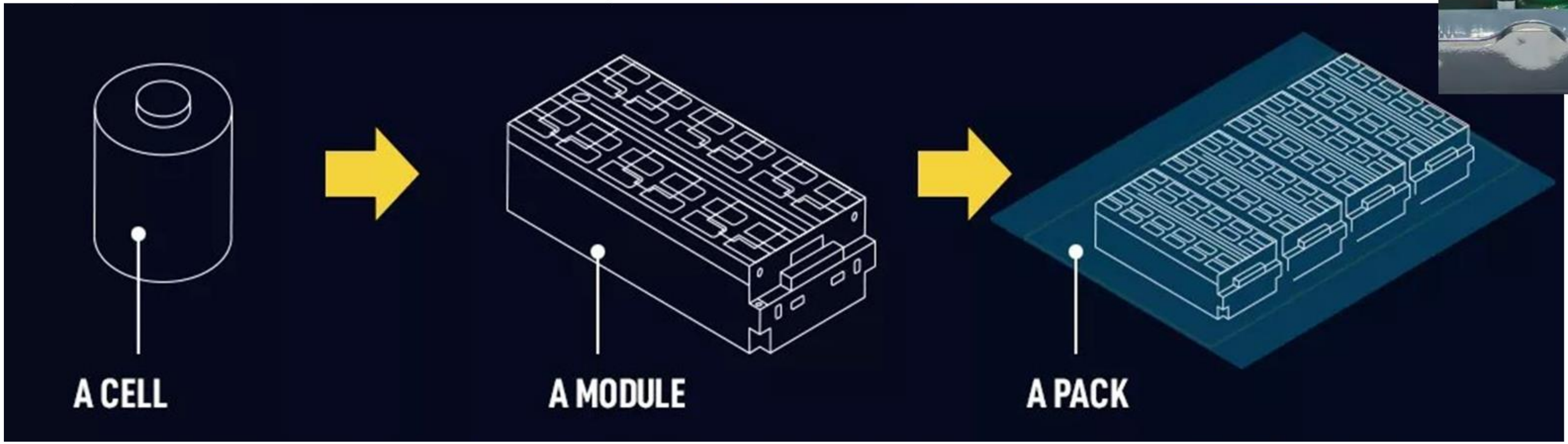
Another oil spill – just as plastic nurdles

Session #4: Emergency response to oil or chemical spillage

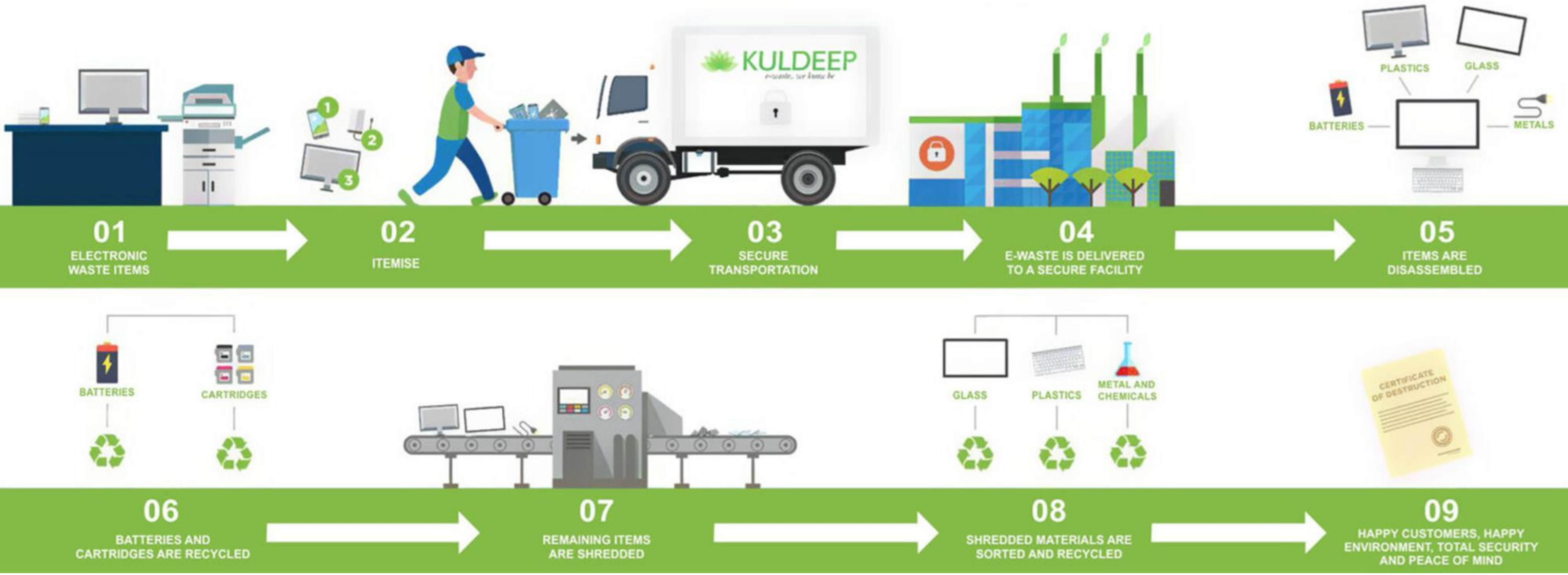
Another oil spill – the nurdles are now discarded plastic products!

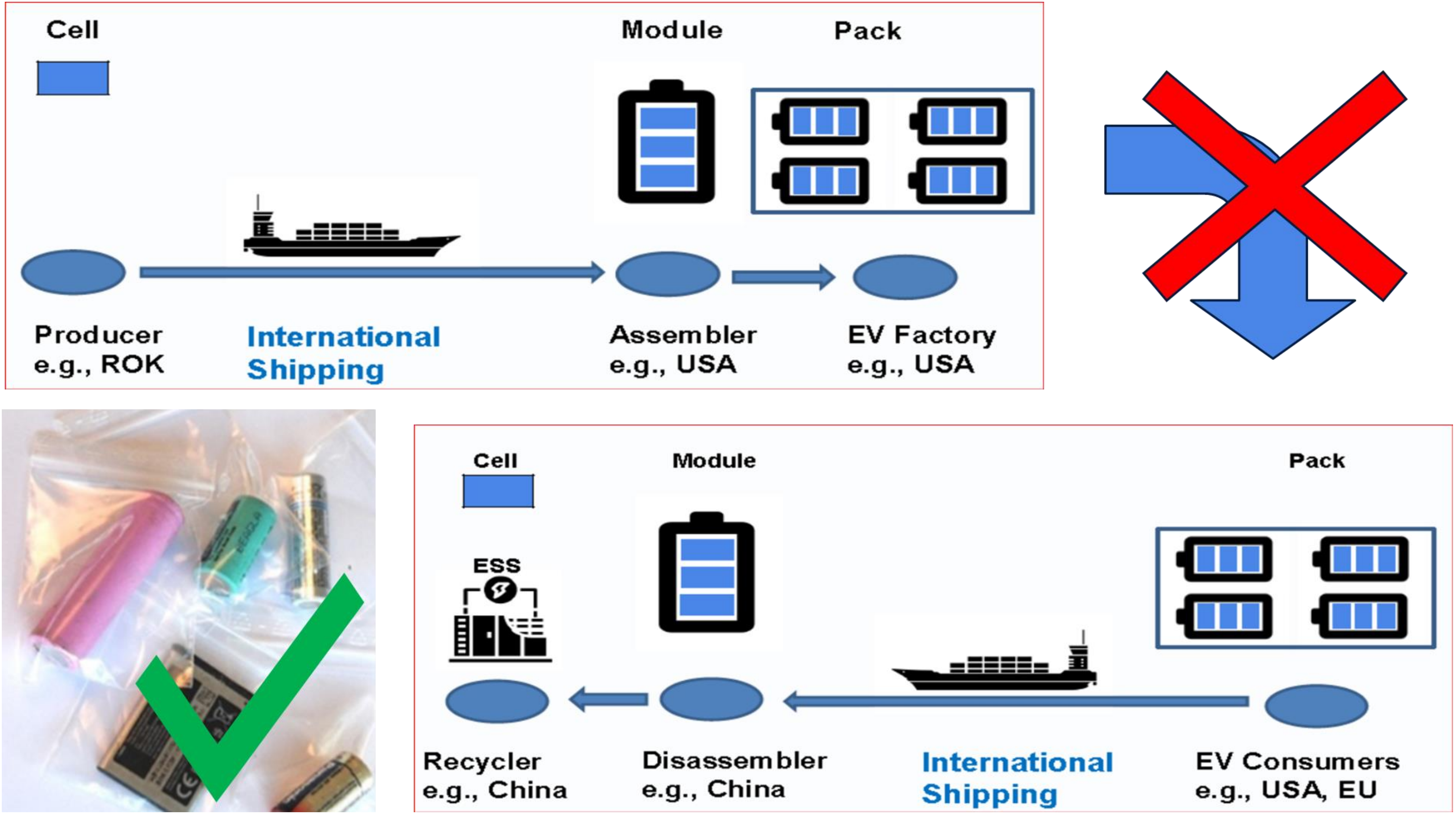
PacPlan Resilience Project 2022-25

The end-of-life lithium battery problem – is it a slow oil spill?.



A typical e-waste/L-ion battery recycling process diagram. Where is the ship?





Cell
Module
Pack
Producer
e.g., ROK
International
Shipping
Assembler
e.g., USA
EV Factory
e.g., USA
Cell
Module
Pack
ESS
Recycler
e.g., China
Disassembler
e.g., China
International
Shipping
EV Consumers
e.g., USA, EU

24 pails per pellet = 576 small batteries, at 0.77t plus pallet weight.

576 battery cells per pallet shipment of 24 pails with 24 small items in each. 1.4ltr per battery and 1.35kg per battery cell.

4 layers (min 50mm bottom, sides and top) with 6 small items per layer – minimum 100mm separation of items from within and between layers.)

Fine, dry sand (20ltr @1.6kg/ltr) = 32kg + pail = 34kg total per pail and 24 pails = 770kg

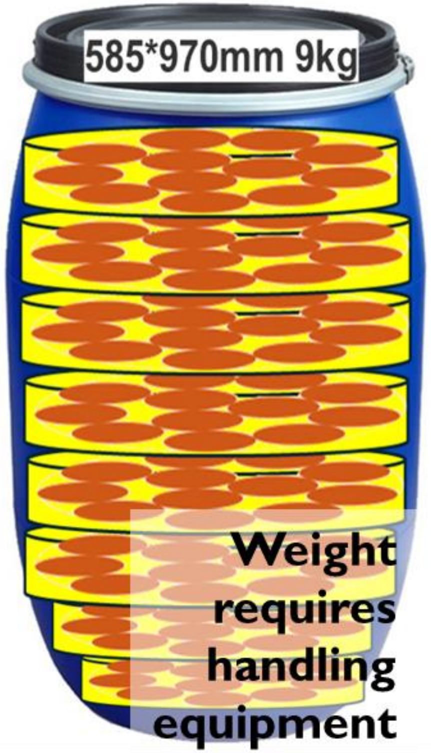
Weight makes easy to handle and stack

4 drums per pellet = 390-400 small batteries, at 1.3t plus pallet weight.

400 battery cells per pallet shipment of 4 drums with 96 small items in each. 2ltr per battery and 3.3kg per battery cell.

8 layers (min 50mm bottom, sides and top) with 12 small items per layer – minimum 100mm separation of items from within and between layers.)

Fine, dry sand (200l @1.6kg/ltr) = 320kg + drum = 330kg/drum



Session #4: Emergency response to oil or chemical spillage

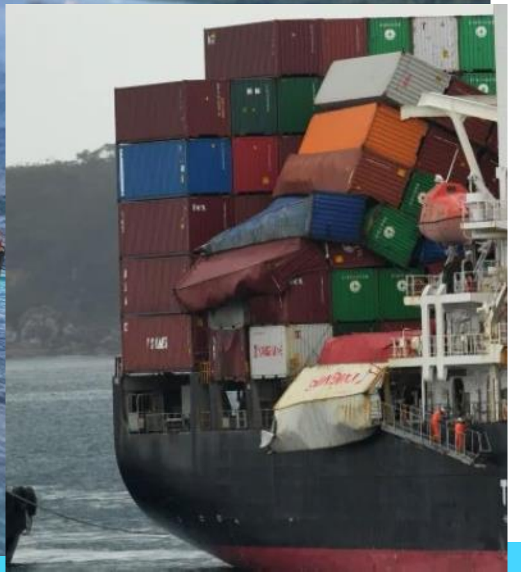
PacPlan Resilience Project 2022-25

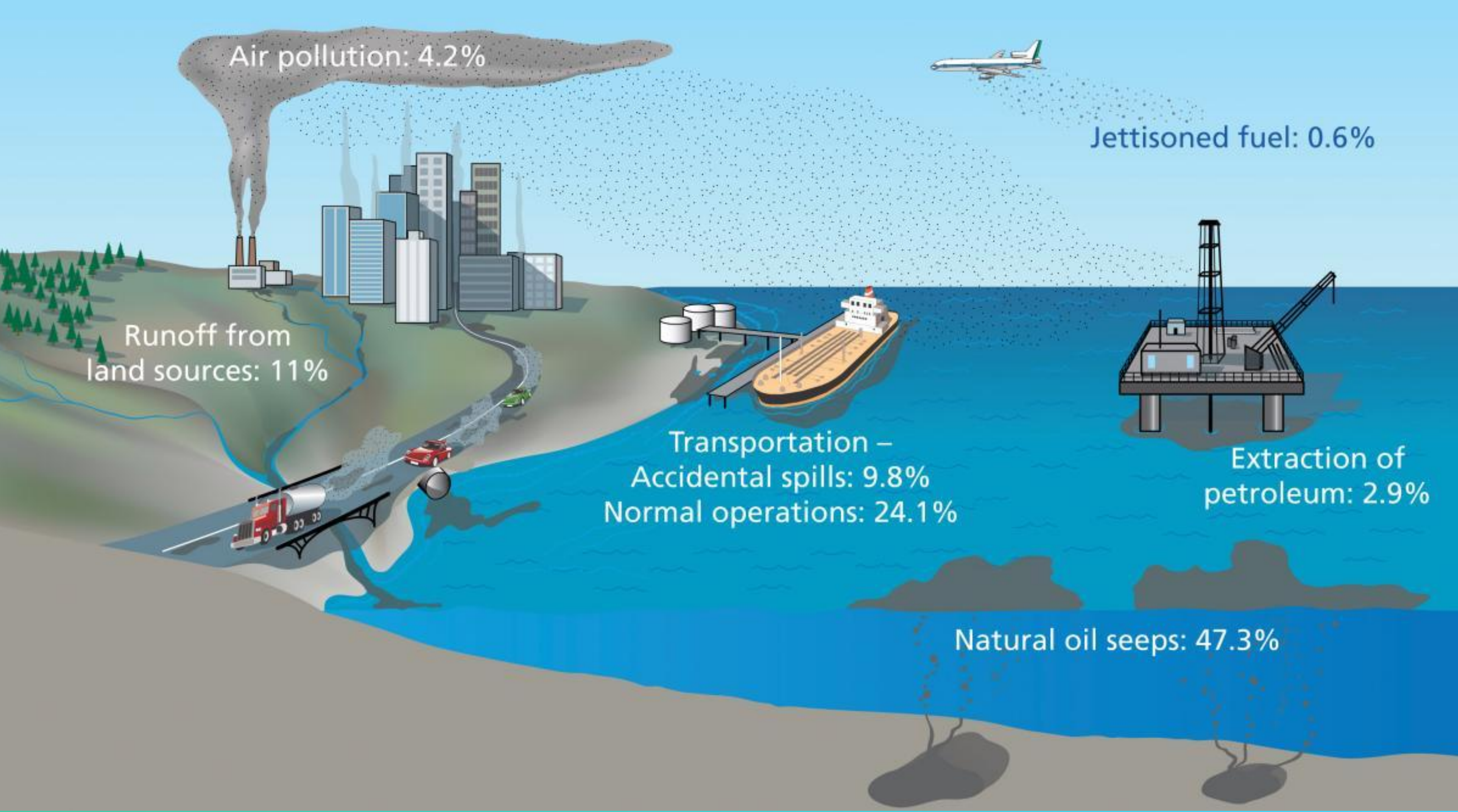
Australian AID SPREP PROE IMO

Back to oils and chemicals – where does the risk and threat come from?

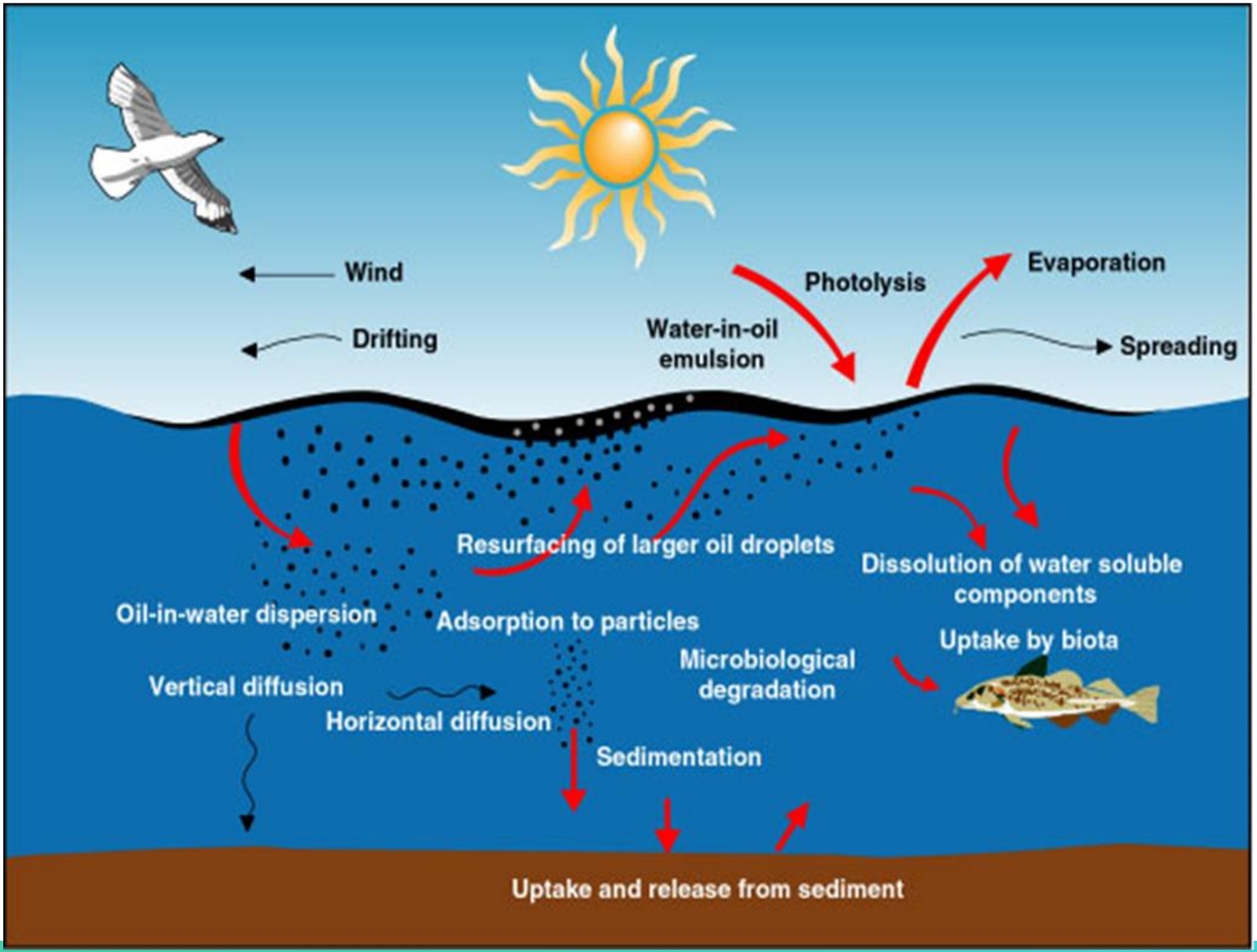


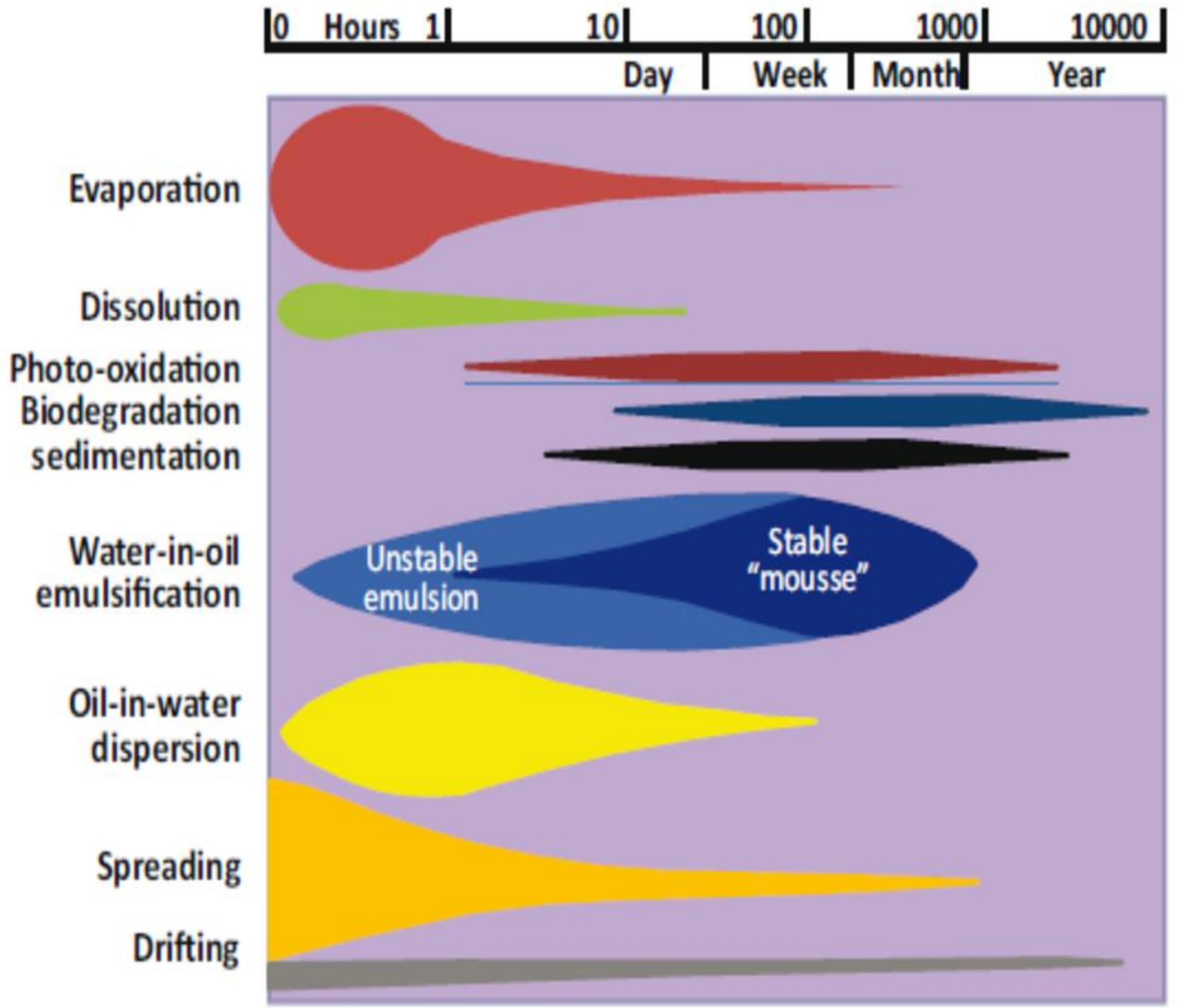


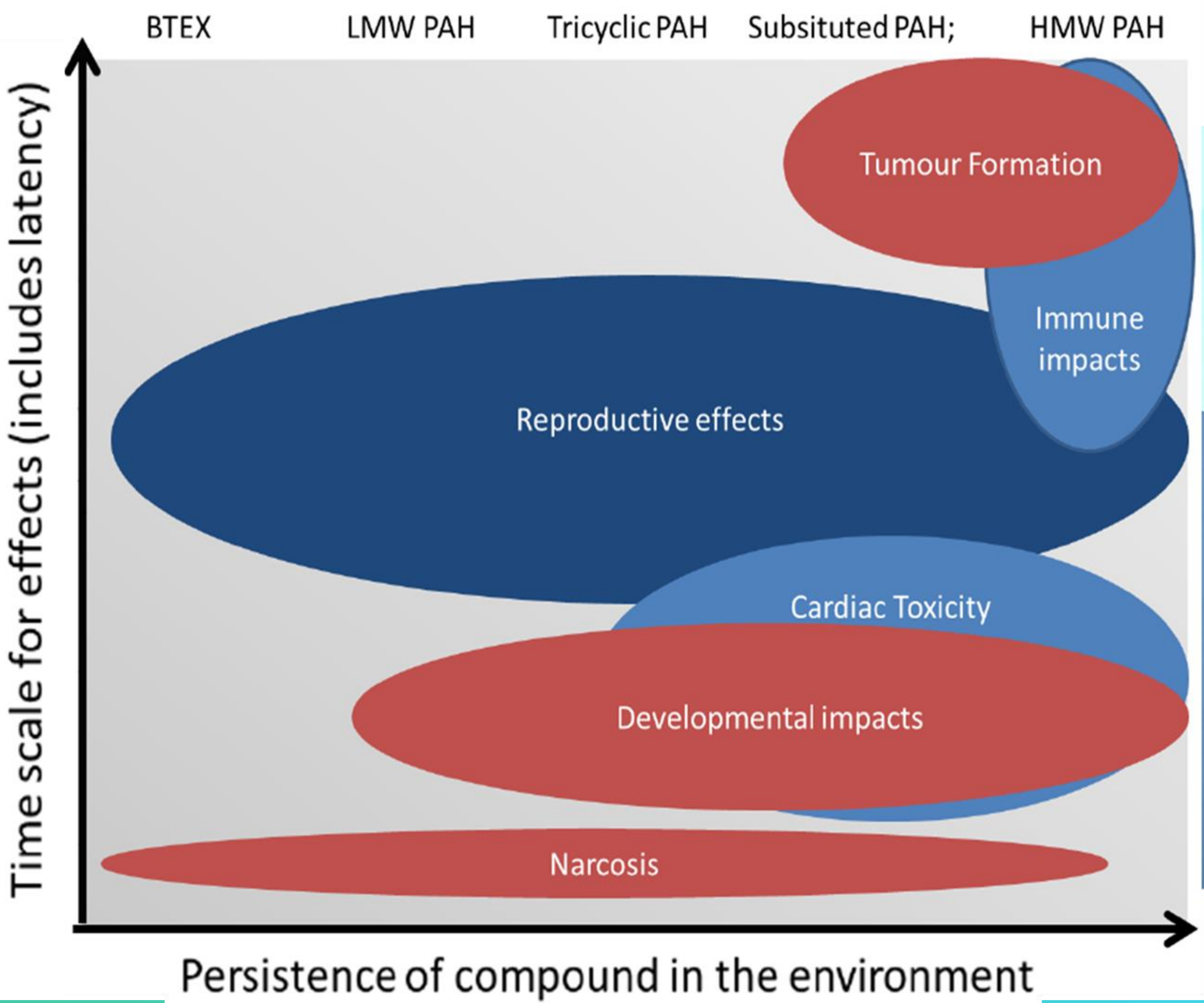



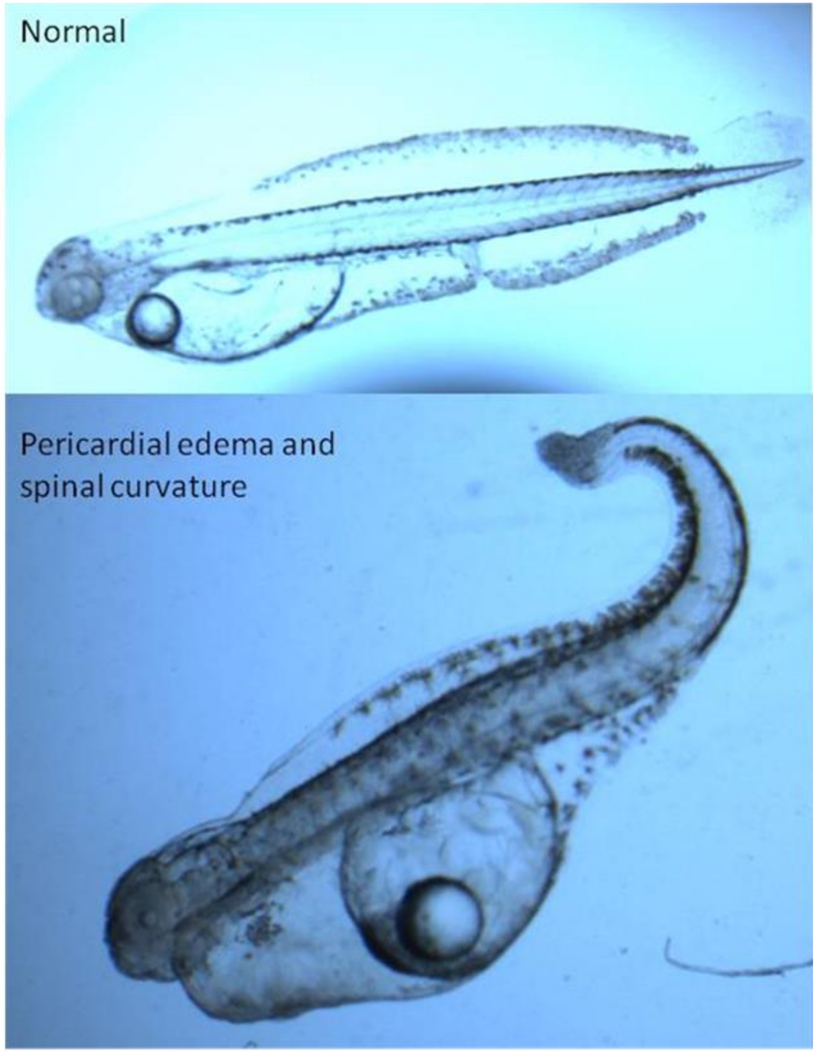

Air pollution: 4.2%
Jettisoned fuel: 0.6%
Runoff from land sources: 11%
Transportation –
Accidental spills: 9.8%
Normal operations: 24.1%
Extraction of petroleum: 2.9%
Natural oil seeps: 47.3%

Back to oils and chemicals – where does the risk and threat come from?

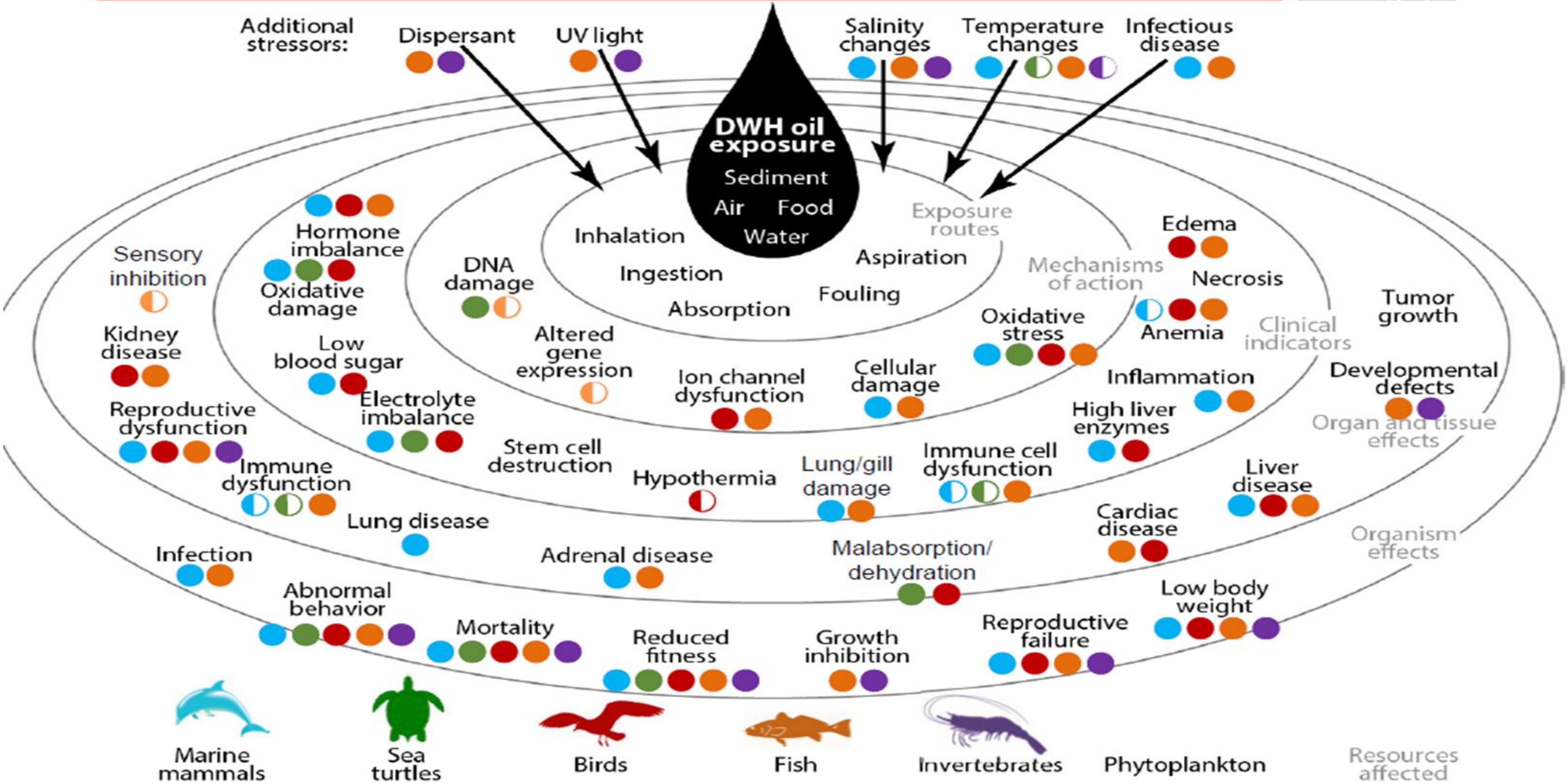





BTEX
LMW PAH
Tricyclic PAH
Subsituted PAH;
HMW PAH
Time scale for effects (includes latency)
Tumour Formation
Immune impacts
Reproductive effects
Cardiac Toxicity
Developmental impacts
Narcosis
Persistence of compound in the environment


Normal
Pericardial edema and spinal curvature

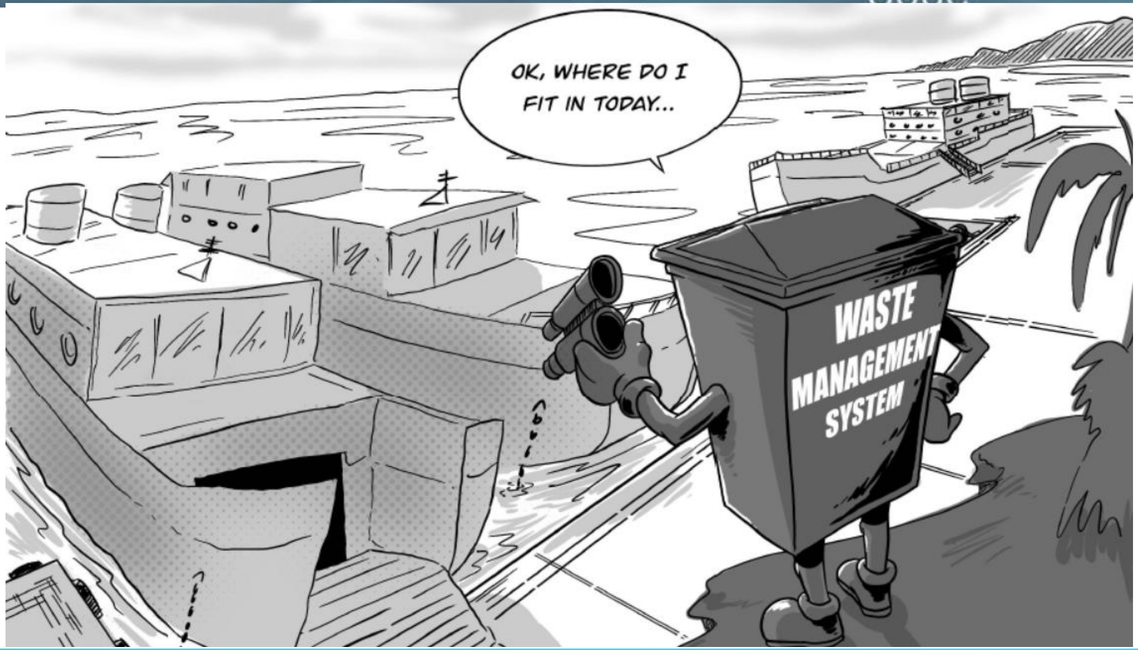
Physiological Oil Response Constellation



Fiji Ocean Swim

PacPlan Resilience Project 2022-25

Session #4: Emergency response to oil or chemical spillage



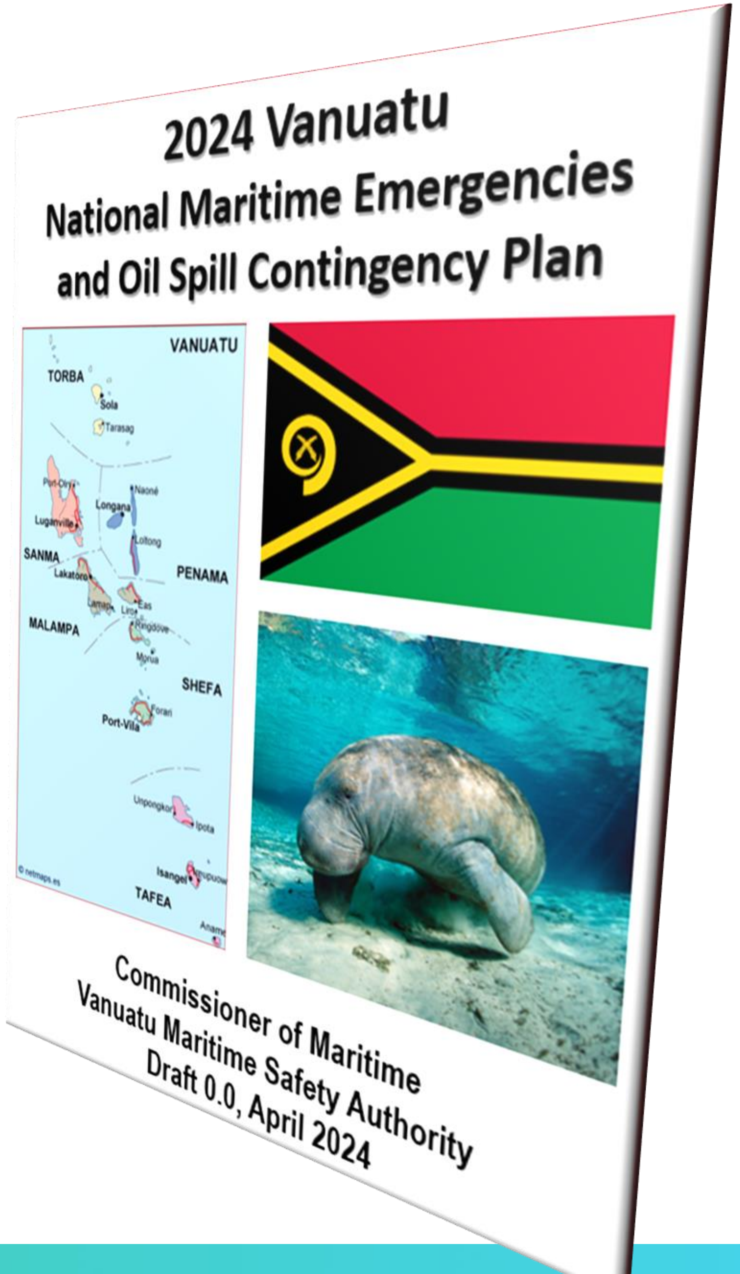
POMF

(Pacific One-Maritime Framework)

– SPC & PIC Maritime Agencies

Session #4: Emergency response to oil or chemical spillage

PacPlan Resilience Project 2022-25



Session #4: Emergency response to oil or chemical spillage

Session #4: Emergency response to oil or chemical spillage

7. heal – ***how are things made right, with accountability, cost recovery, restoration, compensation, rehabilitation?***

PacPlan Resilience Project 2022-25

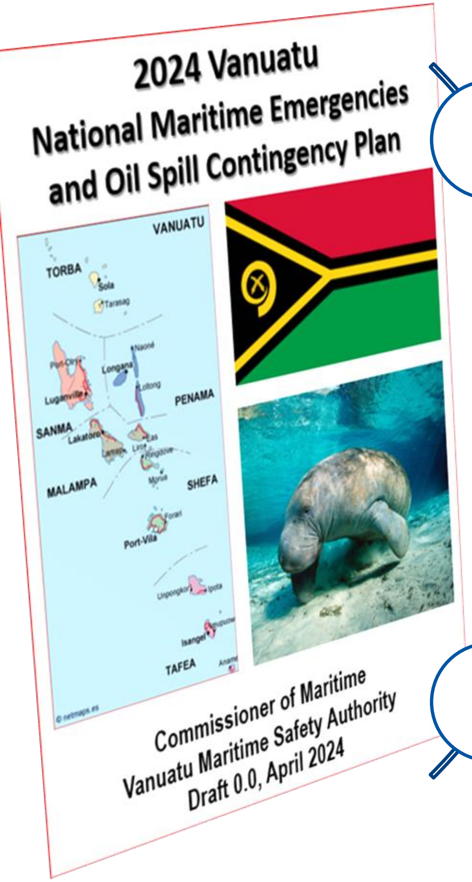
Compensation & Claims Management – the process in brief (it uses insurance and maritime lawyers!)

Session #4: Emergency response to oil or chemical spillage

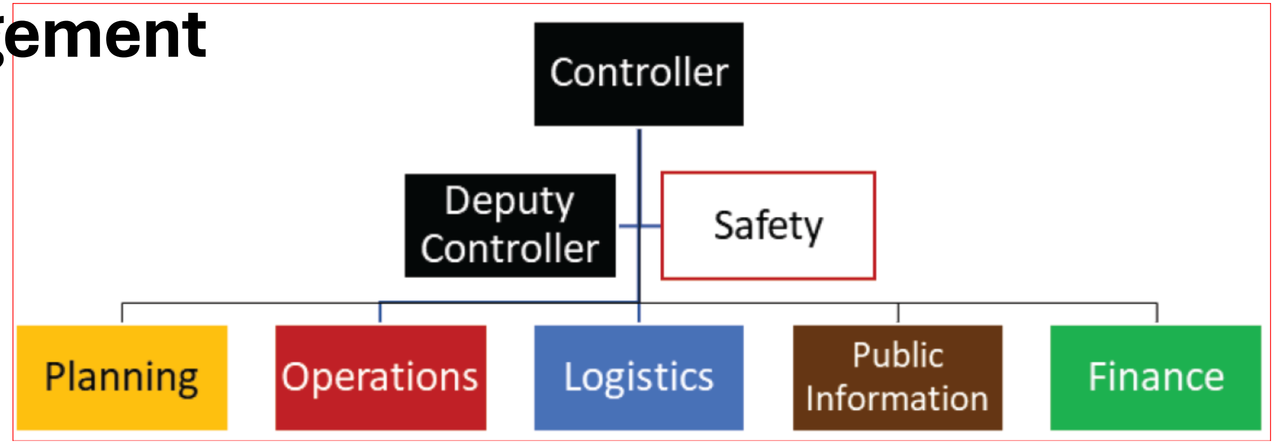
PacPlan Resilience Project 2022-25

Australian AID | SPREP PROE | IMO

Oil spill response / Oily waste management

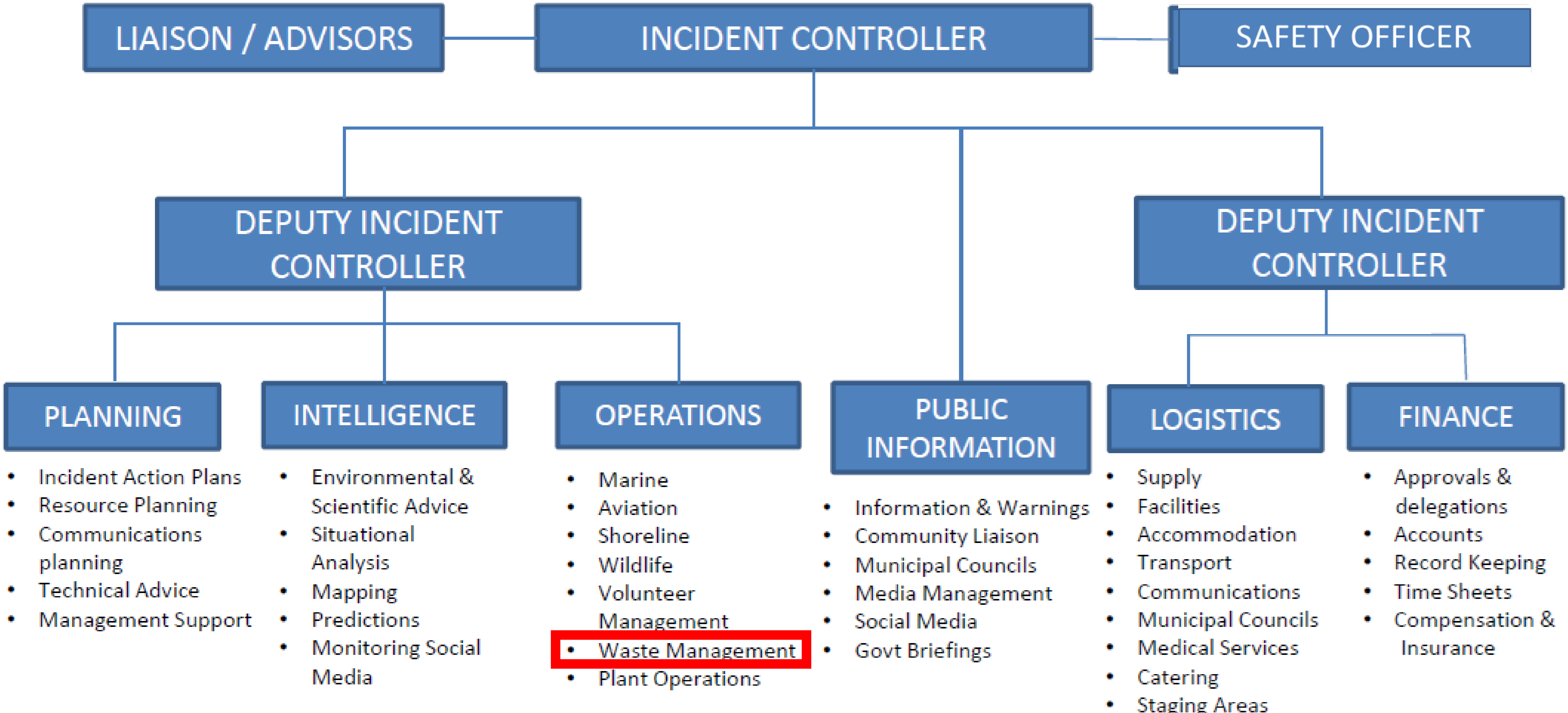


- Management by objectives.
- Functional management.
- Span of control.
- Flexibility.
- Unity of command.



A local organisational structure that works!

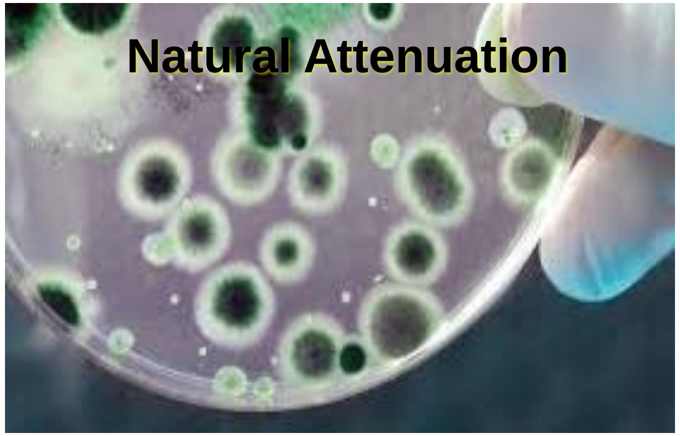
Pacific Incident Management System (PacIMS)



Sources of oily waste

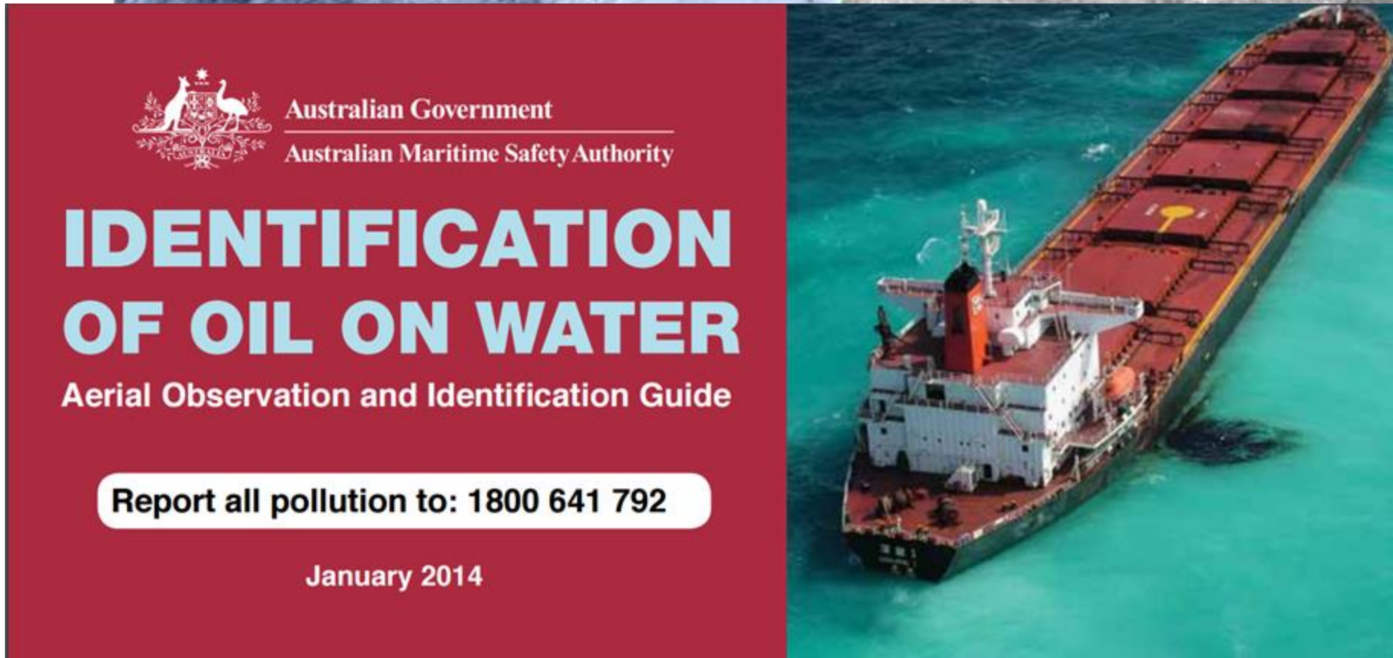
Sources of oily waste

Spill response/clean-up strategies and tools

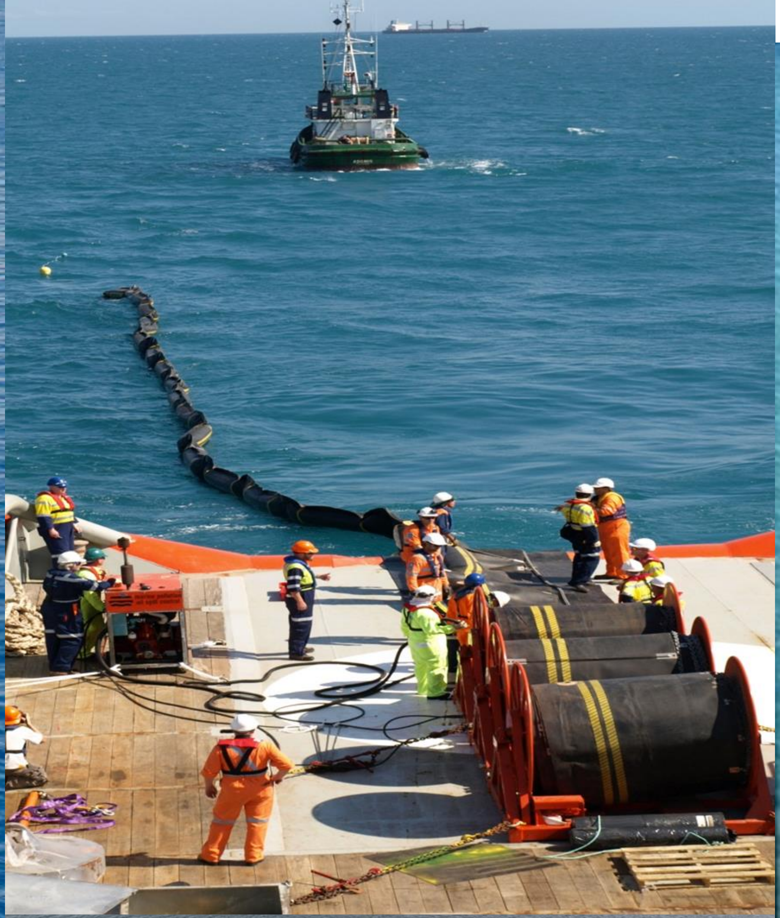


Preventing the spill – lightering or salvage

Monitor & Evaluate



Contain and recover - booms



Contain and recover - skimmers





Contain and recover – temporary storage

Protect & Deflect

Shoreline response – primary

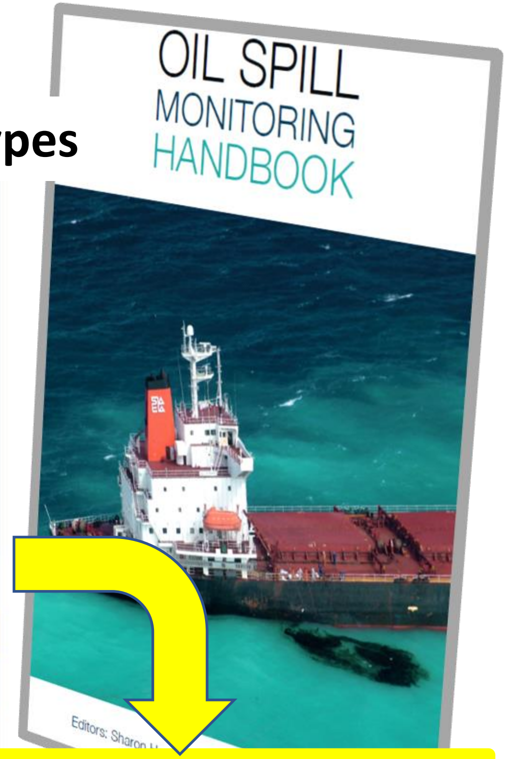
Shoreline response – polishing

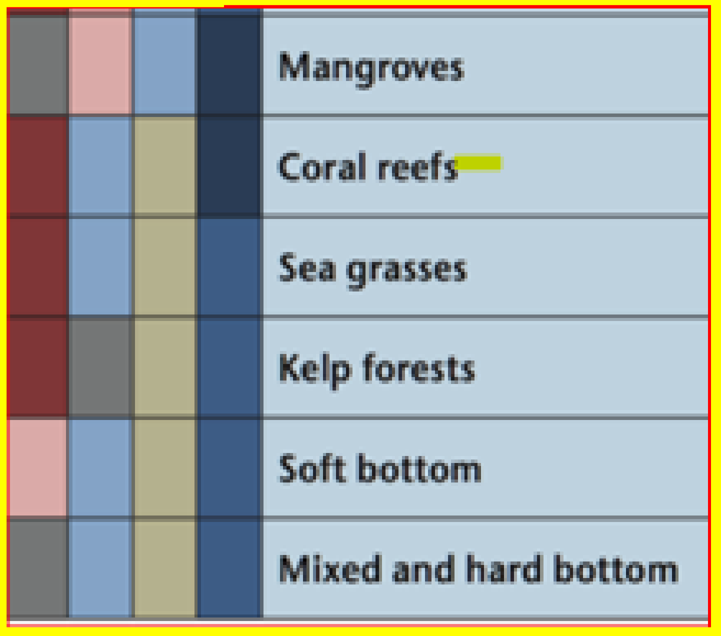
Shoreline waste storage

Shoreline options – horses for courses

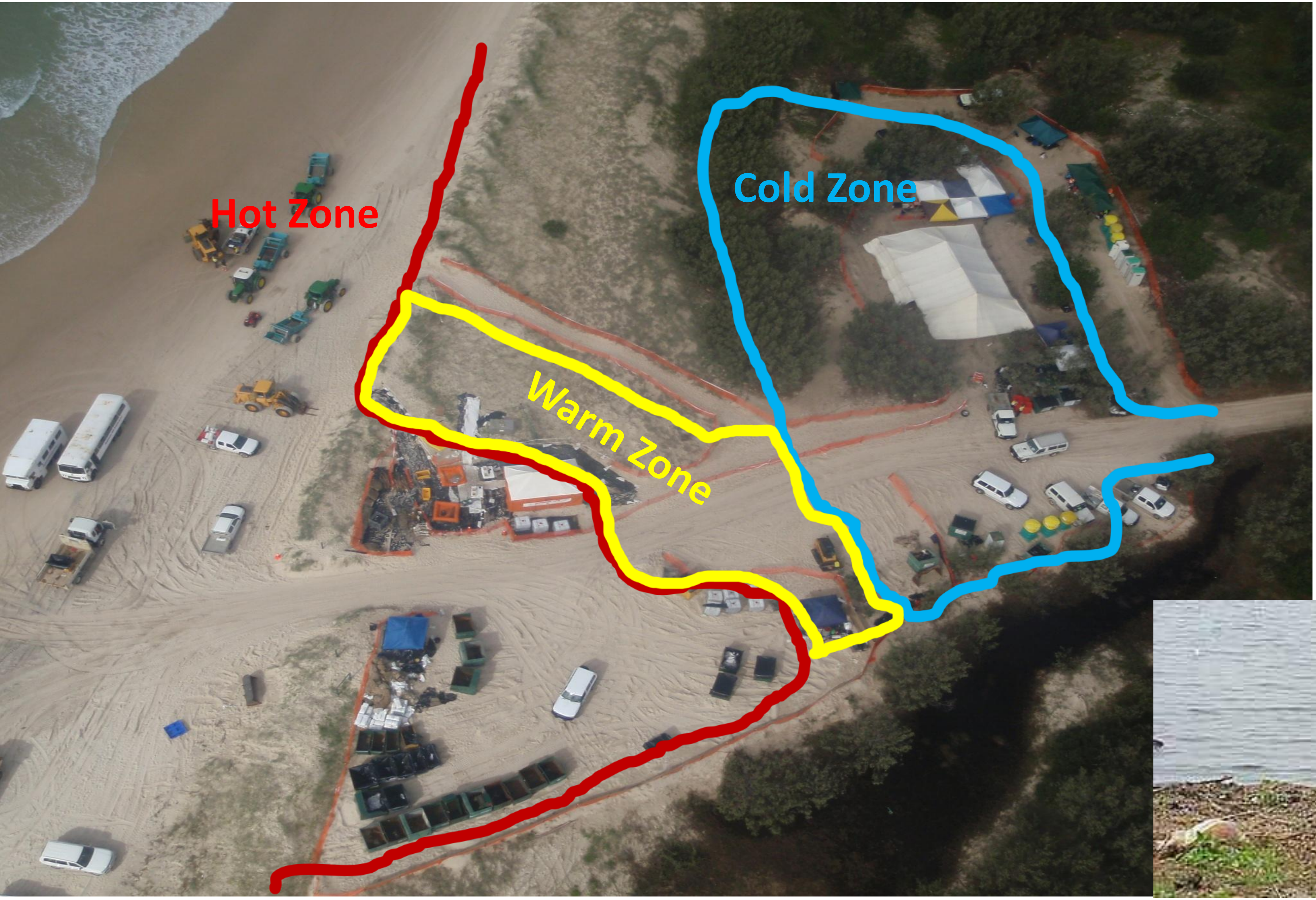
Table 5.2 Examples of shoreline clean-up techniques recommended for different habitat types

Clean-up technique	Exposed rocky shorelines	Exposed man-made shorelines	Exposed, wave cut platforms	Sand beaches	Sand and gravel beaches	Gravel beaches	Rip rap	Exposed tidal flats	Sheltered rocky shores	Sheltered man-made structures	Peat shores	Sheltered tidal flats	Salt/brackish marshes	Mangroves	Coral reefs	Sea grasses	Kelp forests	Soft bottom	Mixed and hard bottom
Natural recovery				A	A														
Barriers/berms					D														
Manual oil removal/cleaning					D	F													
Mechanical oil removal					D	F													
Sorbents									H										
Vacuum																			
Debris removal																			
Sediment reworking/tilling																			
Vegetation cutting/removal																			
Flooding				B	E	E	G				J								
Low pressure/ambient water flushing							G			G									
High pressure/ambient water flushing							G		I	G									
Low pressure/hot water flushing																			
High pressure/hot water flushing																			
Steam cleaning																			





Shoreline response access, site and safety management

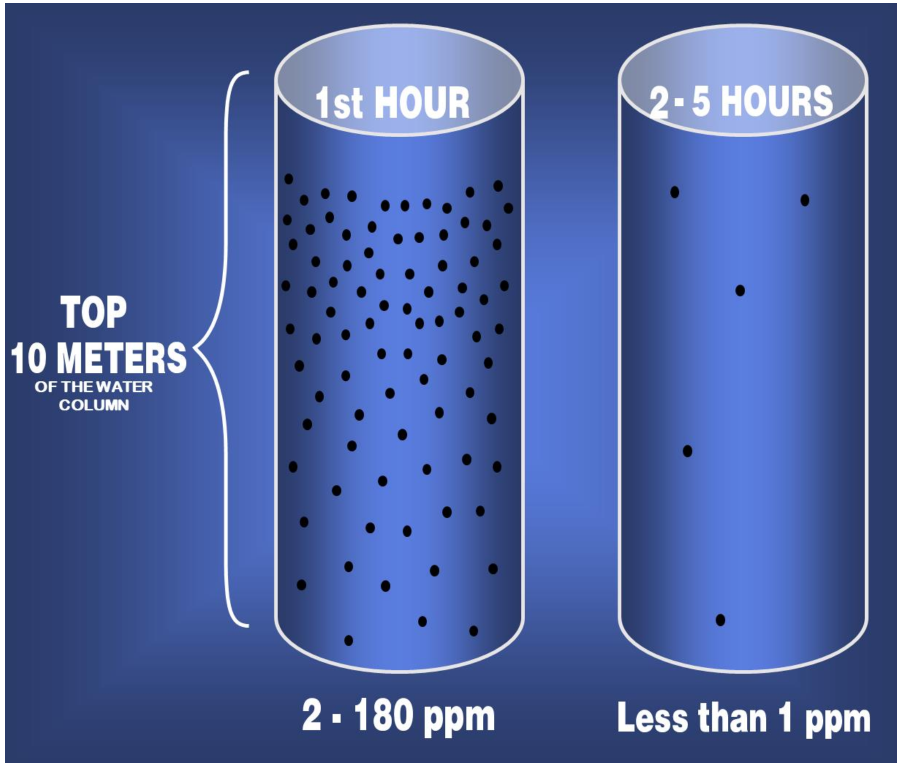


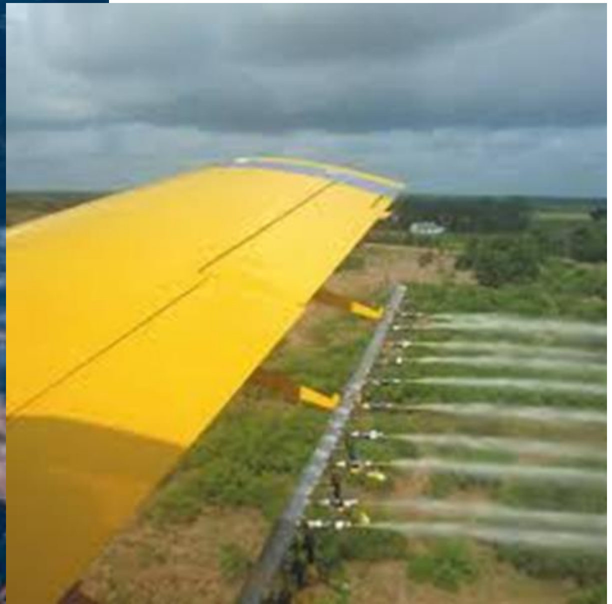
Shoreline response – waste management

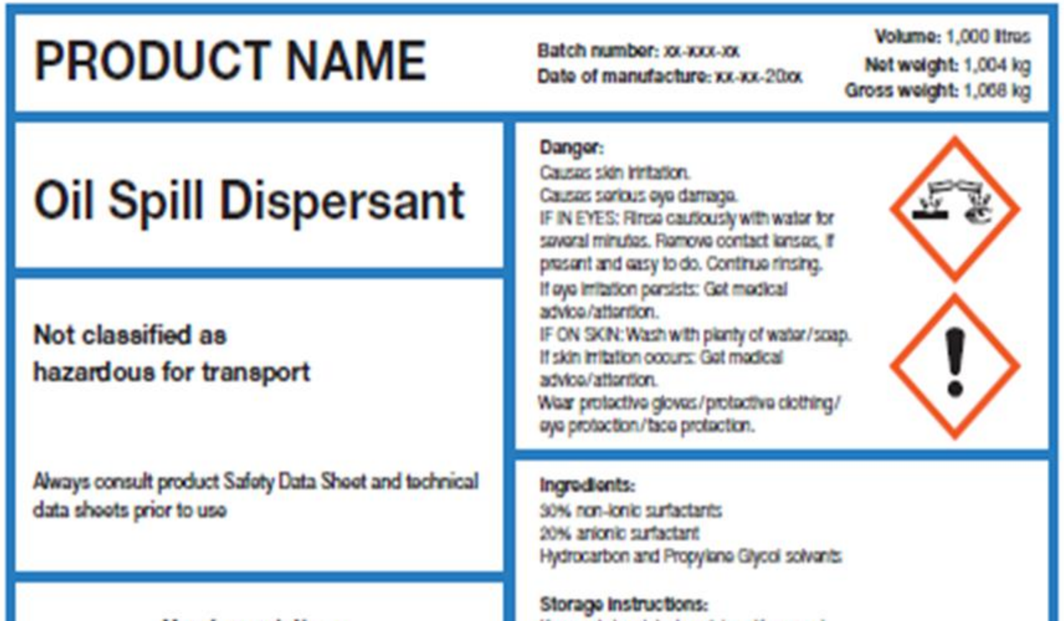
Oiled and injured wildlife response

Demobilisation

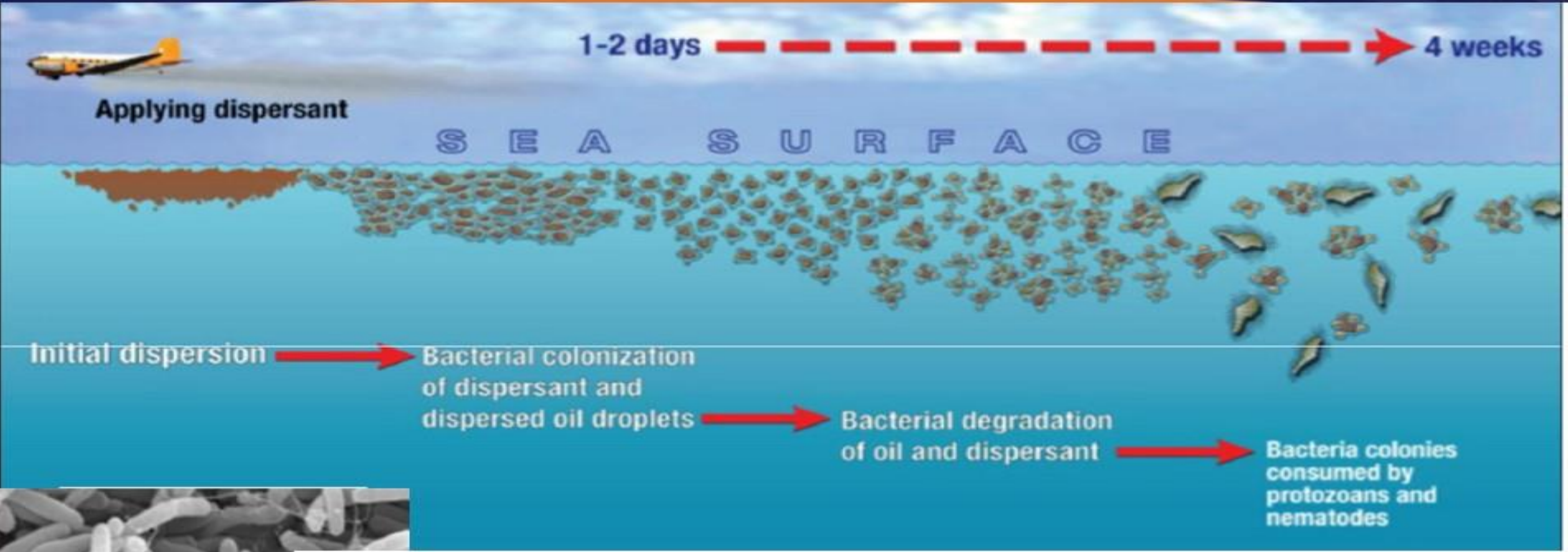
Dispersant response

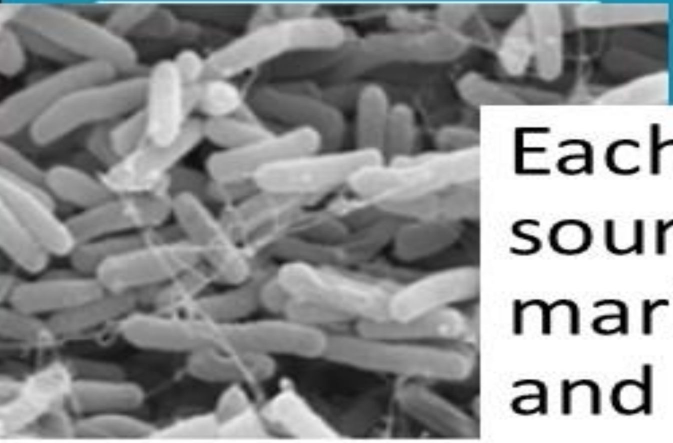






Biodegradation is the goal!

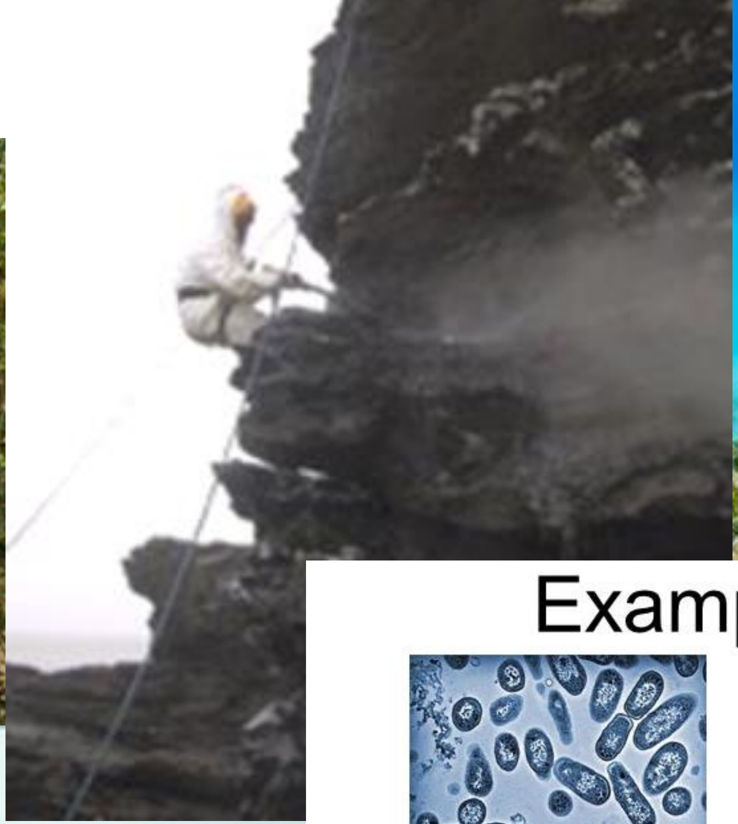


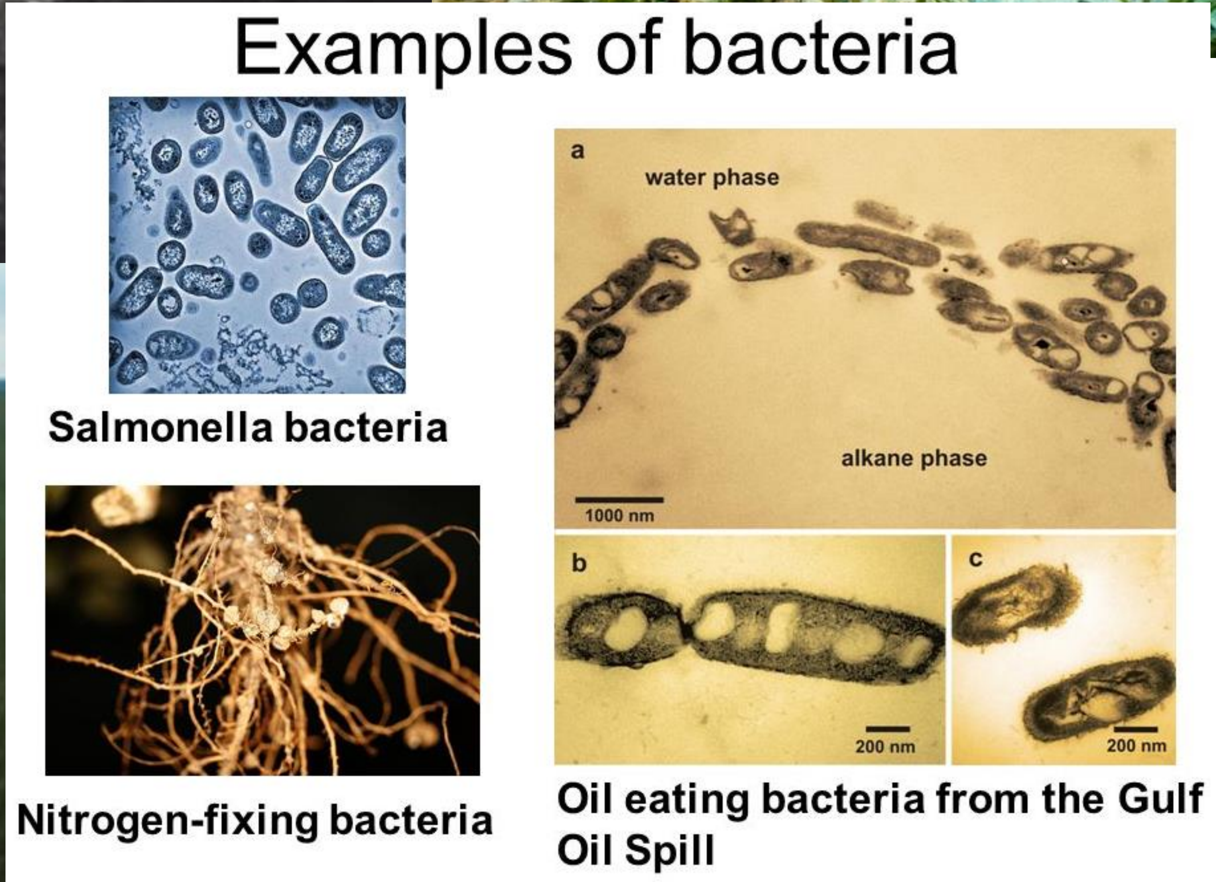


Each dispersed oil droplet is a concentrated food source that is rapidly colonized and degraded by marine bacteria, unlimited by nutrients or oxygen, and below toxicity thresholds

In-situ burning

Natural recovery





Solomon Trader – Waste Management Plan

Best, Most Likely, Worst Cases

Assumptions – apply to all 3 scenarios

- All waste recovered to central storage on island
- All waste will be man-handled so unit sizes and equipment to match
- All waste will be removed from Rennell Is. And may be required to be removed from Solomon Island, altogether to Australia.

Best Case

Salvors successfully remove hydrocarbons with minimal (1000s litres) leakage of hydrocarbon fuel or sludge.

Resources oiled likely limited stretch of shoreline - primarily sand, shallow loose coral rubble and beach wrack/flotsam.

Will present as oily film on items, or as small (mm-cms Ø) tar balls coated in sand.

Limited preventative measures available – wrack removal would minimise organic oily waste.

Response will likely be shore line and small craft collection of oily solid waste items – handpicked, bagged and returned to central waste storage

Most Likely

Salvors successfully remove hydrocarbons with small (less than 5% = 35t) spill or residue release.

Resources oiled likely to be extensive stretches of shoreline, and subsurface sunk (sediment impacted sand and coral rubble), and extensive areas of shoreline wrack.

Will present as oily films on any impacted material, small (mm-cms Ø) and medium (cm-m Ø) tarballs and patches on shoreline and water. Expected to strand rapidly, unless currents drift it out into bay.

Preventative measures could be:

identify areas where wrack could add to waste stream and remove prior to oil arriving (very short time if does leak).

preventative booming around vessel to contain or channel oil movement (solid buoyancy or shoreline boom perpendicular to wave direction

snares or similar to intercept any floating oil

Response will likely be shore line and small craft collection of oily solid waste items – handpicked, bagged and returned to central waste storage, recovery of oily snares and sorbents. 35t of oil could produce 150-300m³ of oily waste.

Worst Case

Salvors unable to remove hydrocarbons and major release due to accident or ship damage.

Resources oiled likely to be very extensive shoreline and fringing reef within Kangava Bay, including logistical positions for loading cargo, and beyond (SE), within the World Heritage Area. Some oil may entrain and sink. Some may entrain and escape to sea.

Will present as everything from sheen to extensive and thick slicks (m-km Ø) and smaller patches (cm-m Ø). Shoreline presence will likely be very heavy oiling, (cms deep) along all shoreline within the bay and beyond.

Preventative measures are same as Scenario 2, but overmuch more extensive area, and length of shore line. Booms may assist but volumes suggest this will be limited given the extensive areas (10s of km²) where oil will be present.

Response will likely be same as Scenario 2, but over greater area (order or magnitude) and longer time (months, not weeks). As oil weathers (sticks and hardens on non-porous surfaces; sinks in water and settles until storm surge moves it inshore again; melts and percolates into porous surfaces, including limestone and sediment beaches). The volume and type of waste could get to 1000s of m³ or tonnes, across many types of oiled material and liquid (skimmed) oil).

Session #4: Emergency response to oil or chemical spillag

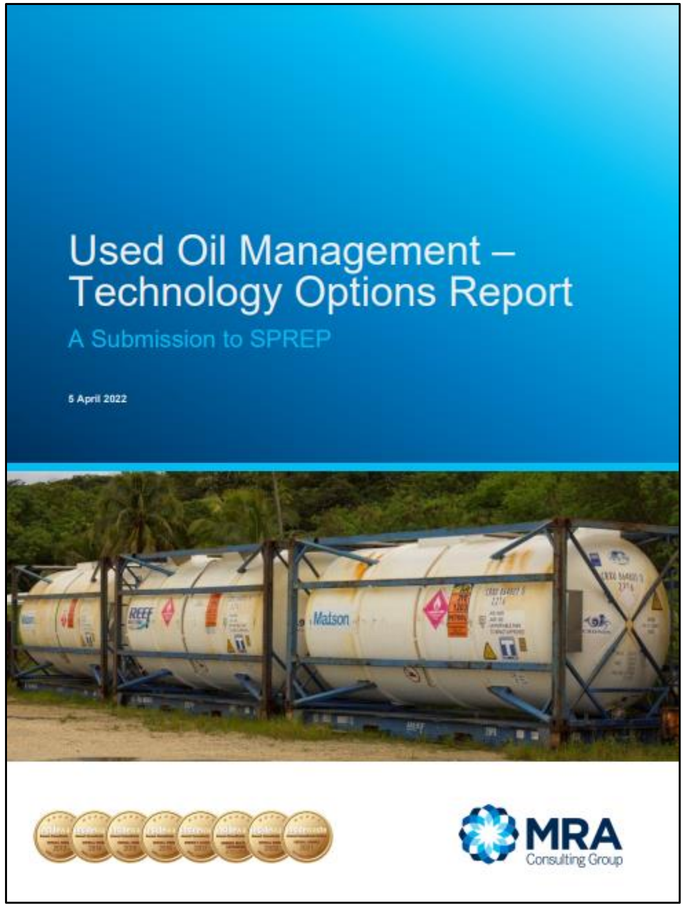
Oil spill response / Oily waste management

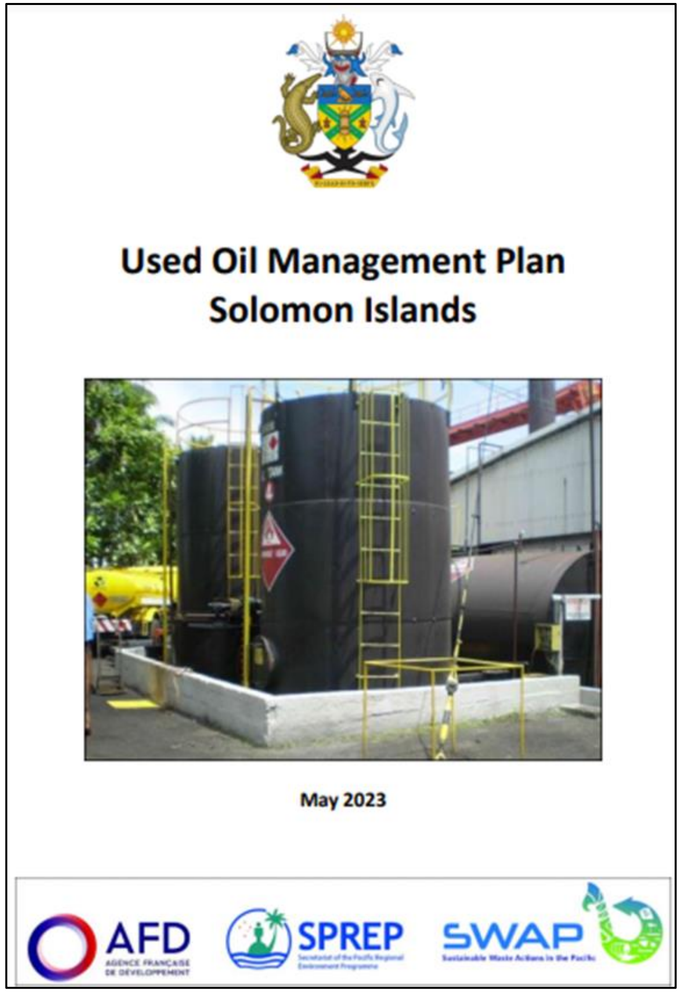
Session #4: Emergency response to oil or chemical spillage

PacPlan Resilience Project 2022-25

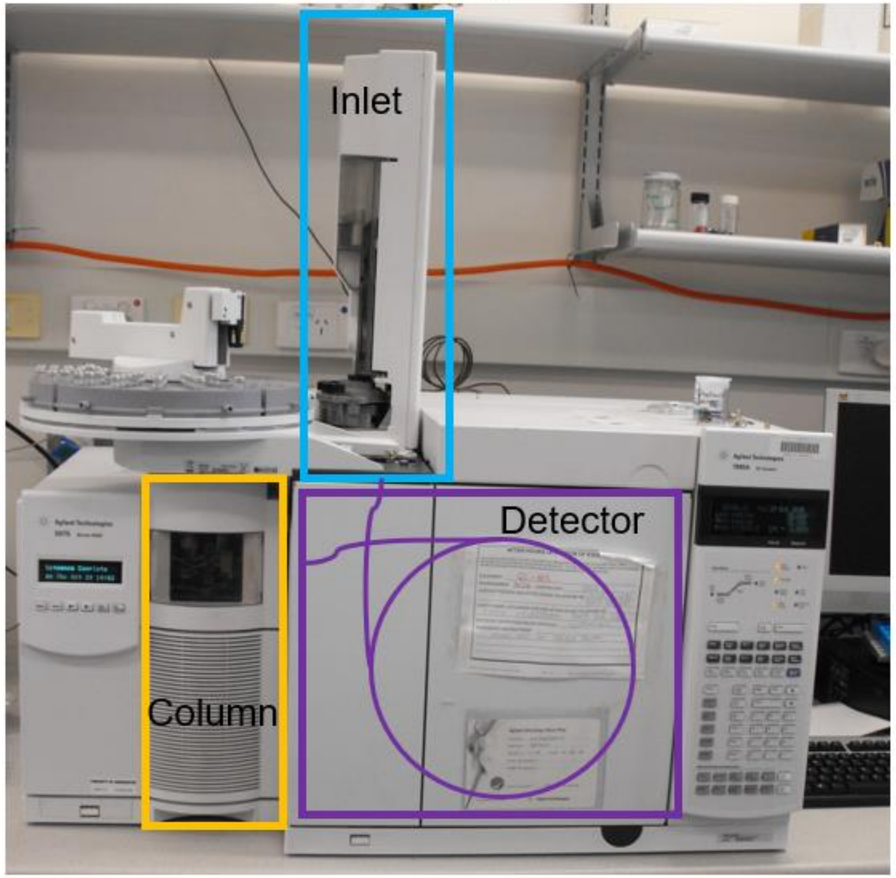
Australian AID SPREP PROE IMO

Oil spill response / Oily waste management





Gas chromatography USP-IAS Suva



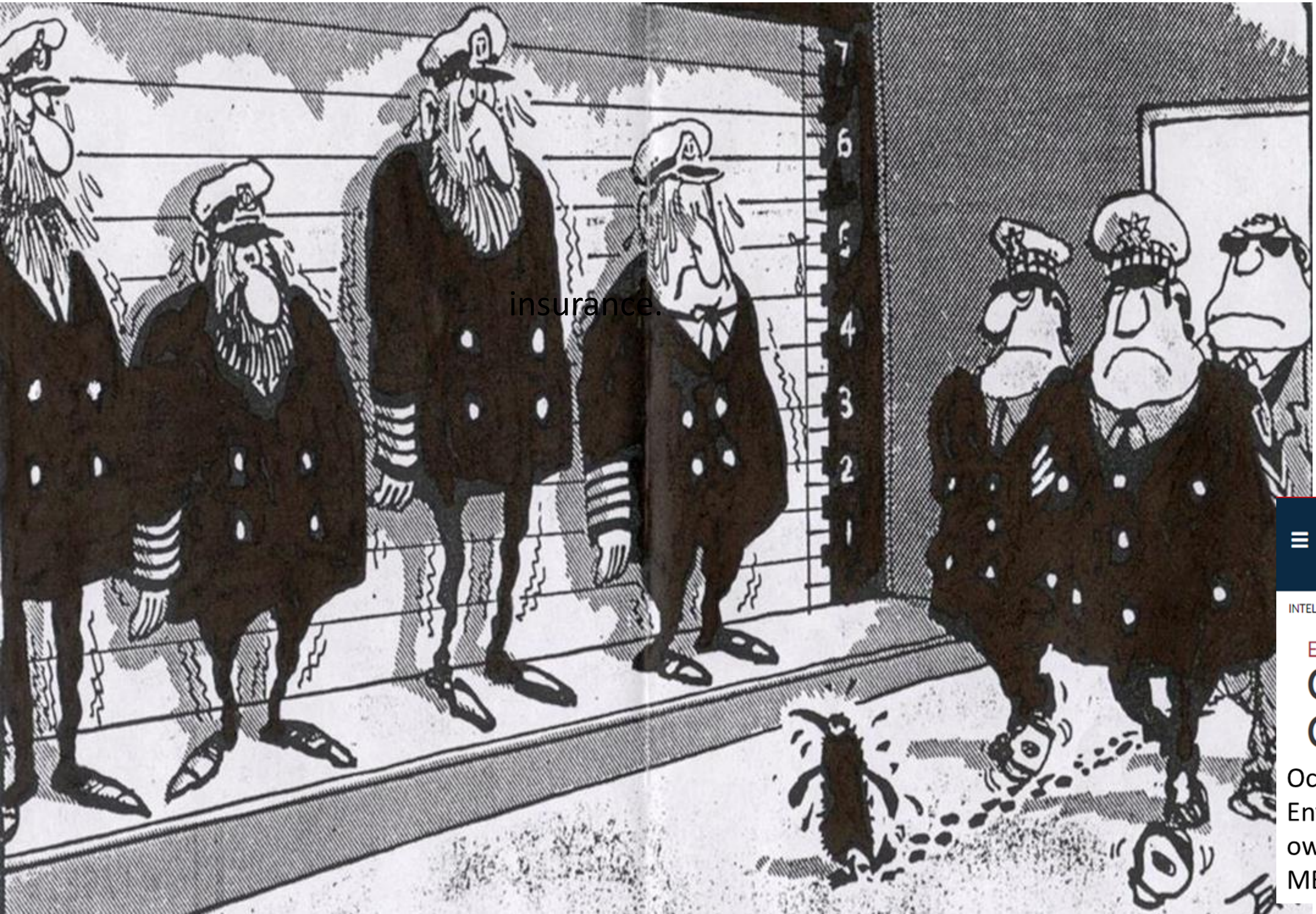
Oily waste management challenges - biosecurity

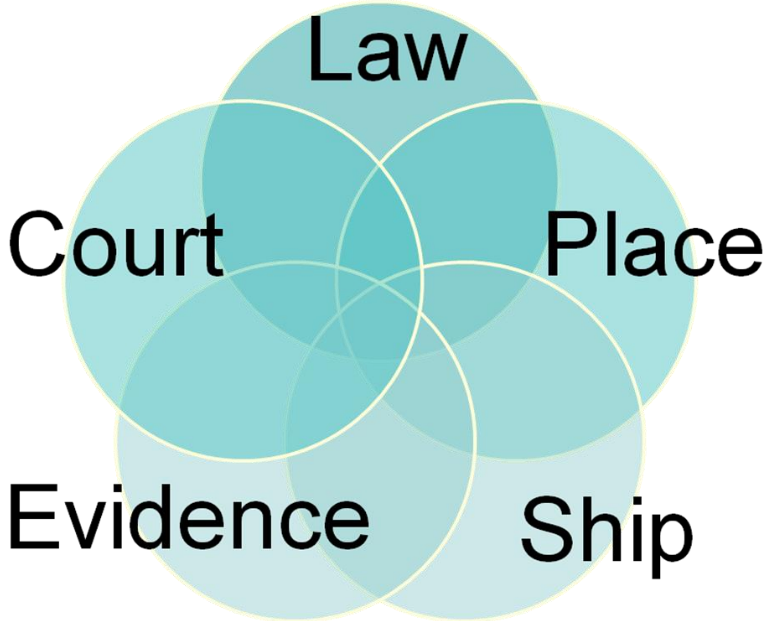
Return Flights & Accom	
Labour and allowances	
Freight of materials	
Purchase of 3 Shipping Containers	
Scoping visit	
Travel time	
Car hire	
Subtotal for WASTE costs	**$40,000**
Quarantine materials (wrap, gas, bund)	
Transport from Christmas Island to Perth	
Disposal of Waste (WA)	
Quarantine Special Burial and Handling Fee	
Quarantine waste fees	
Controlled waste permit	
Subtotal for BIOSECURITY costs	**$80,000**

Oily waste management challenges – waste magnification

1t of spilled oil can produce between 5 and 50t of oily waste

Recovery (Healing) is about accountability - cost recovery, insurance, compensation, restitution, ecological & financial rebuilding,





LAW360

INTELLECTUAL PROPERTY SECURITIES BANKRUPTCY COMPETITION EMPLOYMENT WHITE COLLAR LEGAL INDUSTRY ACCES

Expert Analysis

Oil Spill Deterrence Sticks In Australian Court

October 24, 2014. The New South Wales Land and Environment Court has imposed a fine of $1.2mil on the owner of the MS Magdalene, Schiffahrtsgesellschaft MBH after a serious spill in Newcastle Harbour.

Disaster/Maritime Incident Management – Common Elements

- Leadership
- Communication & Briefing
- Strategic risk assessment & management
- Incident risk management
- Public information
- Resources management
- Emergency operations
- Training and professional development
- Exercise planning

Significant Differences – maritime spill incidents

- **Scenario** – technological incident of a spill of man-made chemical hazards, with broad and ongoing impacts.
- **Legal and liability** – very complex – both national and international law applies. Almost always a liability, a culprit. Both domestic and international law and insurance and compensation mechanisms apply. International laws of preparedness, intervention, salvage, response, wreck, HNS, insurance and liability, compensation, waste, etc. apply.
- **Administrative** – the international and local national laws specifically require a response led by a legally mandated maritime administration. Support can be local and international.
- **Competency** – a single appointed, authorised, competent and experienced person, under relevant domestic legislation, with qualifications and experience, to run the response. Supported by equally competent expert responders, in leadership, and technical positions.
- **Expense, funding and financing** – maritime incidents can be very costly. They are insured. Financing by impacted country first. And spiller liability can be limited, so full compensation comes from international law.

Funding, financing and insurance

- Levies
- Insurance
- Compensation

Funding, financing and insurance

- Levies
- Insurance
- Compensation

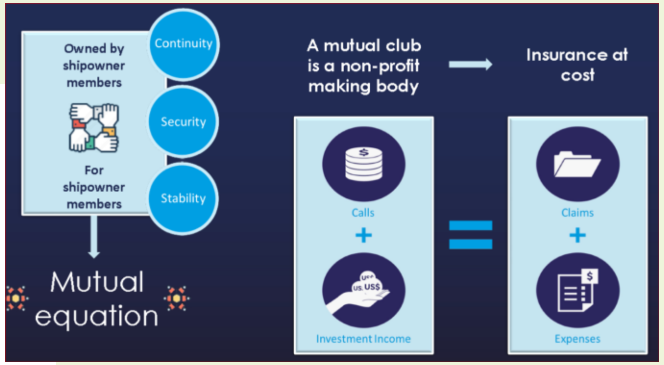
But ...

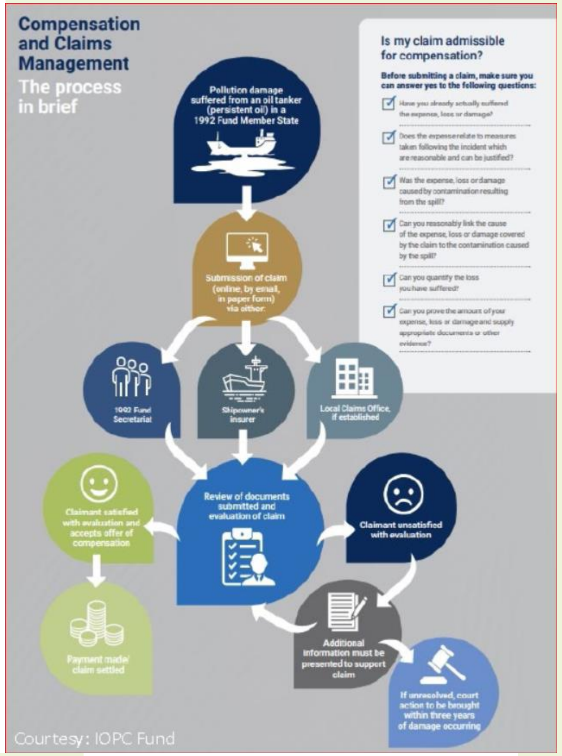
If no conventions,

- **no laws,**
  - **no recovery,**
    - **no healing!**

As at 24 January 2024	INTERVENTION	OPRC	NOUMEA	NOUMEA EMPROT	WAIGANI	BASEL
Cook Islands			x	x	x	x
Fiji	x		x	x	x	
Kiribati					x	x
Marshall Islands	x	x	x	x		x
Micronesia (Fed. States of)				x	x	x
Nauru			x	x	s	x
Niue					x	
Palau		x			s	x
Papua New Guinea	x		x	x	x	x
Samoa		x	x	x	x	x
Solomon Islands			x	x	x	
Tonga	x	x			x	x
Tuvalu					x	
Vanuatu	x	x				

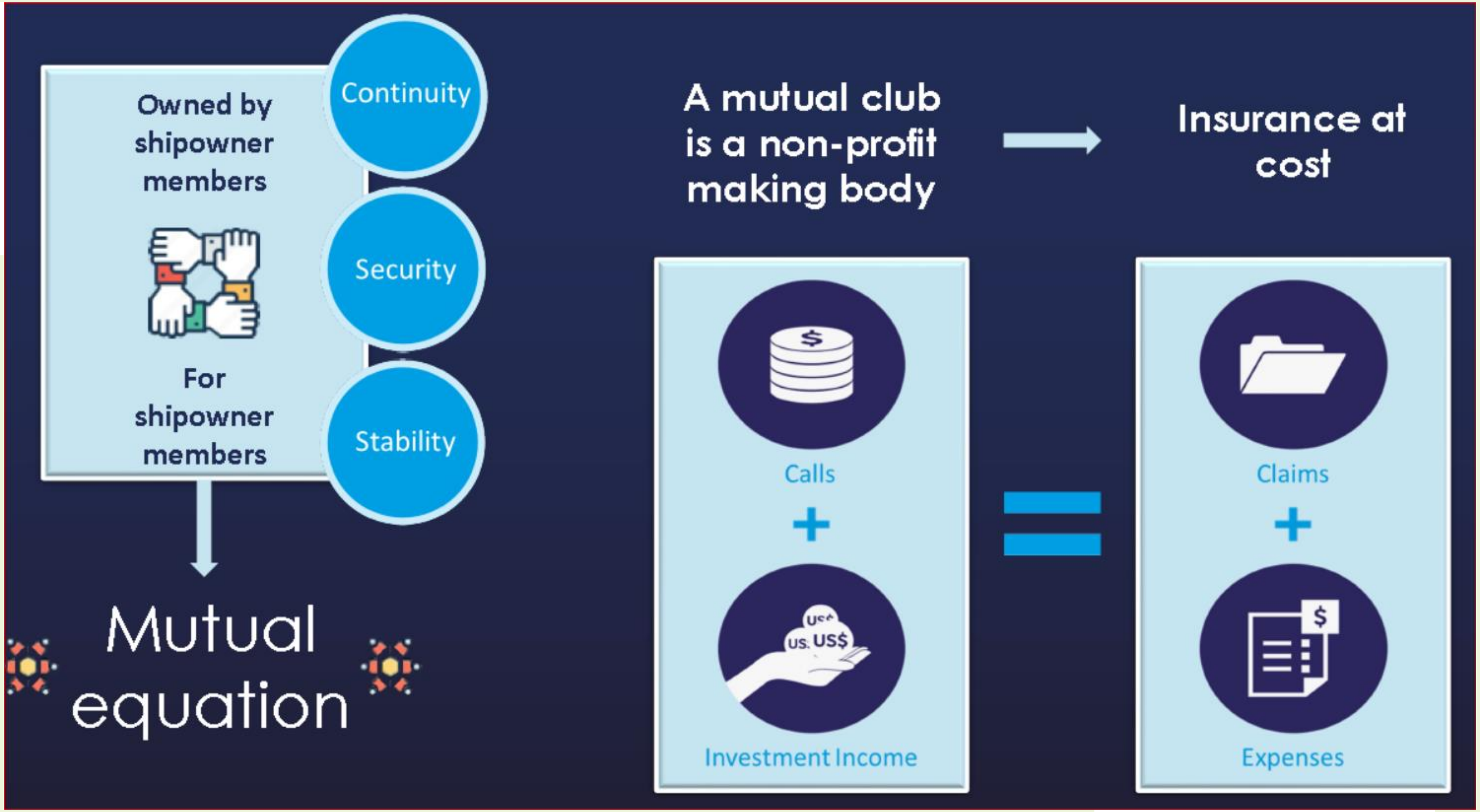
Protection & Indemnity (P&I) Insurance





PacPlan Resilience Project 2022-25

Protection & Indemnity (&I) Insurance



Australian AID SPREP PROE IMO

Transboundary Movement Insurance Guidance

Draft SPREP Procedure for Insuring the Transboundary Movement of Used/Waste Oil

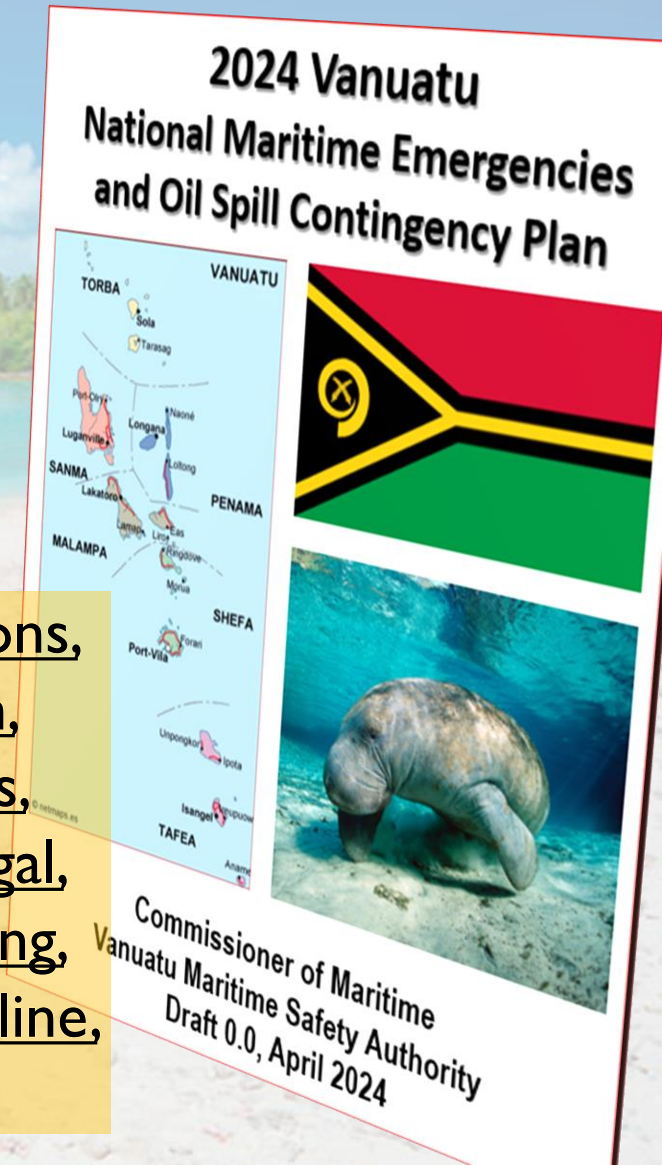
1. Background
2. Objective
3. Key Elements of Insurance for Waste Oil Shipments
   - 3.1 Public Liability Insurance
   - 3.2 Cargo Insurance
4. Parties Involved in Insuring Waste Oil Shipments
   - 4.1 Consignor (Seller/Government or Agency)
   - 4.2 Consignee (Buyer/Recycling Company)
   - 4.3 Shipping Company (Carrier)
5. Step-by-Step Process for Insuring Waste Oil Shipments
   - Step 1: Defining Responsibilities through Incoterms
   - 2: Identifying Insurance Requirements
   - 3: Select & Engage an Insurance Provider
   - 4: Documentation, Packaging and Labelling
   - 5: Issuing the Bill of Lading
   - 6: Managing Liability During Shipping
   - 7: Basel Convention Compliance
6. Market for Waste Oil Insurance
7. Cost of Insurance

For waste management (and everything else) every Government agency must pull their weight, commit and help

Responsibilities, roles, functions and capabilities (what they do, deliver, control, legislation, etc.) under normal business, that can assist with response.

Phase	Expectation	Offer	Capability
1. Preparedness			
2. Operations			
3. Recovery			

e.g. Accommodation, Audit, Aviation, Catering, Childcare, Communications, Consultation, Crowd control, Customs, Data, Diving, Documentation, Driving, Drones, Education, Engineering, Exercises,, Financial, Forensics, Human Resources, Immigration, Insurance, Investigation, Lavatories, Legal, Logistics, Maintenance, Mapping/GIS, Maritime, Media, Medical, Mentoring, Monitoring, Personnel, Photography, Sampling, Search and Rescue, Shoreline, Technical Expertise, Training, Transport, Vehicles, Writing, Waste, etc.



PacPlan Resilience Project 2022-25

Thank you

Landfarming in Samoa

2 October 2024

Yoko Onuma, Chief Advisor of JPRISM3, JICA

SWAP REGIONAL WORKSHOP: A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION – DAY 3, Session #4: Emergency response to oil or chemical spillage

Introduction of J-PRISM's 3R+Return activities

Name: Japanese Technical Cooperation Project for Promotion of Regional Initiative on Solid Waste Management, Phase II (J-PRISM II)
Period: February 2017 – March 2023 (5 years)
Member countries: 9 countries

Overall Goal: Sustainable management of solid waste in the Pacific region is enhanced based on Pacific Regional Waste and Pollution Management Strategy 2016-2025 (Cleaner Pacific 2025)

Project Purpose: The human and institutional capacity base for sustainable Solid Waste Management in the Pacific Region is strengthened through the implementation of the "Cleaner Pacific 2025"

Implementation of the "Cleaner Pacific 2025" (2010-2015)

In-country Activity

Project objectives, achievements and activities are set individually in each country

Samoa	Tonga	Fiji
Solomon	Vanuatu	PNG
Palau	RMI	FSM

Collaboration

Regional Cooperation Activity

Output 1: Monitoring mechanism for solid waste management in line with Cleaner Pacific 2025 is strengthened
Output 2: Regional cooperation is organized and promoted by utilizing regional human resource and sharing good practices in the region
Output 3: Regional capacity of disaster waste management is strengthened
Output 4: Practical and sustainable 3R+Return system is enhanced

Estimation of annual lubricant oil imports and waste oil generation in Samoa

Annual import volume of lubricating oil (2018-2021 average)	740,000 litter/year
Annual waste oil generation amount (Estimated value)	200,000 - 350,000 litter/year

【Source】SWAP, Samoa Used Oil Management Plan, SPREP, 2023.

Current status and challenges of waste oil collection and storage in Samoa

- Main generators: Car dealers, Car service garages etc.
- Lack of legal system related to waste oil
- Lack of facilities to properly dispose of waste oil
- Realistic waste oil disposal scenario for Samoa: Collect and store the waste oil domestically, then hand it over to private recipients in neighboring countries in the Pacific

Current status and challenges of SRWMA's waste oil collection program

Flow of SWOMP program

Collection of waste oil (Collection fee will be collected from generators)

Stored at the SWOMP waste oil storage facility (Capacity: 65,100 liters)

Waste oil exported to neighboring countries for final disposal

Background and implementation issues

- In 2019, the Samoa Recycling Association launched a voluntary program (SWOMP: Samoa Waste Oil Management Programme) to collect, store and export waste oil.
- The program is run by collecting a waste oil collection fee (approx. USD 7 cent/liter) from waste generators.
- Issues include "lack of publicity for the program" and "feeling of burden on waste collection fees"

Based on that, the J-PRISM2 project collaborated with the SWOMP to verify the current waste oil collection and storage capacity of SWOMP in September 2021, and to carry out the analyse to improve its working capacity through pilot project for 1 month.

2-3. Waste Oil Collection and Storage Pilot Project Objectives and Results

Implementation Period	**1 month** （Aug 30 to Sep 30, 2021）
Collection Frequency	**1 days a week collection** (Mon)
Daily Collection Amount Target	**1,000-4,000** litter/day
Monthly Collection Amount Target	**8,000-32,000** litter/day

Collection Day		Discharger	Collection Amount（litter）	Breakdown
1st	30 August	Ford Samoa	10,722	51 Drums, 9,650kg
2nd	6 September	Vailima Breweries	8,997	40 Drums + 21 Small Containers, 8,098kg
3rd	13 September	Nissan Hyundai Service Center	12,897	60 Drums, 11,608kg
4th	20 September	Nissan Hyundai Service Center	12,897	60 Drums, 11,608kg
Total			45,513	211 Drums + 21 Small Containers, 40,964kg
Average amount collected per day			11,378	（≒ 51 Drums, 10,241kg）

1st Phase Waste Oil PP has been completed successfully in Sep 2021

Four months later, the Samoan government also went into lockdown due to the global spread of COVID

Phase 1 Implementation Report has been uploaded to the SPREP website

Downloadable from the SPREP site ↓
https://www.sprep.org/publications/srwmajprism-ii-waste-oil-collection-storage-pilot-project-implementation-report-phase-i

This report summarizes the results of SWOMP, collection and storage of waste oil for one month in Sep 2021, and proposed activities that JPRISM planned to implement in Phase 2 of the pilot project.

Waste oil leak incident that occurred during the lockdown

Leakage incident No1: February 2022
Waste oil type: engine oil
Amount leaked: 1 IBC tank (approx. 1,000 liters)

Leakage incident No.2: March 2022
Waste oil type: unknown
Amount leaked: 2 plastic containers (approx. 400 liters)

In response to the accident, the J-PRISM2 project began examining possible measures to clean up contaminated soil in Samoa, and decided to carry out "land farming" together with the SRWMA and MNRE.

Technical Advisors on Landfarming

SPREP	• Mr. Anthony Talouli, Director, Waste Management and Pollution Control • Mr. Lance Richman, PacWastePlus Technical Waste Project Officer Hazardous Waste • Mr. Paul Irvin, Marine Pollution Project Officer, PACPLAN Project
USP	• Dr. Md. Abdul Kader, Senior Lecturer in Soil Science • Dr. Viliame Savou, Soil Science Senior Technician
SROS	• Fiso Pousui Dr. Fiame Leo, Technical Manager of the Technical Services Division
Taisei Corporation	• Environmental Laboratory Team, Technology Center Urban Infrastructure Technology Research Department

Definition and Purpose of Land Farming

What is Land Farming?	Land farming is a method of bioremediation, which is a method of purifying and stabilizing oil-containing soil by utilizing the ability of microorganisms to decompose mineral oils. Since oil is decomposed into harmless substances such as water and carbon dioxide without using special equipment or machinery, there is no need for post-treatment and there is less concern about secondary pollution. As it is a purification method that is generally cheaper than other physicochemical methods, it is considered to be easy to apply not only to Samoa but also to the Pacific region.
Purpose of Landfarming	It is assumed that the oil leak problem is occurring not only in Samoa but also in each country in the region. It is required to take appropriate measures based on the topographical conditions, leaked oil types, and land use methods. Through the experience of SRWMA's soil pollution problem countermeasures and landfarming experiments, JPRISM would like to contribute to the promotion of proper waste oil collection and storage methods and the improvement of contaminated soil purification techniques in the region.

Tests conducted at Landfarming

Test Name	Purpose
1. Oxygen and Carbon Dioxide Concentration Level Test by JPRISM	• To confirm whether the carbon dioxide concentration is increasing and the oxygen level is decreasing in the soil due to the implementation of land farming
2. Odor Test by JPRISM, SRWMA, SROS, USP	• To check oil odors intensity and acceptance level taking soil samples
3. GC-MS Test by SROS	• To identify the type of oil • To calculate TPH (Total Petroleum Hydrocarbon) concentration • To calculate the amount of fertilizer required for land farming according to TPH concentration

Land farming implementation results - Identified issues -

Issue 1: The groundwater observation wells installed within the disposal site were far from the oil spill site and could not be used for groundwater monitoring purposes.

- MNRE confirmed the inland borehole at sludge area- 35m depth (free and clear not blocked)
- the front boreholes near the road at sludge area- 41m depth & 42m depth (free and clear not blocked)

(Issue) the front 2 boreholes at the sludge area may be too far inland to get a good representative sample of any contamination from the runoff from oil spill from SWOMP facility. Better to dig a new borehole closer to the contaminated area to get an accurate read of the current contamination level or for future spills.

Issue 2: SROS (Samoa Scientific Research Organisation) own and use a GC-MS machine for the purpose of analyzing the components of narcotics. However, this was their first attempt at using the same machine to analyze waste oil type, so they needed additional technical support.

GC-MS machine owned by SROS

SHIMADZU GCMS-QP2010SE Machine

Issue 3: The Samoa Scientific Research Organisation (SROS) did not have the reagent (carbon disulfide) required for the TPH test, so they were forced to find an alternative.

The carbon disulfide necessary for the TPH test using the GC-FID method could not be obtained, and the start of land farming was delayed for about a month while they considered how to obtain it.

After that, SROS confirmed that a method of using "dichloromethane (CH_2Cl_2)" as a reagent was listed in the GC-MS method of oil analysis method documents provided to SROS by PACplan, and since SROS had the reagent, they changed to using dichloromethane instead of carbon disulfide this time.

nordtest method

NT CHEM 001
Edition 2
Approved 1991–02

1(24)

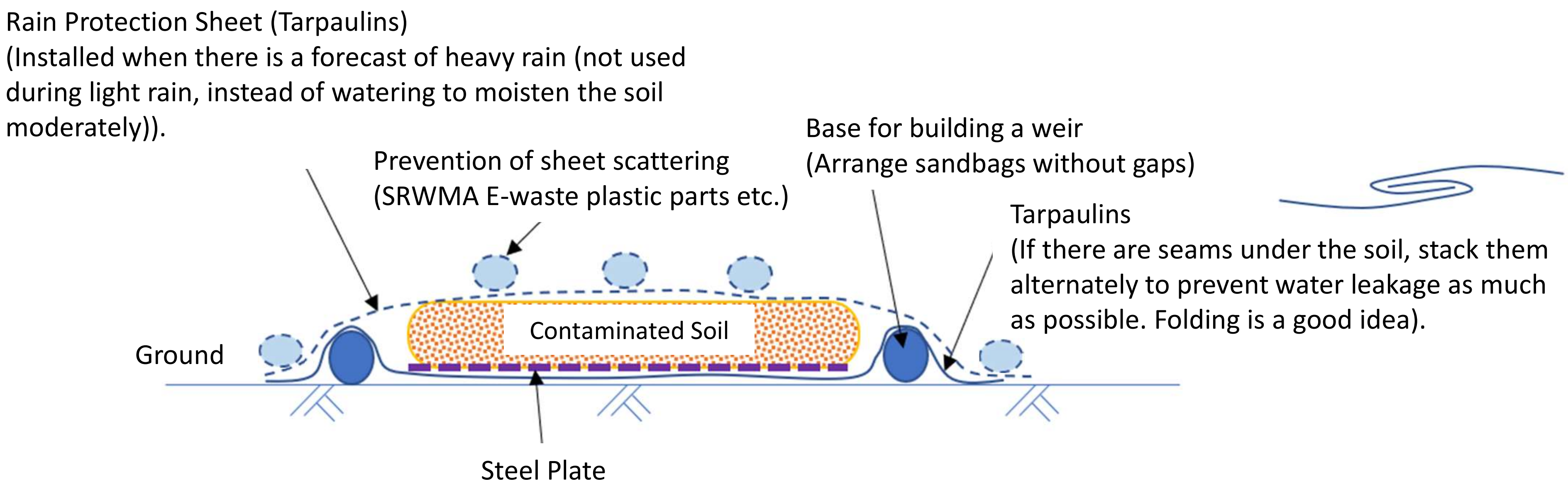
OIL SPILL IDENTIFICATION

UDC 614.7

Key words: Oil spill, identification, weathering, biomarkers, gas chromatography, mass spectrometry, finger printing

CONTENTS

Implementation Method of Landfarming



Findings: It was confirmed that the daily operation work of land farming can be carried out adequately in Samoa.

Watering

Stirring

Spreading and agitation of fertilizer

Agricultural fertilizer
Blaukorn Classic 25kg (12-8-16)

Findings: With support from USP, we also confirmed that oxygen and carbon dioxide concentration meters can measure on-site in Samoa.

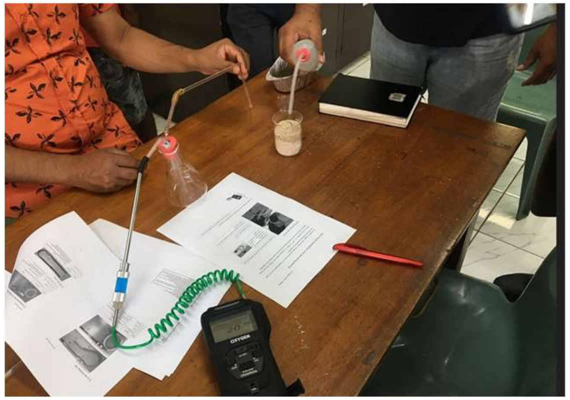
(Gas Sampling Image photo)

Portable Gas Detector (O and CO2): JPRISM procured

Gas-liquid separator for prevention of groundwater intake (see photo of flask on the right)

Gas sampling tube in soil

Cover the ground surface to prevent fresh air from entering



- **Implementation Date**

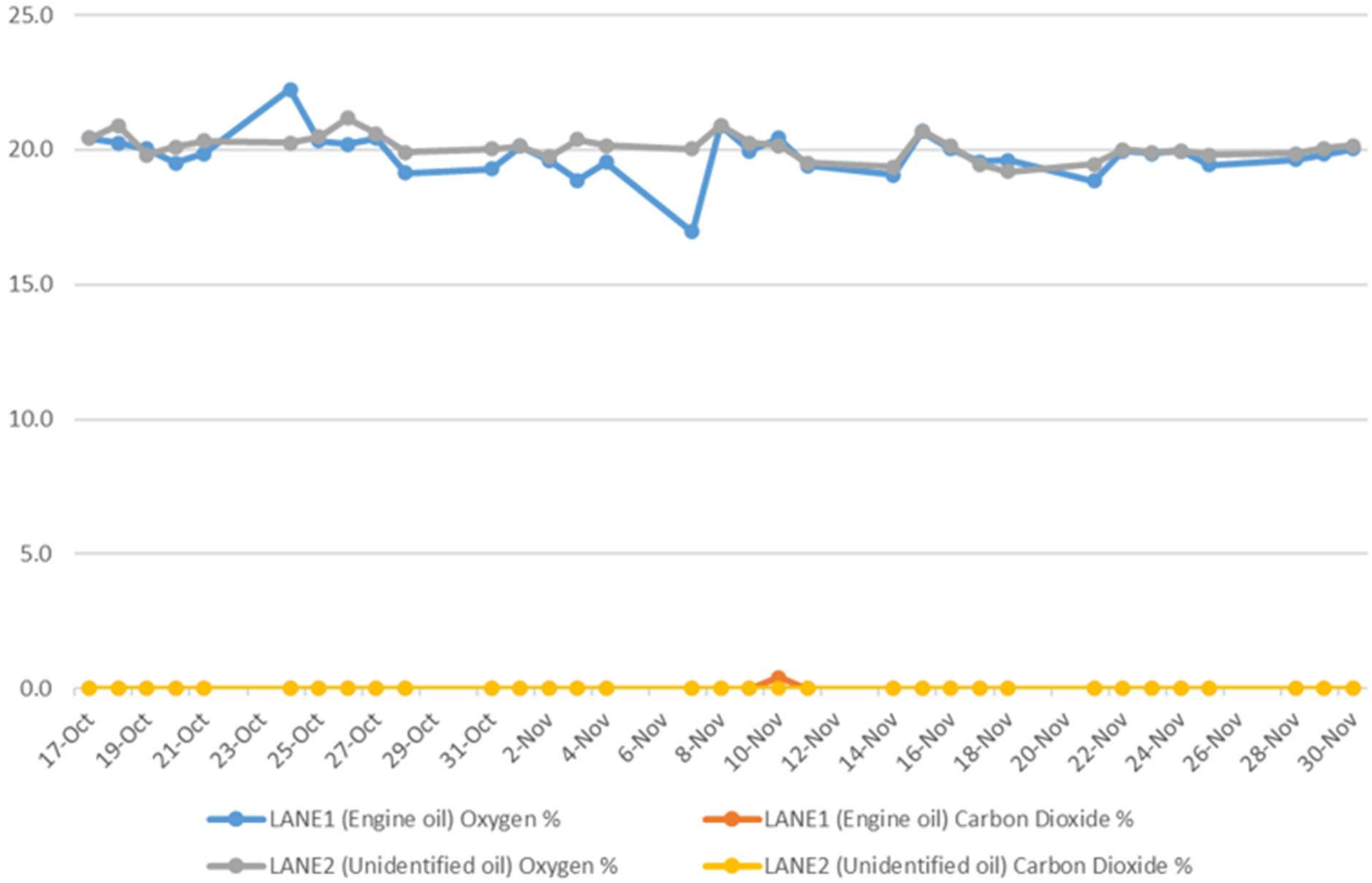
Every day from October 17th to November 30th

- **Implementation Results**

In summary, there was **no significant change in the concentrations of oxygen decrease and carbon dioxide increase in the contaminated soil throughout the 1 and a half month period of land farming**. The following factors are assumed as the cause of this result.

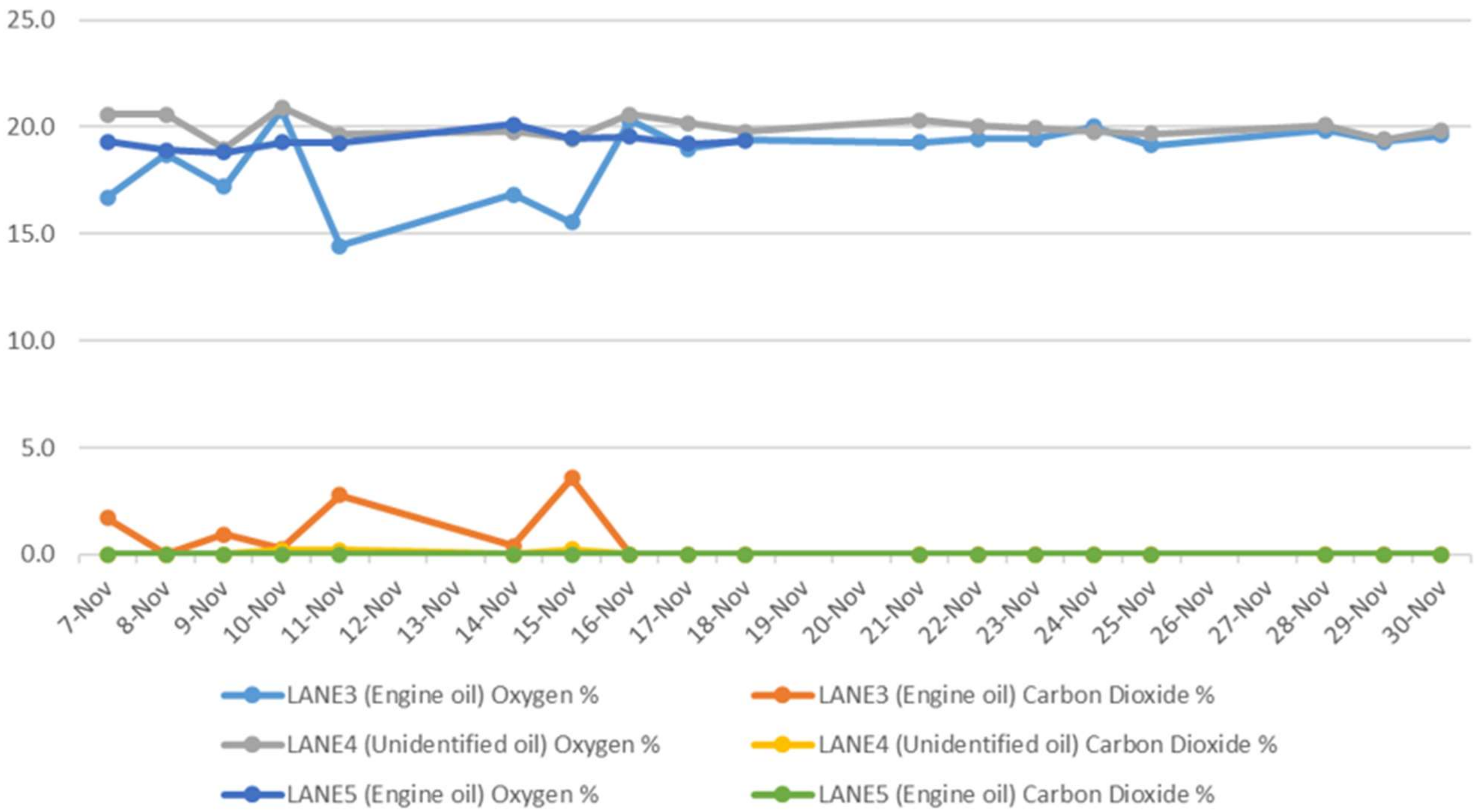
- **Lack of Data on Identification of leaked oil type and TPH concentration**
  Since there are various types of oil, it is necessary to accurately grasp the value of the oil contained in the soil. This time, we planned to calculate it by GC-MS analysis, but we could not get and calculate it from the GC-MS analysis results.
- **Amount of fertilizer applied may not have been appropriate**
  As the above data were not available, the amount of agricultural fertilizer input was decided according to the amount of soil in each lane, assuming an oil content amount of soil is 100,00mg/kg-soil. For this reason, there was a possibility that the input was insufficient.

Oxygen and Carbon Dioxide Concentration Level Test



→ Fertilizer was added in fixed amounts on 17 and 24 October, 7,14, 21, and 28 November.

Oxygen and Carbon Dioxide Concentration Level Test



→ Fertilizer was added in fixed amounts on 17 and 24 October, 7,14, 21, and 28 November.

How to estimate the amount of fertilizer to be applied

The mixing ratio is 100% oil: 5% nitrogen: 1% phosphorus
C:N:P=100:5:1

1. Measure the TPH concentration of the contaminated soil by GC-MS, and calculate the required amount of nitrogen from the analysis value of the oil

↓

2. If the analytical value of the oil is 10,000mg/kg-soil, the required nitrogen amount is 10,000 x 5/100 = 500mg/kg-soil (5g of nitrogen per kilogram of soil).

   Fertilizer: Blaukorn 25kg (12-8-16)
   → When using this fertilizer product, the amount of fertilizer required for 1 kg of soil is 0.5g x 100/12 = 4.2g, so 5g is the required amount.

Land farming data from Oct 17 to 21

Engine oil **2.90 m³ 3.77ton**		17 Oct	18 Oct	19 Oct	20 Oct	21 Oct
Soil temp		31℃	31℃	31℃	34℃	30℃
Ph level		7.0	6.4	6.7	7.1	6.8
Fertilizer		18.9 kg	-	-	-	-
Water/Stir		yes	yes	yes	yes	yes
Sample 1 upstream	O2	20.0%	20.1%	19.9%	18.5%	19.8%
	CO2	0.0%	0.0%	0.0%	0.0%	0.0%
Sample 2 midstream	O2	20.4%	19.8%	20.0%	19.5%	19.8%
	CO2	0.0%	0.0%	0.0%	0.0%	0.0%
Sample 3 downstream	O2	20.9%	20.9%	20.2%	20.5%	20.0%
	CO2	0.0%	0.0%	0.0%	0.0%	0.0%

Land farming data from Oct 17 to 21

Unidentified oil **1.38 m³ 1.79ton**		17 Oct	18 Oct	19 Oct	20 Oct	21 Oct
Soil temp		31℃	31℃	28℃	33℃	30℃
Ph level		7.1	6.8	6.3	6.3	6.1
Fertilizer		8.95 kg	-	-	-	-
Water/Stir		yes	yes	yes	yes	yes
Sample 1 upstream	O2	20.0%	20.9%	19.7%	20.3%	20.9%
	CO2	0.0%	0.0%	0.0%	0.0%	0.0%
Sample 2 midstream	O2	20.4%	20.9%	19.8%	20.0%	20.0%
	CO2	0.0%	0.0%	0.0%	0.0%	0.0%
Sample 3 downstream	O2	20.9%	20.9%	19.9%	20.0%	20.1%
	CO2	0.0%	0.0%	0.0%	0.0%	0.0%

Odor Test Results

➢ **Implementation Date**

◘**1st test**: September 15th (when excavating and removing contaminated soil)

◘**2nd test**: October 27th (one week after the start of landfarming)

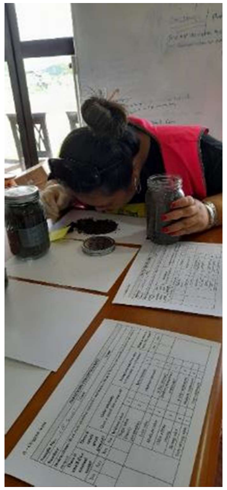
◘**3rd test**: November 17th (one month after the start of landfarming)

◘**4th test**: November 30th (last day of landfarming implementation)

➢ **Implementation Results**

- **It was not fully confirmed that landfarming reduced the contaminated soil odor**

  It was not confirmed that the odor of the sample was sufficiently reduced from this implementation period and method.



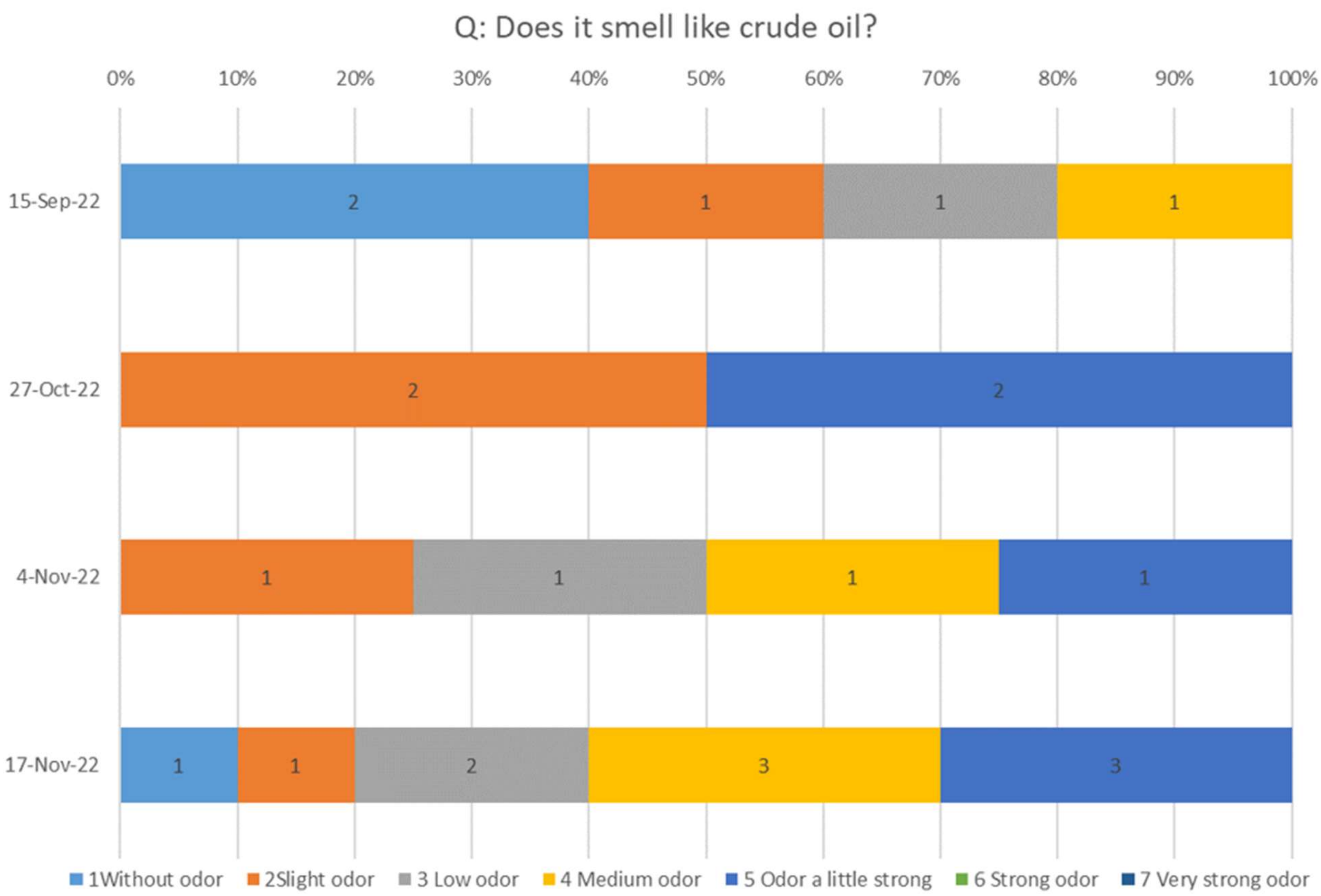


Figure 75: Odor Intensity (Engine oil Lane1)

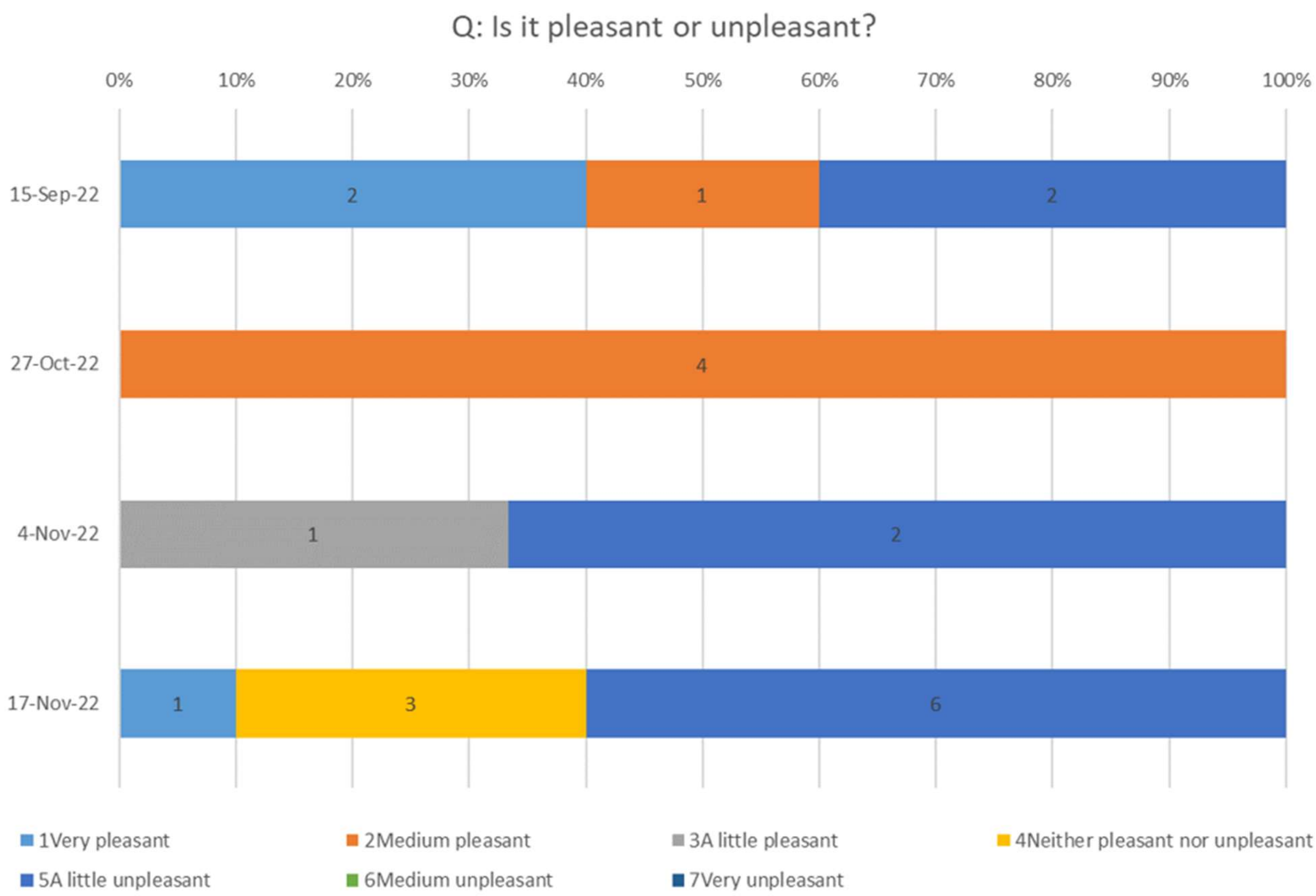


Figure 76: Acceptance level for odor (Engine oil Lane1)

GC-MS Test Results

- **Implementation Date**

◘**1st test**: September 15th (when excavating and removing contaminated soil)
◘**2nd test**: October 27th (one week after the start of landfarming)
◘**3rd test**: November 17th (one month after the start of landfarming)
◘**4th test**: November 30th (last day of landfarming implementation)

- **Implementation Results**

JPRISM planned to use the results of the GC-MS analysis and TPH test in the implementation method of landfarming, but due to the following challenges, **we were not able to fully utilize the data in the pilot project period**.

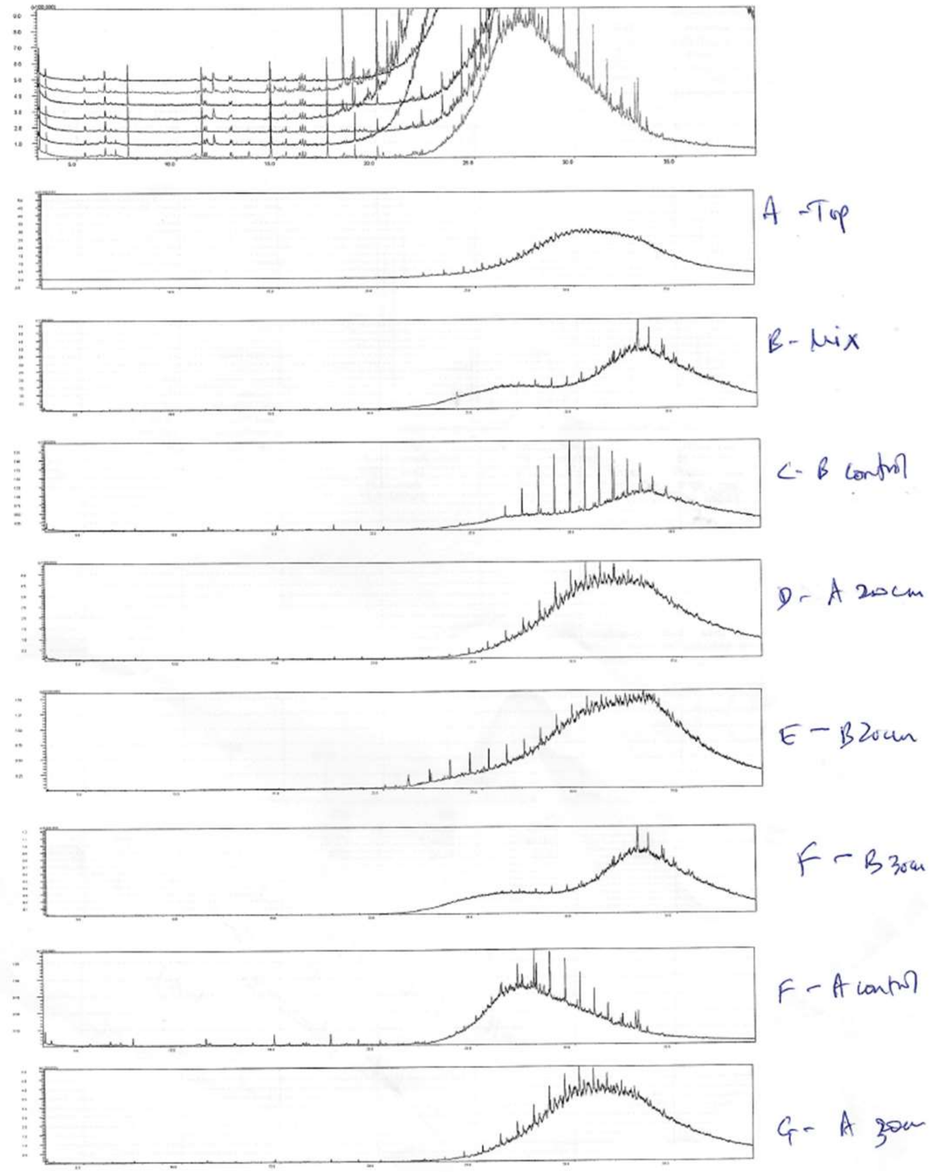
- The task of summarizing the conclusions in a report from the results of sample analysis using a GC-MS instrument is time consuming. Interpretation work required for analysis of the data is still ongoing at SROS.

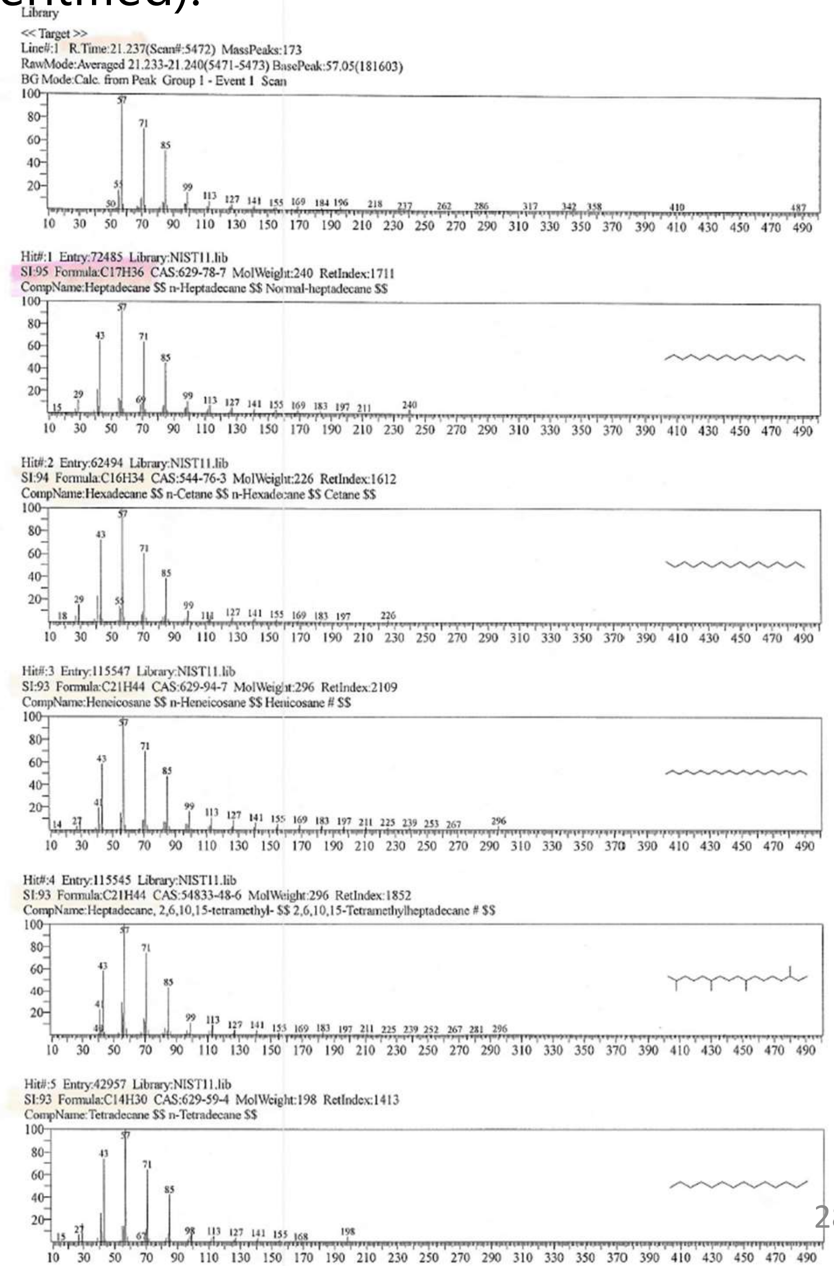
↓

Therefore, JPRISM would like to hand over this landfarming activity to PACPLAN, including the continuation of this analysis work.

GC-MS Test Results

A soil sample collected on September 15 was analyzed using a GC-MS machine and it was confirmed that C17H36 (a type of diesel) had the highest similarity index (however, the type of oil was not identified).





TPH Concentration Calculation Method

TPH Test method usignt the GC-FID method pp.13-14

The sample area determined in 2.5.3 is applied to the calibration curve prepared in 2.5.2 (3), the TPH concentration in the sample extraction solution is determined, and the oil content in the soil is determined by the following formula. The calculation is performed with 3 significant digits and then rounded to 2 digits for reporting. It is clearly stated that the analytical values are the results of the carbon range n-C_6H_{14} to n-$C_{44}H_{90}$.

$$Cs = \frac{As \times Vt}{Ws} \times \frac{100}{(100 - Sw)}$$

Cs: TPH concentration in soil [μg / g]
As: TPH concentration in the extract solution [μg/ml]
Vt: Amount of extraction solvent [ml]
Ws: Weight of extracted sample [g]
Sw: Moisture content [%]

Conclusions and lessons learned

1) **Land farming can be implemented in Samoa**
   Although the waste oil spill was an unexpected accident, we confirmed that land farming can be implemented in Samoa as a method for remediating soil contaminated by waste oil.

2) **The need to strengthen the capacity of analytical laboratories**
   Having analytical institutions that can determine the hazardousness of waste oil and perform their own component analysis will contribute to strengthening the country's environmental countermeasures capacity. However, due to the limited implementation period of this land farming, we were unable to fully strengthen the capacity of the institution

3) **Continuation of the activity**

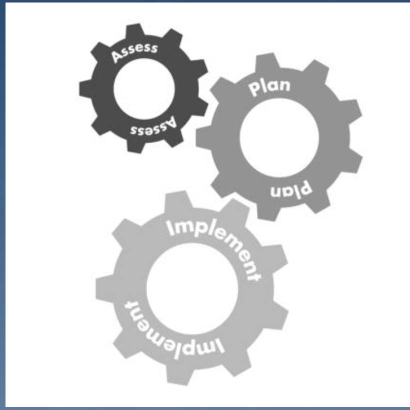
   Although it was not possible to fully verify the effectiveness of the activity from a data perspective in this initiative, the activity was carried over to Pacplan and SRWMA.

   We hope that soil contamination countermeasures and efforts in this field will continue to be promoted in the PICS including Samoa.

Appendix D: Power Point Presentations

SESSION #5: DISASTER WASTE MANAGEMENT

- Appendix D22: Setting the Scene: Overview of Disaster Waste and Impact
- Appendix D23: Framework for Resilient Development in the Pacific (FRDP)
- Appendix D24: Mainstreaming Waste Management into National Disaster Management Office Framework
- Appendix D25: Practitioner's Guideline on Drafting National Disaster Waste Management Plan
- Appendix D26: Overview of Disaster Waste Management in Fiji
- Appendix D27: Disaster Waste Management Response in Vanuatu
- Appendix D28: Tonga's Journey through Disaster Waste



Disaster Waste

SESSION 5

DISASTER WASTE

Overview

Highlight the linkages between waste management and Disaster Risk Reduction.

Highlight how critical effective disaster waste management planning to improve the capacity of Pacific Countries prepare for emergencies and disasters, thereby ensuring timely and effective response.

Inform of the principle and concept of Disaster Waste Management

Inform of the assistance provided to Pacific Island Countries by the Secretariat of the Pacific Regional Environment Programme to improve Disaster Waste Management.

Mainstreaming Circularity into Disaster Waste Management

Overview of Session 5

Session 5a

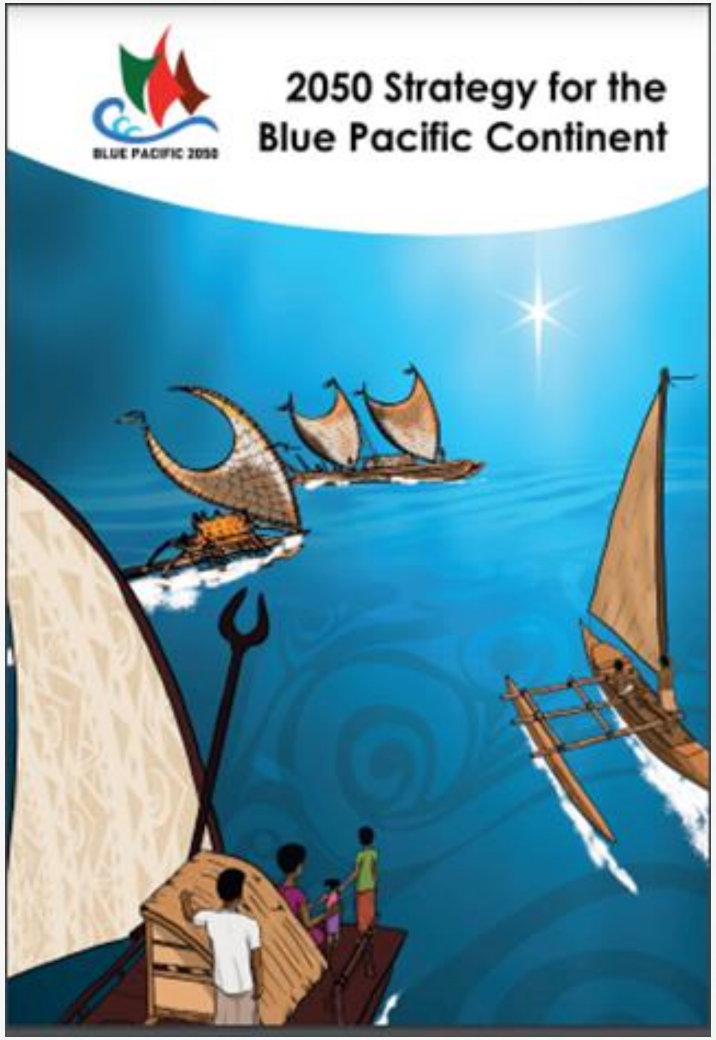
- ✓Introduction to Vulnerability Index for the Region
- ✓Introduction to Disaster Risk Resilient
- ✓ Introduction to Disaster Waste Management

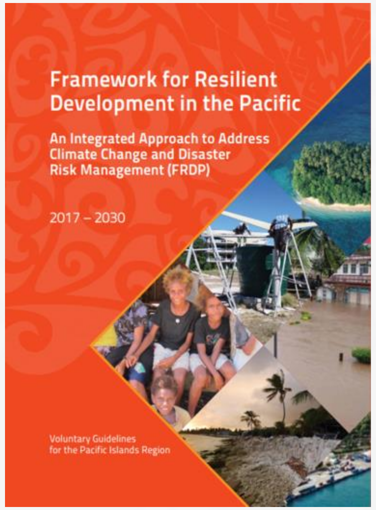
Session 5b

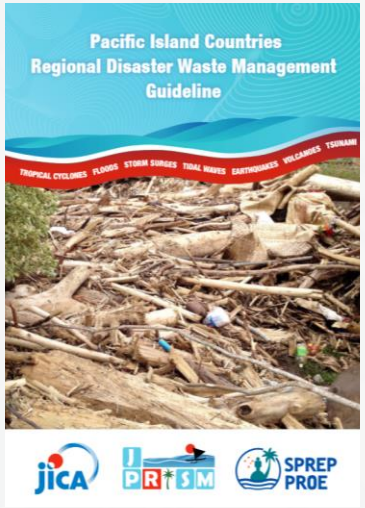
- ✓Case Studies on National Initiatives to Improve Disaster Waste Management:
  1. Fiji
  2. Tonga
  3. Vanuatu
- ✓SPREP's assistance to PICs on improving Disaster Waste Management

Session 5a

CIRCULARITY WORKSHOP
PORT VILA, VANUATU
30 SEPTEMBER – 4 OCTOBER 2024







Regional Policies

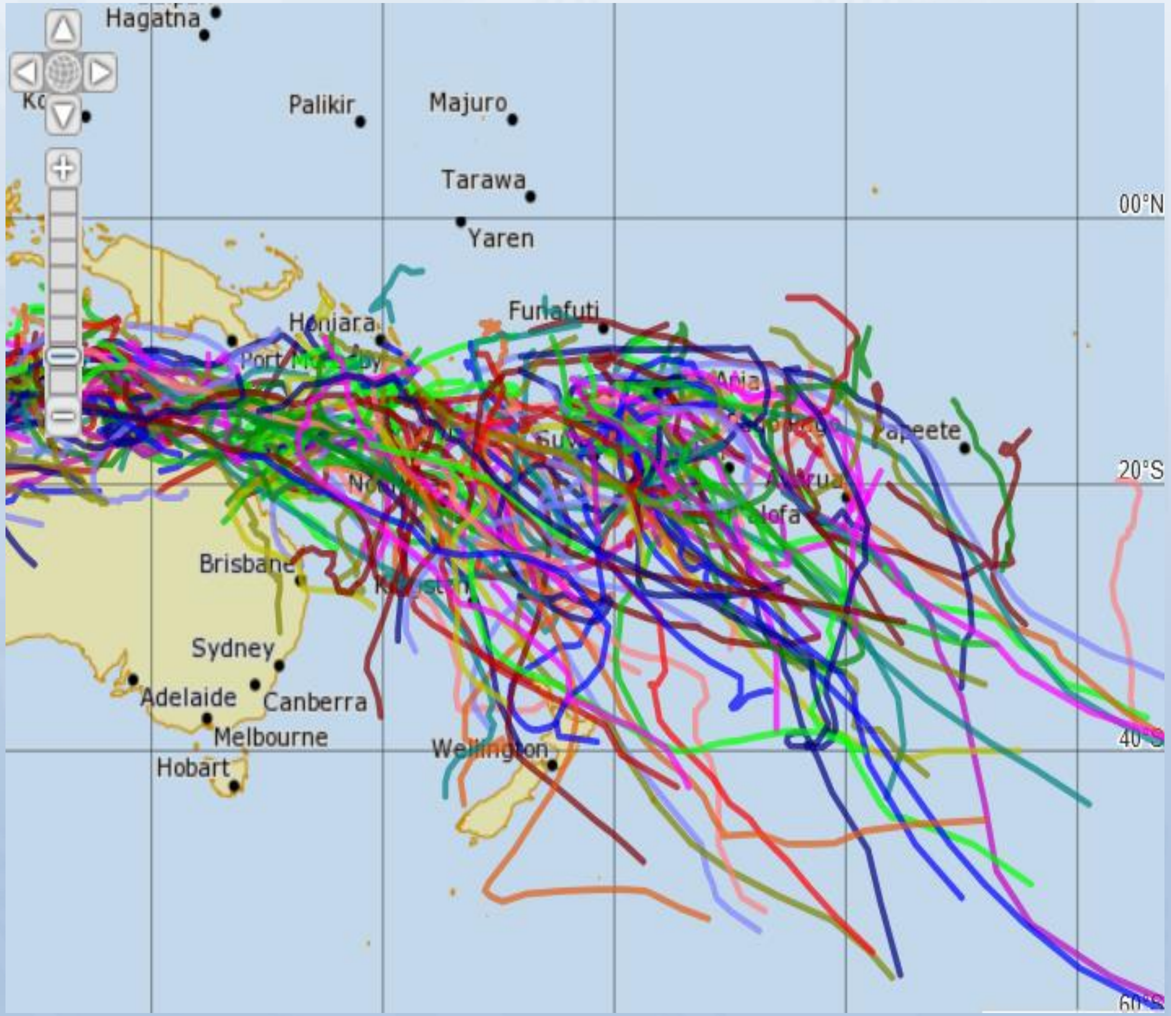
Disaster Waste
Management

+

Resilience

Background

- **The Pacific region is identified to be most prone to disaster and climate risks**, cyclones, landslides, flooding, drought, earthquakes and even tsunamis.
- **Natural disasters are associated with generation of large volume of waste**, damage waste management facilities, and disruption to waste services posing a risk to public health which through direct or vector-induced exposure.



While considerable efforts have been focused on predicting and building resilience to climate change-related disaster impacts in the Pacific, the national management of debris and waste after each disaster event is **still often ad hoc and uncoordinated.**

Key Challenges in Disaster Waste Management

- ✓ **Volume and Composition**: Large quantities and diverse types of debris.
- ✓ **Coordination**: Difficulty in coordinating between local, state, and federal agencies.
- ✓ **Logistics**: Collection, transport, and disposal challenges.
- ✓ **Environmental Impact**: Risk of pollution and ecological harm.
- ✓ **Equity Issues**: Disproportionate impact on vulnerable communities.

THANK YOU

Disaster Waste Management

And the Framework for Resilient Development in the Pacific (FRDP) 2017-2030

REGIONAL WORKSHOP

A CIRCULAR APPROACH TO WASTE MANAGEMENT IN THE PACIFIC: CREATING RESOURCES FROM WASTE AND POLLUTION

Iririki Island Resort Port Vila, Vanuatu

Sept 30-Oct 5, 2024

Rebecca Polestico
Monitoring and Evaluation Adviser
Strategic Planning, Partnership and Resource Mobilisation Department (SPPRD)

SPREP
PROE

Session Objective(s)

To introduce the Framework for Resilient Development in the Pacific (FRDP 2017-2030) and Disaster Waste Management Sector Across the Region:

- ✓ Familiarise the over-all goals and objectives of FRDP 2017-2030
- ✓ Disaster Risk Reduction
- ✓ Inclusion of Disaster Waste into FRDP
- ✓ Pacific Resilience Partnership (PRP)
- ✓ Pacific Resilience Standards (PRS)
- ✓ Waste Management Synergies: Adaptation
- ✓ 2050 Strategy for Blue Pacific Continent

Background
FRDP 2017-2030: Leaders Decision

- ✓ **2012: PIFLM (Pacific Island Leaders Meeting) supported a single and Integrated Framework on climate change and disaster risk management**
- ✓ 2013: First Joint Meeting Joint Meeting of the Pacific Climate Change Roundtable (PCCR) and Pacific Platform for Disaster Risk Management (PPDRM) on 2 Regional Frameworks

  Pacific Disaster Risk Reduction and Disaster Management Framework for Action (commonly referred to as the Regional Framework for Action or RFA) ; and

  Pacific Islands Framework for Action on Climate Change (PIFACC)
- ✓ **2015: Pacific Islands Framework for Action on Climate Change (PIFACC) and Pacific Disaster Risk Reduction and Disaster Management Framework (Regional Framework for Action (RFA) extended by Leaders in 2015**
- ✓ 2016: 47th PIFLM approved FRDP
- ✓ **2017: Pacific Resilient Partnership established**

Background
FRDP 2017-2030: Leaders Decision

- ✓ Sept 2016 at the 47th PIFLM approved FRDP

  FRDP 2017-2030: An Integrated Approach to Address Climate Change and Disaster Risk Management

- ✓ An overarching regional framework for climate change and disaster risk management, providing high level voluntary strategic guidance to different stakeholder groups.

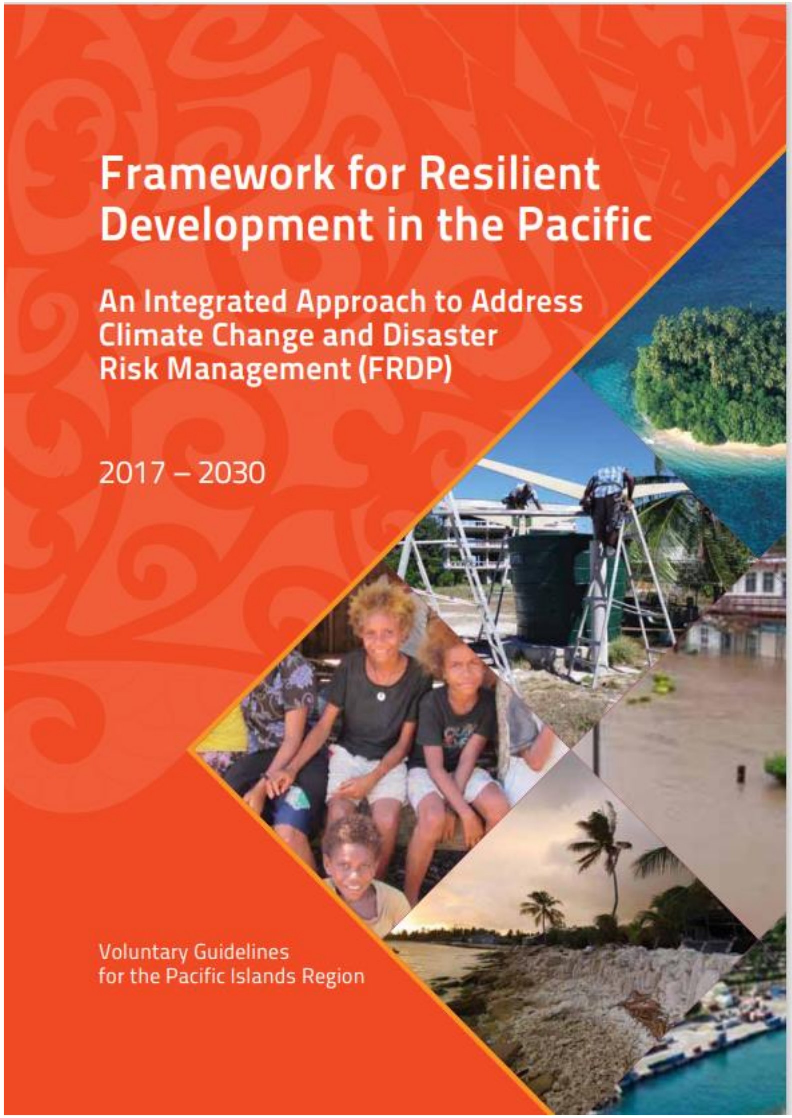
- ✓ Leaders through the Pohnpei Statement: Strengthening Pacific Resilience to Climate Change and Disaster Risk, called on all development partners, the private sector and civil society to join with Pacific Islands Countries and Territories to support the principles and the implementation of this statement through high-level participation in a new Pacific Resilience Partnership which was established in September 2017.

Background
FRDP 2017-2030 and Disaster Waste Management Sector

- ✓ SM28 in 2017 (SPREP): Members directed the Secretariat to play an active role in the PRP governance and report to Members on progress.
- ✓ 2018: Assessment on the operationalisation of FRDP Goals and Strategic Objectives through SPREP-DFAT GA (Grant Arrangement): GA 2018-2021 and GA 2021-2025
- ✓ FRDP Goal 3: Disaster Preparedness, Response and Recovery (DPRR)
- ✓ Disaster Waste Technical Working Group in the PRP Taskforce in 2022
- ✓ Climate Change and Disasters as Pillar 5 in 2050 Strategy for the Blue Pacific Continent in 2023

SPREP PROE

Introducing FRDP 2017-2030



Strategic Goals

Goal 1 Strengthened integrated adaptation and risk reduction to enhance resilience to climate change and disasters

Goal 2 Low carbon development

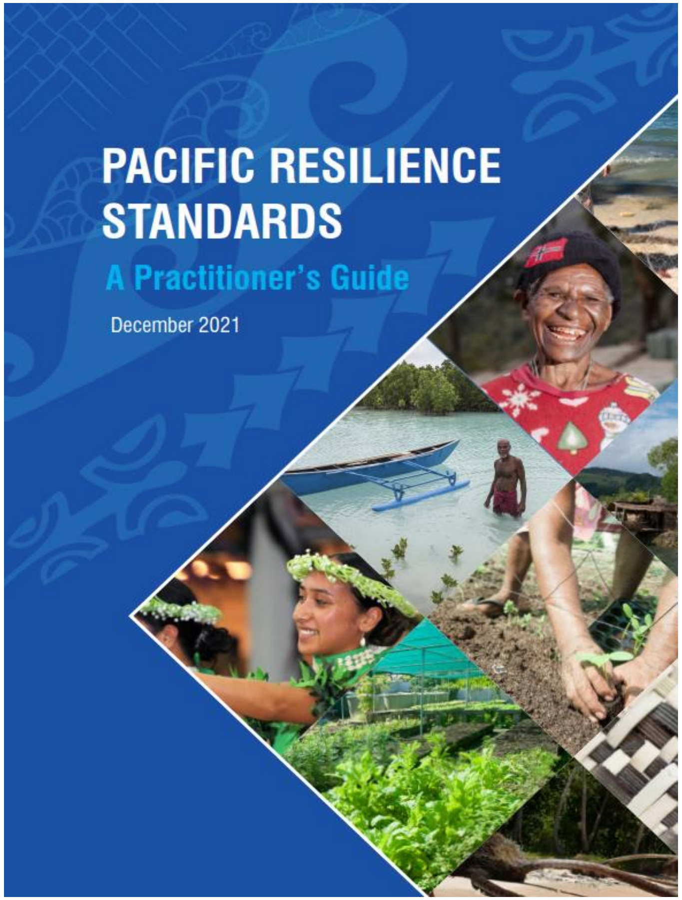
Goal 3 Strengthened disaster preparedness, response and recovery

Framework for Resilient Development in the Pacific (FRDP) 2017-2030

An integrated approach to address climate change and disaster risk management

Pacific Resilience Standards (PRS)

https://www.resilientpacific.org/en/pacific-resilience-standards



Regional Commitment

Brief Overview of FRDP 2017-2030

- ❖ **What is Resilience and Why is it important?**
- ❖ **Leaders Decision**
- ❖ **What is the FRDP?**
- ❖ **Pacific Resilience Partnership (PRP)**
- ❖ **PRP Taskforce**

  (PRP Taskforce Support Unit)
- ❖ **Pacific Resilience Meeting (PRM)**

What is Resilience and Why it is Important

Resilience: The Pacific Perspective

'The **ability** of a **system**, **community** or **society** exposed to hazards, and/or climate change, to **resist**, **absorb**, **accommodate** and **recover** from the consequences of a hazard event or of climate change in a timely and efficient manner. This includes through the **preservation** and **restoration** of its **essential** basic structures and functions.' [Source: UNISDR 2009]

Exposure, Hazard, Risk, Vulnerability

SPREP PROE

FRDP-Disaster Waste Management-Disaster Risk Response: Prolonged Impact

Photos: (top) C. Lacovino, SPREP

(bottom) SPC

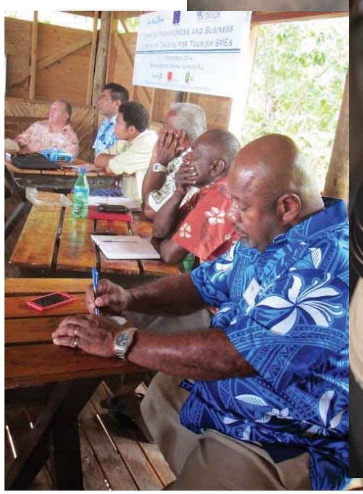
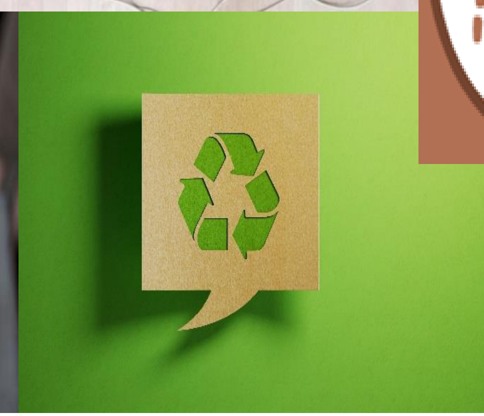
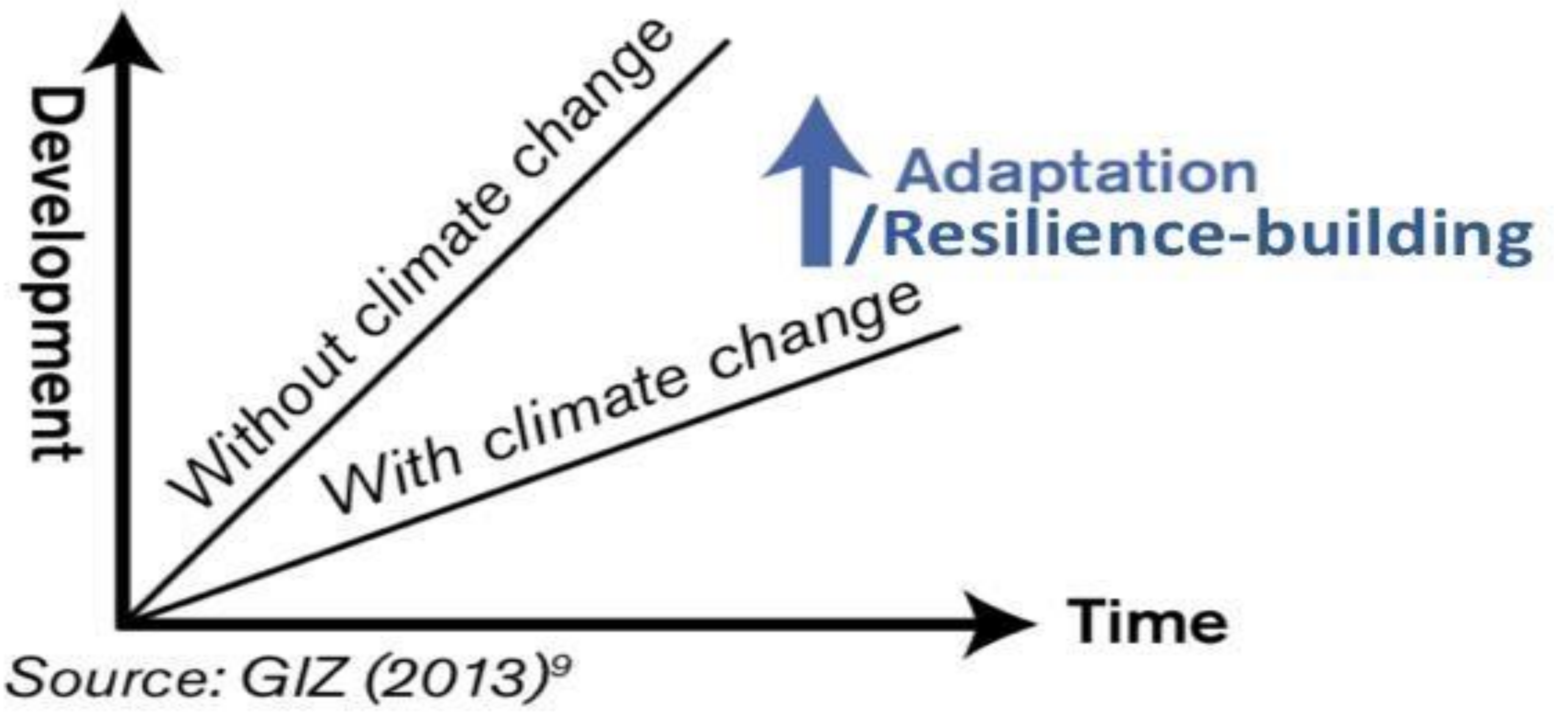


Photo: UNISDR

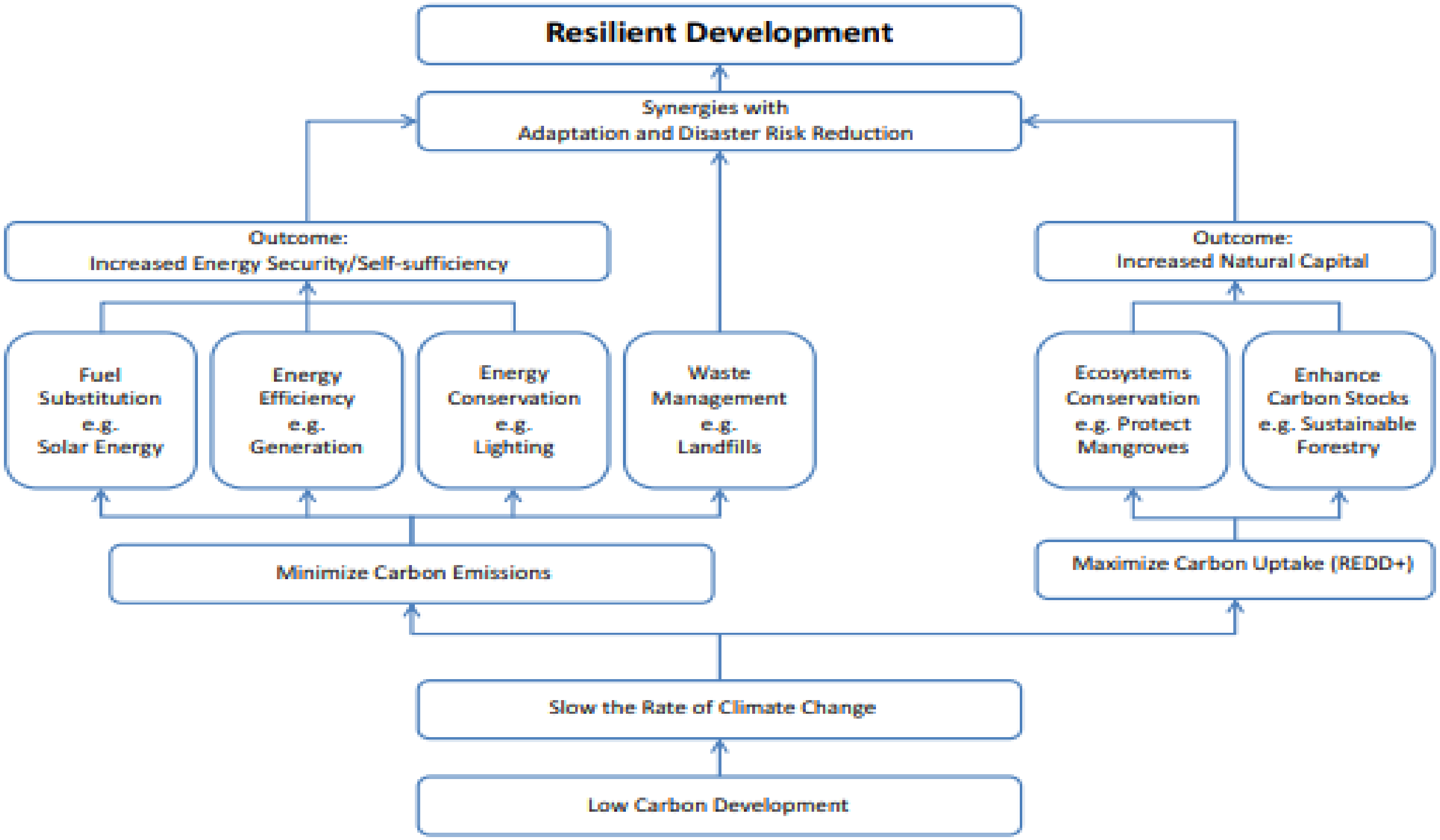


Theory of Change (ToC) and FRDP 2017-2030

- FRDP is in its 7th year of Implementation
- ToC may have prevailed in its OUTCOMES by Strategic Goals at this time.
- Direct causal effects of FRDP are still developing

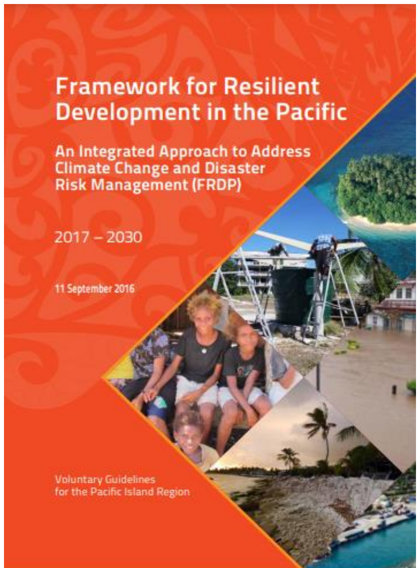


Waste Management: Synergies with Adaptation and Disaster Risk Management

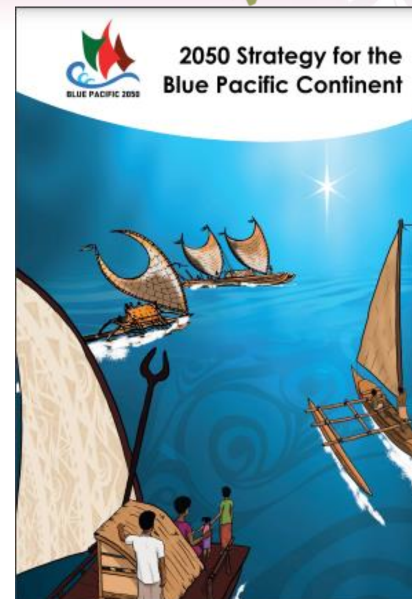


gure 4. The multiple aspects of, and contexts for, low carbon development with illustrative examples.

SPREP PROE



FRDP 2017-2030 and 2050 Strategy for the Blue Pacific Continent and Waste Management Sector



FRDP 2030

Goal 1: Strengthened integrated adaptation and risk reduction to enhance resilience to climate change and disasters

Goal 2: Low Carbon Development

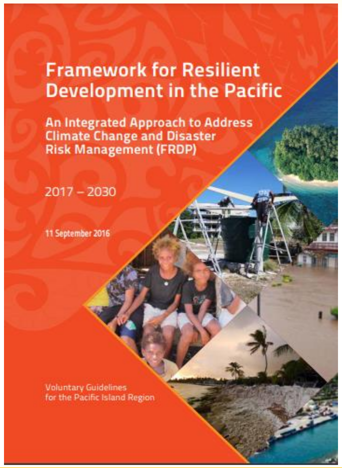
Goal 3: Strengthened disaster preparedness response and recovery

2050 Strategy

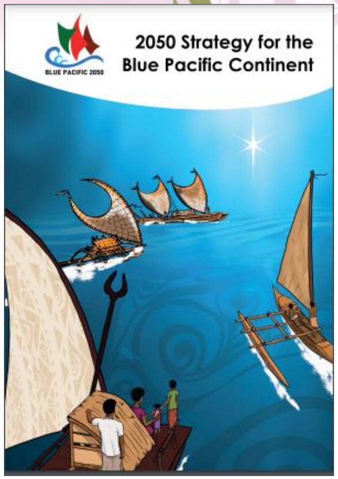
Thematic Area 5: Climate Change and Disaster

Thematic Pillar 6: Ocean and Environment

Waste Management Sector



FRDP 2017-2030 and 2050 Strategy for the Blue Pacific Continent and Waste Management Sector



FRDP Goal 3: Strengthened disaster preparedness, response, and recovery

Includes improving the capacity of PICTs to prepare for emergencies and disasters, thereby ensuring timely and effective response and recovery in relation to both rapid and slow onset disasters, which may be exacerbated or caused by climate change. Disaster preparedness, response and recovery initiatives will reduce undue human losses and suffering, and minimise adverse consequences for national, provincial, local and community economic, social and environmental systems (pg 3)

2050 Strategy Thematic Area 5: Climate Change and Disaster

Focuses on measures that proactively, collectively, and in a culturally appropriate manner, address planetary crisis of climate change, current and future disaster impacts including extreme weather events, cyclones, drought, flooding and sea level rise and ocean acidification. It also addresses climate finance, disaster risk reduction mechanisms, loss and damage, the nexus between climate change and the ocean, maritime boundaries, human rights, the rights of women and girls, the rights of persons affected by climate change, food and water security, disasters as well as climate change and disaster related mobility including relocation, migration, and displacement. (pg 26)

SPREP
PROE

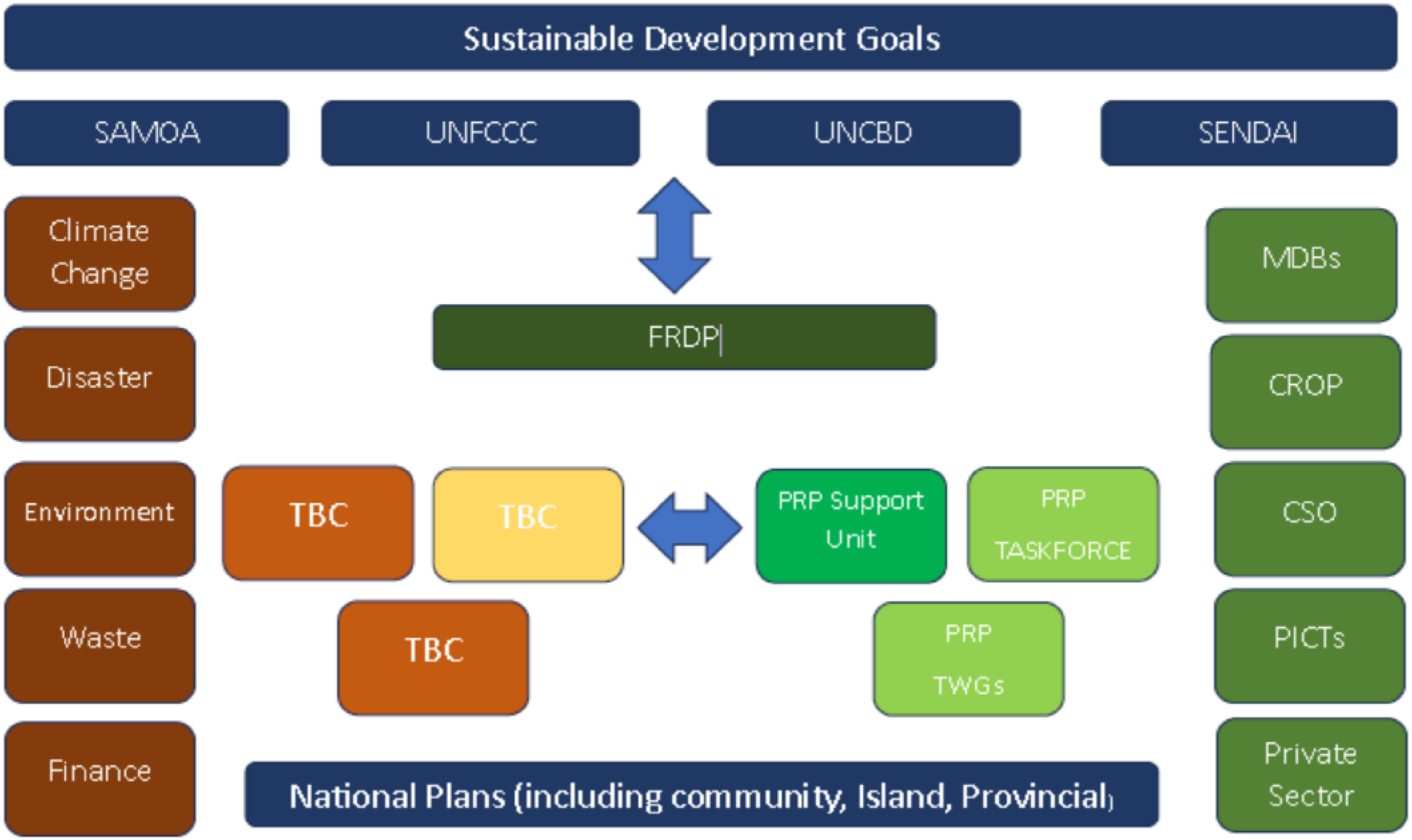
2050 Strategy for the Blue Pacific Continent

Climate Change and Disasters

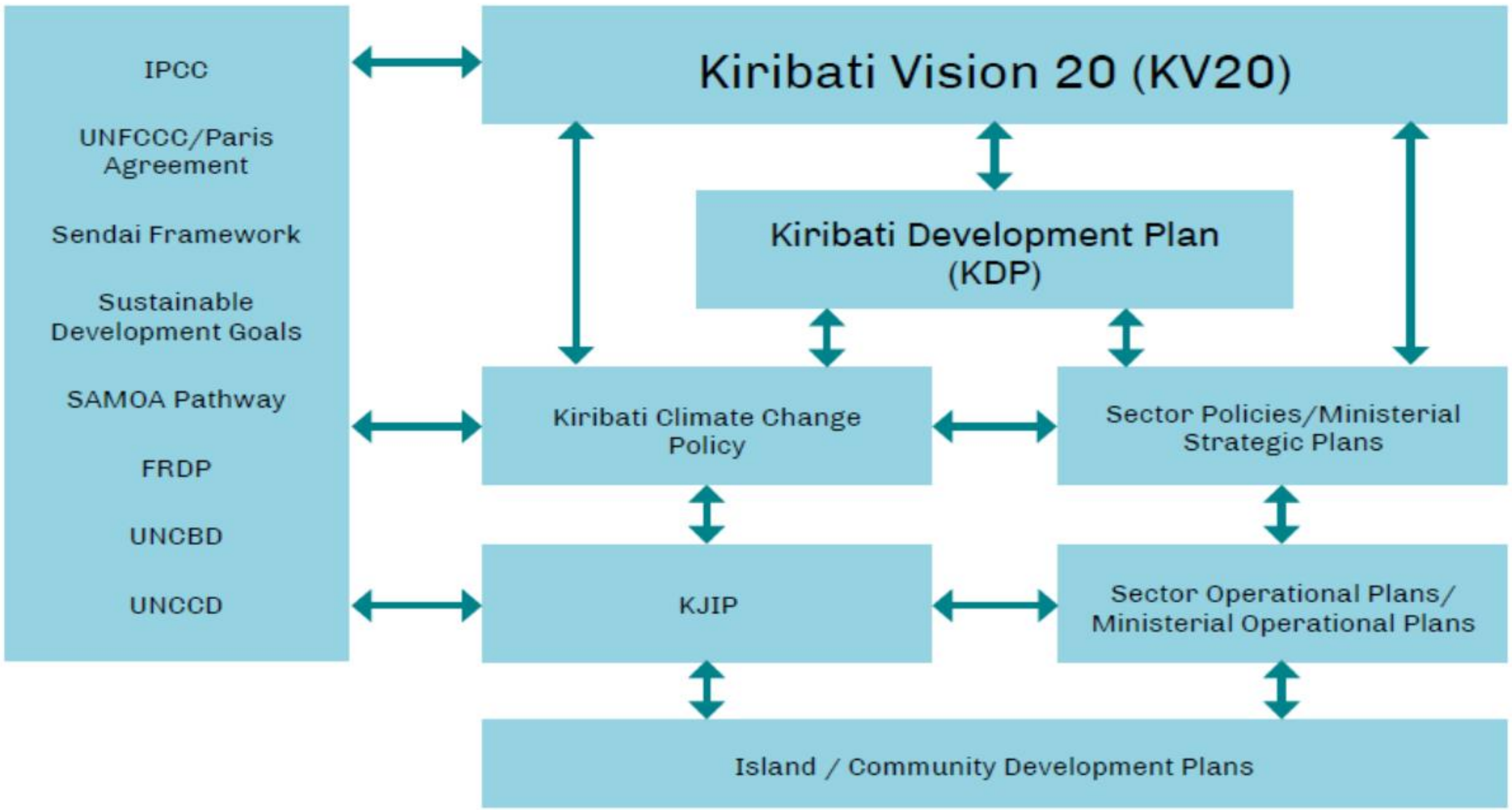
This thematic area focuses on measures that proactively, collectively, and in a culturally appropriate manner, address planetary crisis of climate change, current and future disaster impacts including extreme weather events, cyclones, drought, flooding and sea level rise and ocean acidification. It also addresses climate finance, disaster risk reduction mechanisms, loss and damage, the nexus between climate change and the ocean, maritime boundaries, human rights, the rights of women and girls, the rights of persons affected by climate change, food and water security, disasters as well as climate change and disaster related mobility including relocation, migration, and displacement.

SPREP PROE

FRDP Mechanism



FRDP At Country Level Kiribati



Framework for Resilient Development in the Pacific (FRDP) and Waste Management sector

- National resilience instruments
- Regional resilience instruments
- National linkages
- Regional and International linkages
- Existing Structure
- Technical Working Groups

Regional and International Linkages

Regional Policy Instruments:

- Framework for Pacific Oceanscape
- Framework for Nature Conservation and Protected Areas
- National Environment Management Strategy
- Clean Pacific 2025 (Waste & Pollution)
- Framework for Resilient Development (FRDP) in the Pacific
- 2050 Strategy
  - Climate Change & Disasters
  - Ocean and Environment

International Policy Instruments:

- UNFCCC
- UNCBD
- UNCCD
- Paris Agreement
- Sendai Framework
- S.A.M.O.A Pathway
- SDGs

Operationalisation: National Linkages

National Policy Instruments:
- ❖ Strategic Development Strategies
- ❖ Climate Change Plans
- ❖ Disaster Management Plans
- ❖ Environment Plans
- ❖ Energy Roadmaps
- ❖ Sector Plans

Community Development Plans
- ❖ Village Development Plans
- ❖ Island Development Plans
- ❖ Provincial Development Plans

Technical Working Groups:
Pacific Resilience Partnership

1. Risk Governance and Resilient Development
2. Disaster Risk Finance
3. Human Mobility (Migration, Displacement, and Relocation)
4. Localization
5. Information Knowledge Management
6. Water Security Advocacy
7. Pacific Based Carbon Mechanism
8. Resilient Infrastructure & Resilient Housing
9. **Women & Gender**
10. **Disaster Waste**

SPREP PROE

Operationalisation of FRDP 2017-2030

Waste Management:

Clean Pacific Indicators

Regional Waste Monitoring System

Clean Environment

Resilient Oceans

Healthy Communities

Circular Economy

CHANGES (Transactional/ Translational/ Transformational)

Sustainable livelihoods

Improved Community practices

Pacific Men, Women and Children

Institutional Criteria of Evaluation

Relevance
Effectiveness
Efficiency
Sustainability
Impact

What’s next?

- *Adopt SMART measures for waste management vis-à-vis disaster waste sector*
- *Strengthen regional waste monitoring and evaluation system*
- *Synergy between disaster waste management and disaster preparedness, response and recovery (FRDP Goal 3)*
- *Embed Circular Economy into Resilience*
- *Integrate cohesive action plans into Thematic Area 5 in 2050 Strategy for the Blue Pacific Continent*

Questions… Insights…

email:
rebeccap@sprep.org
strategicplanning@sprep.org

SPREP
PROE

“To build a resilient world, we must go circular”

World Economic Forum 2020

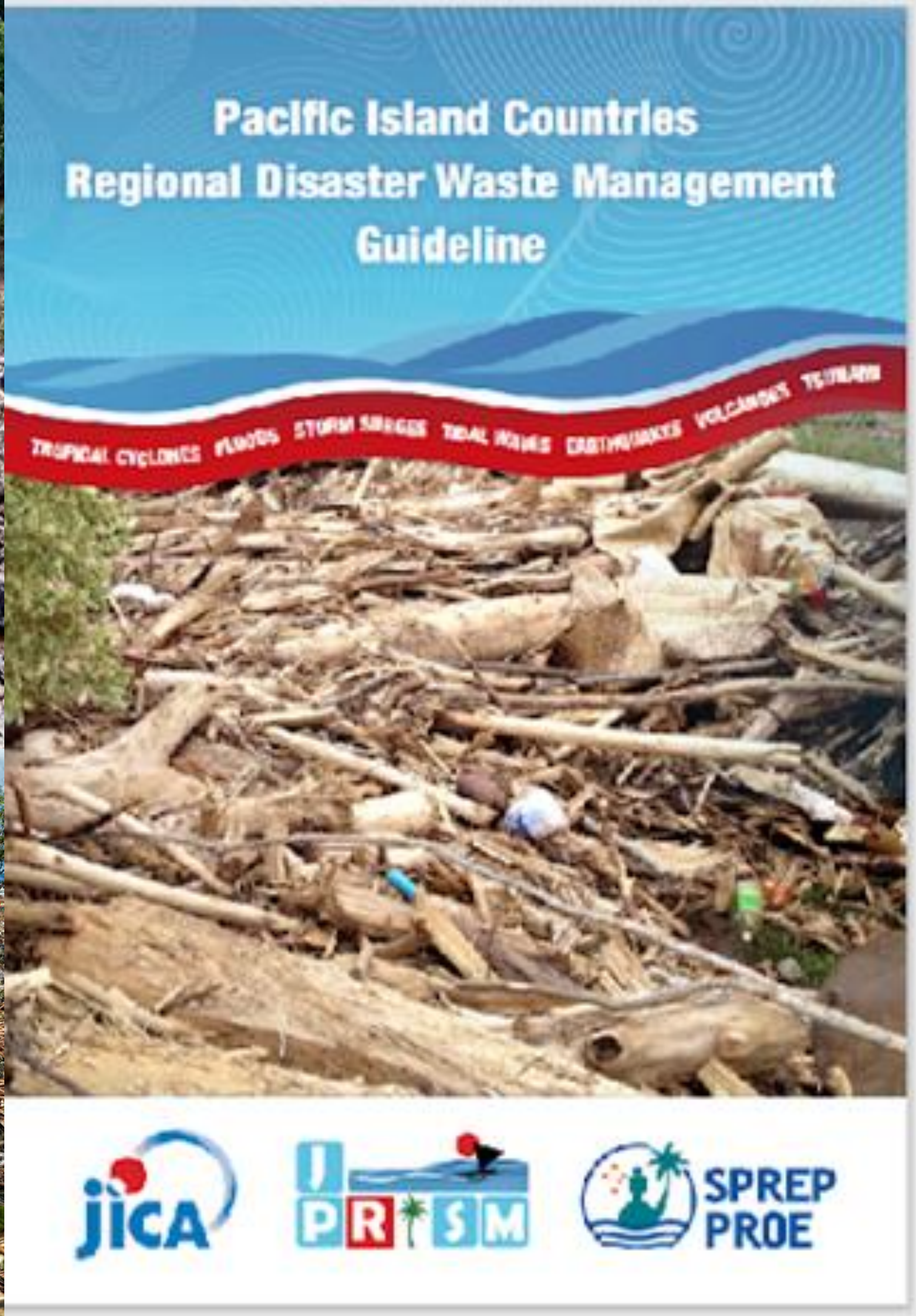
Thank you very much

Becky P

MAINSTREAMING WASTE MANAGEMENT INTO NATIONAL DISASTER MANAGEMENT OFFICE FRAMEWORK

Through the Regional Disaster Waste Management Guideline

PacPlan Resilience Project 2022-25



The Regional Disaster Waste Management Guideline

JICA J-PRISM SPREP PROE

1. PRESENTATION CONTENTS

1.1. Supporting 3Rs Principles & Approaches.

- Waste Management Hierarchy.
- Adopted Treatment and Management Flow.
- Win-Win Partnership.

1.2. Disaster Waste Management Cycle

- Two main disaster phases.
- The different stages under the two phases
- Key Activities under the different stages

1.3. Specific 3Rs Supporting Activities

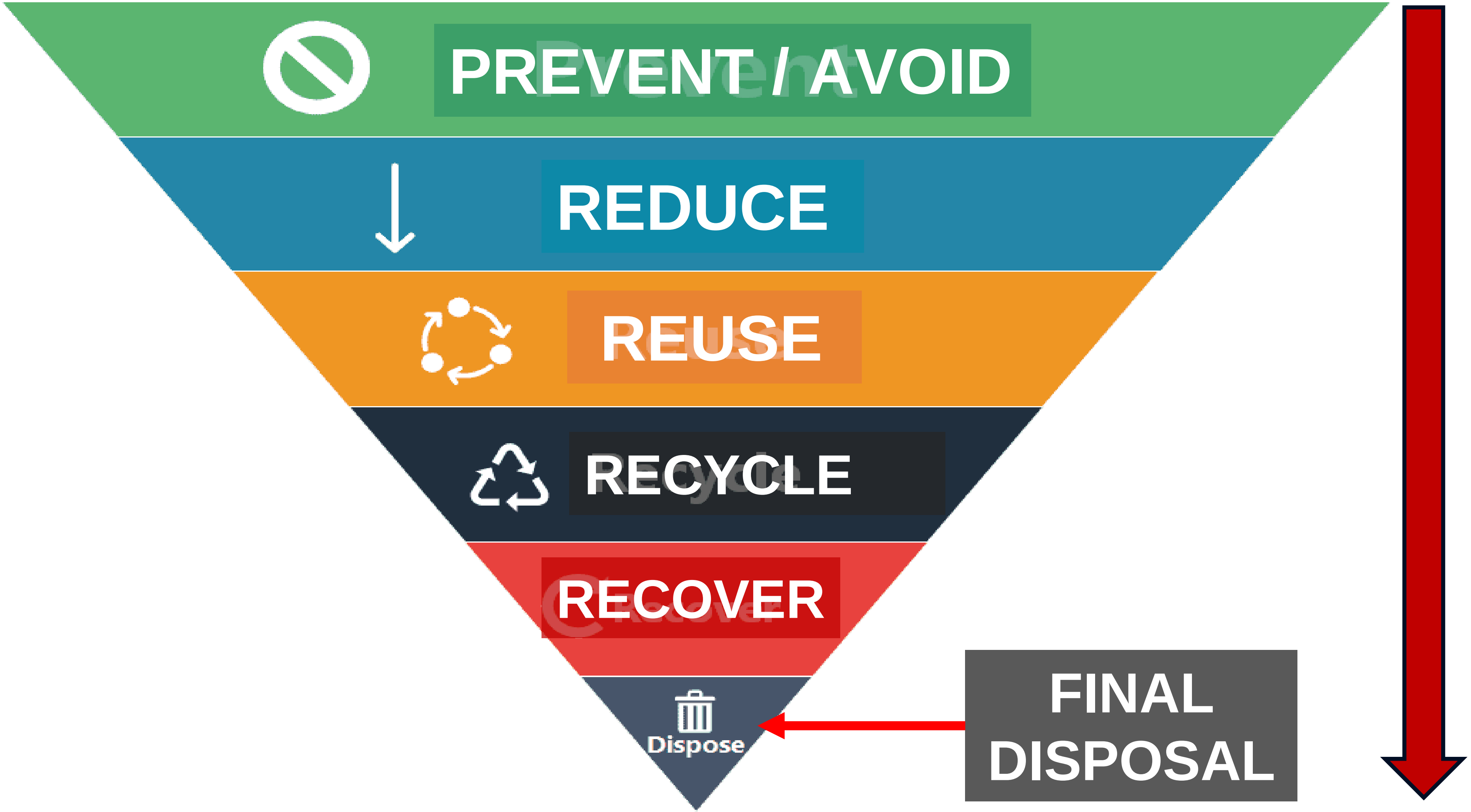
- Under the Preparedness phase
- Under the Response phase

1.4. Conclusion

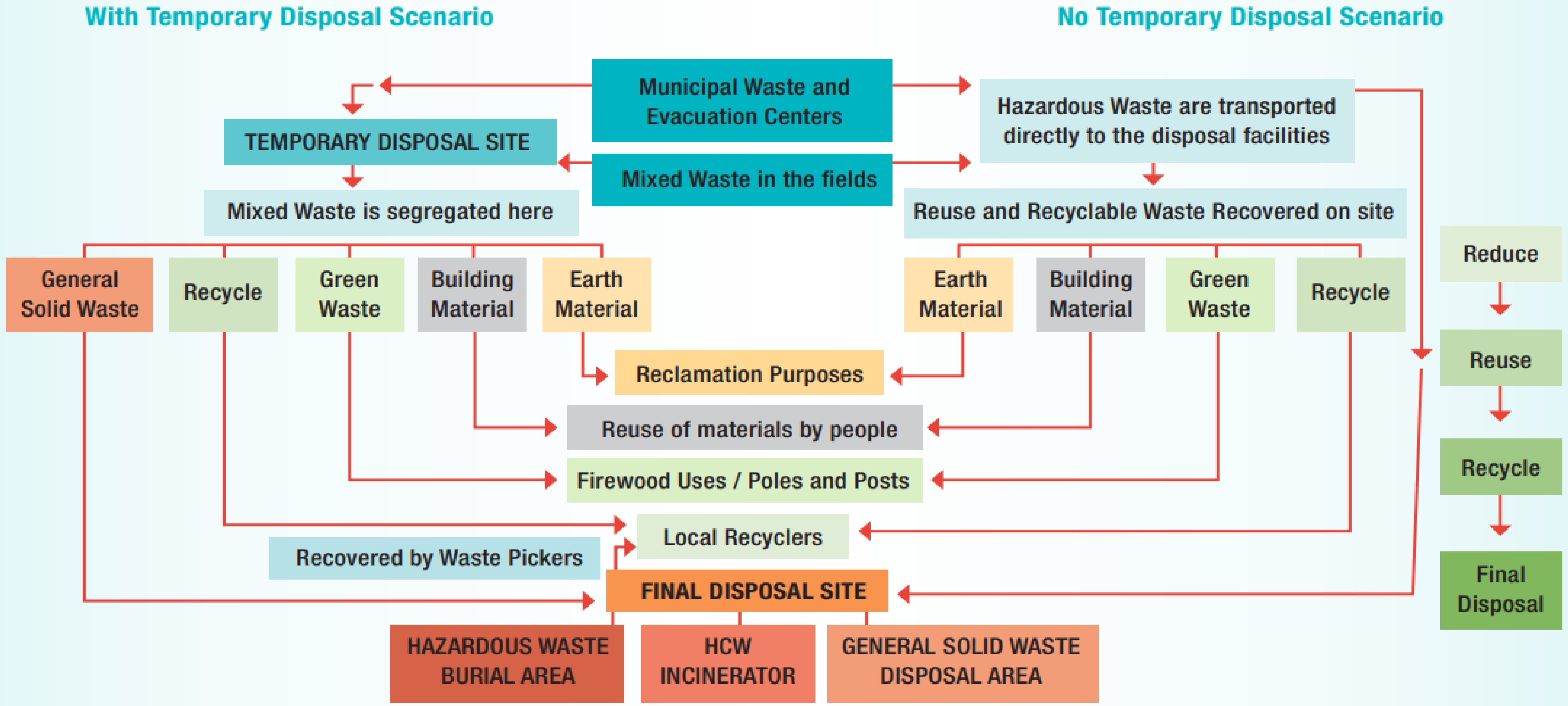
- Issues and Challenges
- Way Forward

1. SUPPORTING PRINCIPLES - APPROACHES TO 3Rs

1). Waste Management Hierarchy principle



2. Adopted DW Treatment / Management Flow



3. Win-Win Partnerships

Examples of Win-win Partnership

- ❑ **Local Recycling Operator – Waste Management Agency.**

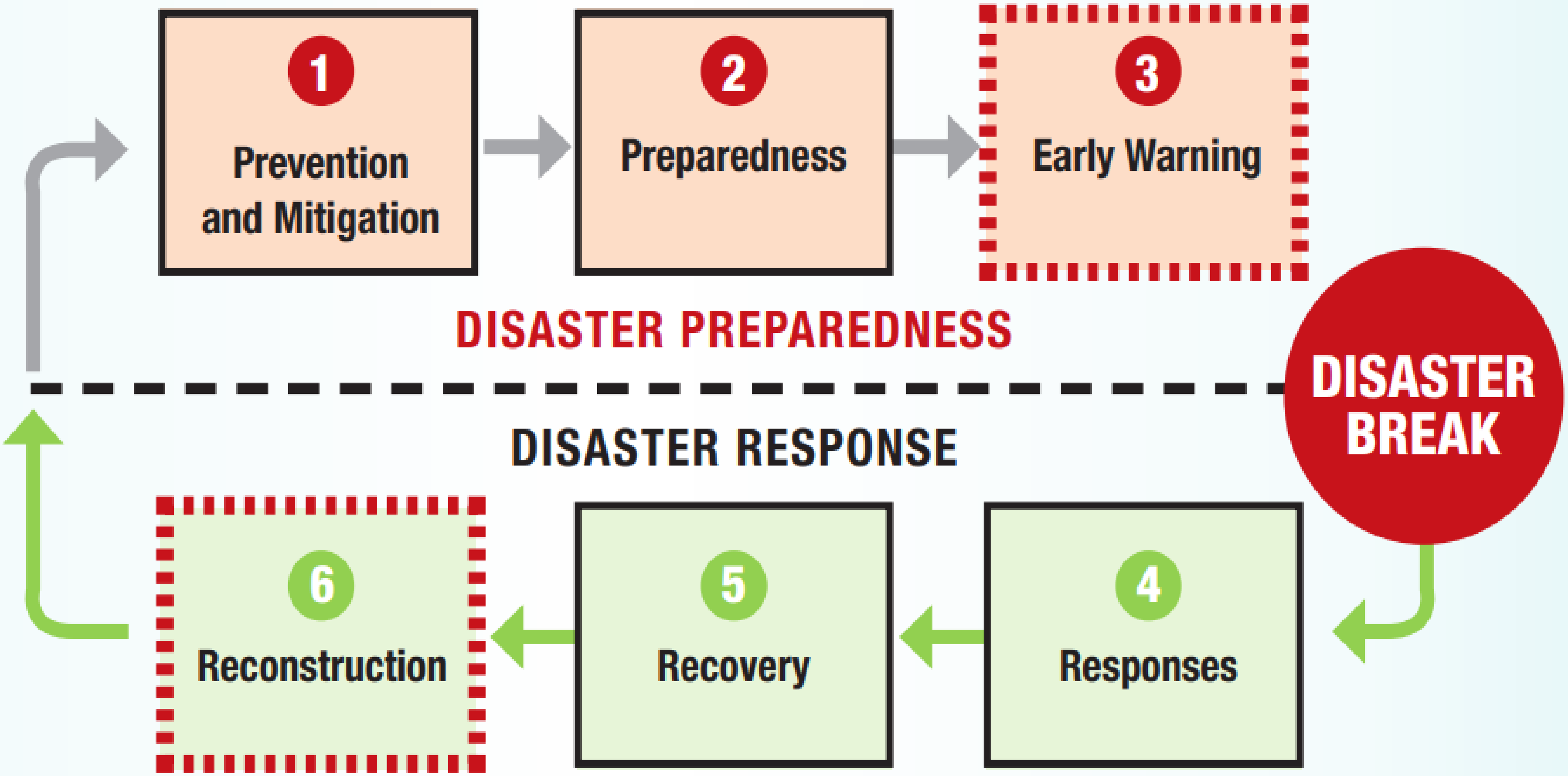
Local Recycling Operator:

- ✓ To collect and recover all recyclable materials from a designated area.
- ✓ To process and export what are collected from the site.
- ✓ He or she keeps the generating income or profit.

Waste Management Agency

- ✓ Reduced operational cost for collection and disposal.
- ✓ Quick recovery of recyclable materials
- ✓ Reduced incoming waste to the disposal site, saving space.

1.2. DISASTER WASTE MANAGEMENT CYCLE



	KEY PHASE	SPECIFIC STAGE
BEFORE DISASTER	PREPAREDNESS	1. Prevention & Mitigation 2. Preparedness 3. Early Warning
DISASTER STRIKES		
AFTER DISASTER	RESPONSE	4. Response 5. Recovery 6. Reconstruction.

3. DWM STAGES AND ACTIVITIES

3.1. Prevention & Mitigation

It mainstreams **Disaster Risks Reduction** (DRR) and the **Waste Management Hierarchy** into the management of DW.

The focus is on measures to:

- Avoid waste generation (prevention) .

-Reduce the impact of disaster (mitigate) to waste management facilities (collection, disposal and recycling operations).

Examples of Prevention Measures:

- **Prevent the influx of Unsolicited Bilateral Donations (UBDs) or Gifts in Kind (GIK).**

Some of these supplies eventually end up at the waste disposal sites. How could we prevent this from happening?

- ✓ Produce draft lists of supplies.
- ✓ Promote cash donations.
- ✓ Procurement of relief supplies locally.


WONG IMPORT EXPORT
WD
USAID
NOODLES
Vanuatu

Examples of Mitigation Measures:

- **Protection of Waste Disposal Sites from flooding.**

During disaster events like tropical cyclones and flooding, waste disposal facilities are affected, causing disruptions to waste management services. How could we control this?

- ✓ Build surrounding embankments to protect disposal sites
- ✓ Raise the site`s base above the flooding level.
- ✓ Relocate waste disposal facilities to higher lands.

Before Mitigation

After Mitigation

3.2. Preparedness

An important period for improving the readiness of PICs to respond after disaster events by building the capacity and capability of PICs

1. Establishment of a Waste Management Sector or Cluster.
2. Development of DWM Plans.
3. Conduct Training.
4. Develop partnerships with recyclers, contractors and the communities.
5. Develop MOUs, Agreements, Contracts, etc.

DWM Guideline / Plans, Educational Materials

3.3. Early Warning

A period within hours to days before a disaster occurs, which is crucial in implementing last minute preparation to improve readiness.

1. Improve access roads to the disposal sites if not done earlier.
2. Relocation of disposal area to another location within the site.
3. Making arrangement for backup equipment.
4. Confirming a temporary location for DW Storage.
5. Provide information to the public on potential disruption of waste management services and arrangements made.

.

Last minute Road Improvement Works

3.4. Response

Measures within 72 hours after a disaster event focussing:

- Mapping the generated waste for planning purposes.
- Containment of any identified hazardous waste.
- Management of potential risky waste. E.g. Carcasses.

  Supporting lifesaving operations.

1. Conduct a Rapid Assessment.
2. Containing any identified hazardous waste.
3. Remove fallen trees and waste from public areas.
4. Collect and dispose of any generated carcasses.

Rapid Assessment to map the generated waste and risks

Clearance of fallen trees **Locating any risk to the public**

3.5. Recovery

Waste management related measures after 72 hours to manage the generated disaster waste focussing on:

- More information and planning tasks.
- Restoring cleanliness and normalcy

1. Conduct detailed assessment – PDNA, etc.
2. Produce reports and needed information for funding support.
3. Management of the generated disaster waste

Collection of Reusable Waste, Samoa Tsunami 2009

Collection of Woods for Firewood

Recyclables Collection,
Vanuatu Cyclone PAM 2015

Collection of Recyclable Waste by Recyclers
Samoa Tsunami, 2009


UNIC

3.6. Reconstruction

Measures within a year or more as part of the Build Back Better approach to rebuild affected waste management facilities focusing on:

- Improve the resilience of affected facilities.

1. To Build Back Better damaged waste landfills.
2. To replace the damaged waste equipment with new and better brands with secured spare parts.

Bouffa Landfill after Cyclone PAM 2015

Photo 1: The main entrance to the area was full of waste

B

Reconstruction Works in 2017

Completion of Reconstruction Works

NAMARA DISPOSAL SITE, LABASA, FIJI – MARCH 2014

After Reconstruction Works – November 2014

Namara Landfill, Labasa, Fiji in 2014

1.3. Specific 3Rs Supporting Activities

a). Under the Preparedness phase

- **Establish policies** on **Unsolicited Bilateral Donations** or **Gifts In Kind**
- Establish partnership with **recyclers, chainsaw operators, environmental groups and the communities**.
- **Develop draft agreements or arrangements** based on a WIN-WIN scenario.
- **Conduct refreshened training** – chainsaw operators and recyclers on **Occupational and Health Safety**

b). Under the Response phase

- **Confirm and activate draft lists of Relief Supplies** to be requested from development partners.
- **Activate the supporting arrangements** from recyclers, chainsaw operators, environmental groups and the communities.
  - Allow approved chainsaw operators to enter affected areas to reduce fallen trees to manageable sizes.
  - Allow approved recyclers to enter affected areas to segregate potential items for collection.

- **Collection and transportation of:**
- ✓ Scrap metals for off island recycling.
- ✓ Tree stems and woods for local uses.
- ✓ Earth materials for waste landfill management purposes.

N.B. The recovery of the above items depends on the type of disaster. E.g. Difficult to recovery scrap metals if heavily contaminated with soil from flooding events.

4.0. CONCLUSION

4.1. Key Issues and Challenges

a). Governance – waste is yet to be officially recognized under the National Disaster Management Plan of PICs.

b). Technical and Financial Capacity

Most PICs still have **limited waste management facilities and resources** – land, equipment, fund, etc.

4.2. Way Forward

1). Mainstreaming the guideline into PICs` National Disaster Plans. Some good progresses have been made:

- Inclusion of DW under the WASH / Environment Cluster or Sector

  Samoa, Tonga and Vanuatu

- Draft DWM Plans

  (Samoa, Tonga, Vanuatu and Solomon Islands)

2). Improvement of Existing Waste Management Facilities and Supporting Systems

- Waste Collection and Disposal Services
-
- Recycling Facilities

- Financing Mechanisms (CDL, ARF, etc.)

THANK YOU

EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

This initiative is supported by **PacWastePlus**-a 72 month project funded by the European Union (**EU**) and implemented by the Secretariat of the Pacific Regional Environment Programme (**SPREP**) **to sustainably and cost effectively improve regional management of waste and pollution.**

30 SPREP PROE
Sustainable, transformative, and resilient for a Blue Pacific

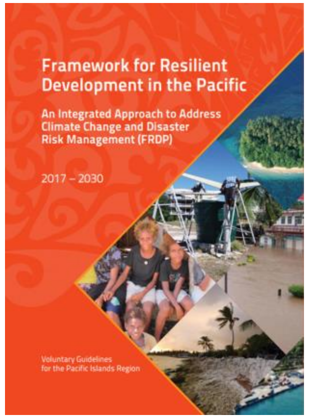
Improved Disaster Waste Management for a Resilient Pacific

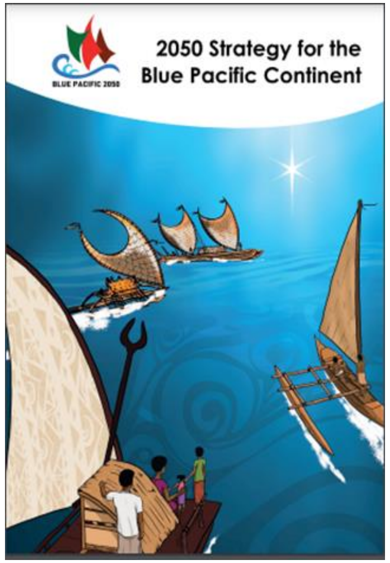
Presented by Ms Sainimili Bulai
PacWaste Plus Technical Officer-Solid Waste
Waste Management & Pollution Control
Secretariat of the Pacific Regional Environment Programme (SPREP)

3 October 2024
Circular Economy
VANUATU

Identify a Key Learning from Yesterday

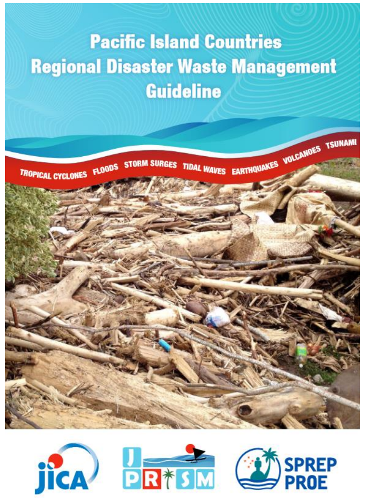
RECAP OF SESSION 5a





Framework for Resilient Development Framework:
Endorsed by the leaders
Govern the reporting and monitoring of Disater Risk
Goal 3 - Build the capacity of PICs to Prepare, Response and Recover from Disaster.

Blue Pacific 2050 Strategy – measures on Disaster Impact & Reducing Disaster Risk and Identify Disaster Financing.



Regional Disaster Waste Guideline - intends to guide our island countries in implementing the appropriate pre-disaster preparations and timely post-disaster responses. These measures quickly restore our affected islands and communities, making them more resilient. Disaster Waste Management Guideline mainstreams 3R plus Return concept into the management of Disaster Waste Management.

Harmonization of Waste Management and Disaster Risk Management At the Regional Level

Identify	Activities to be carried out before and after a disaster to ensure that waste generated following these events are effectively managed.
Prioritise	Management of hazardous and difficult waste.
Identify	The disposal process for different types of waste generated following a disaster.
Identify	Roles of different community members in the assessment, collection, storage and safe disposal of disaster waste.

Resilience

‘**The ability** of a system, community or society exposed to hazards, and/or climate change, **to resist, absorb, accommodate and recover from the consequences of a hazard** event or of climate change in a timely and efficient manner. This includes through the preservation and restoration of its essential basic structures and functions.’

[Source: UNISDR 2009]

Understanding Disaster Risk

DRR meaning managing risk with different tools – hard intervention which include protecting infrastructures and Soft intervention which include training and education and enhancing capacity of community.

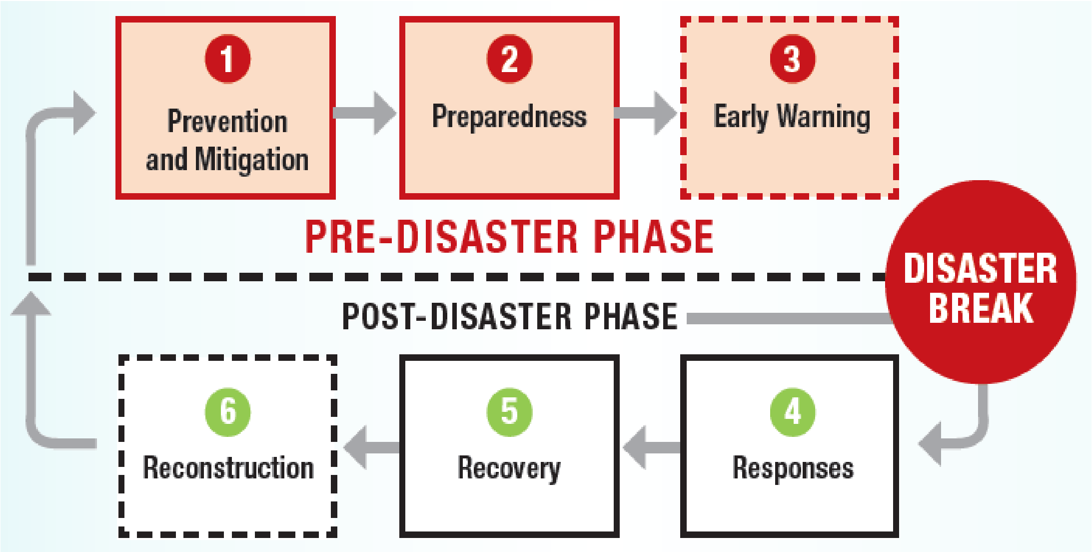
- Disaster Risk Management is 2 parts:
  - investing into ways of reducing or mitigating the effect of hazards.
  - responding to a natural disaster

Regional Mechanism for Coordinating Disaster Waste

- ✓ Establishment of the Disaster Waste Management Taskforce
- ✓ Inclusion of Waste Indicators to FRDP Monitoring Systems
- ✓ Introduction of Waste Management Indicators under GOAL 3 of the FRDP

Regional Disaster Waste Management Guideline

- ✓ Understanding the basic management cycle of Disaster is important
- ✓ Understanding and cooperation with not only WM but disaster prevention and emergency response too are essential
- ✓ Establishing Partnership
- ✓ Reducing/ Minimising Risk from Disaster Waste
- ✓ Disaster Waste Management Plans to be inclusive to include outer Islands
- ✓ The Importance of Data to inform national decision making in the building back process.



❖ It is important for each country and donor to recognize in advance that it will take time to finalize disaster waste management plan under the national disaster management laws and to legislate and systematize it

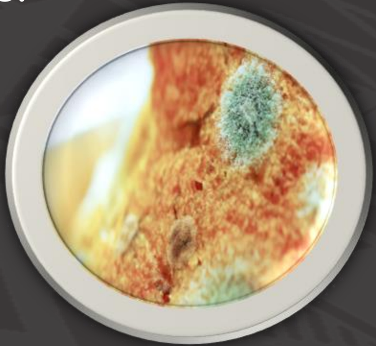
The effect of disaster waste when not managed effectively

Burning of Waste produces chemicals that harm human health

Metal and sharp objects can cause injuries to people especially children when not identified and managed quickly

Piles of waste on the roads when not quickly removed can delay emergency lifesaving operations.

Carcasses if not identified and managed earlier can potentially result in vector borne disease



Contaminated food when not removed may be consumed and affect community health

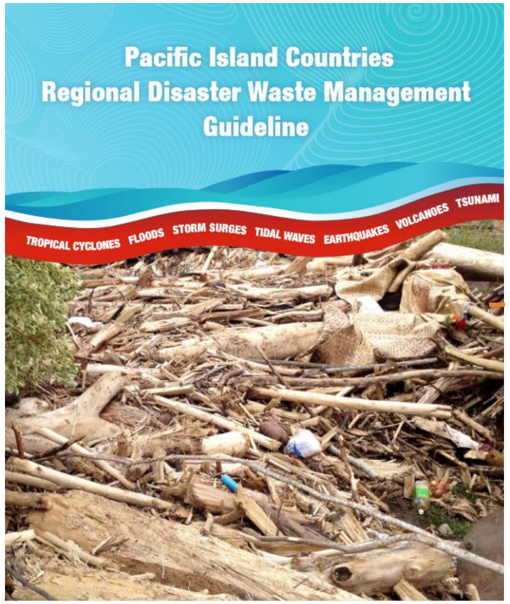
Overview of Session 5b

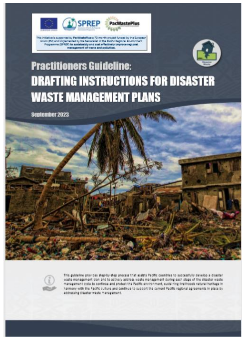
Case Studies on National Initiatives to Improve Disaster Waste Management:

1. Fiji
2. Tonga
3. Vanuatu

Overview of Session 5b

Highlight Practitioners Guideline to assist Pacific Island Countries implement the Regional Guideline at the National Level





Drafting Guideline for Disaster Waste Management Plans

Mainstreaming Principle and Activities of the Regional Disaster Waste Management into National Disaster Management Plans

- ✓ Identify Waste Management Activities to be undertaken in each stage of the DWM cycle
- ✓ Identify Recyclers/ private sectors to receive wastes
- ✓ Determine Responsibilities of local agency.

"BY FAILING TO PREPARE, YOU ARE PREPARING TO FAIL"
Benjamin Franklin

EUROPEAN UNION SPREP Secretariat of the Pacific Regional Environment Programme PacWastePlus PACIFIC WASTE MANAGEMENT

Practitioners Guideline on Disaster Waste Management

Case Study: Fiji

EUROPEAN UNION SPREP Secretariat of the Pacific Regional Environment Programme PacWastePlus PACIFIC WASTE MANAGEMENT

Drafting Guideline on Establishing Environment Sector Working Group

Lead the Implementation of the National Disaster Waste Management Plan:

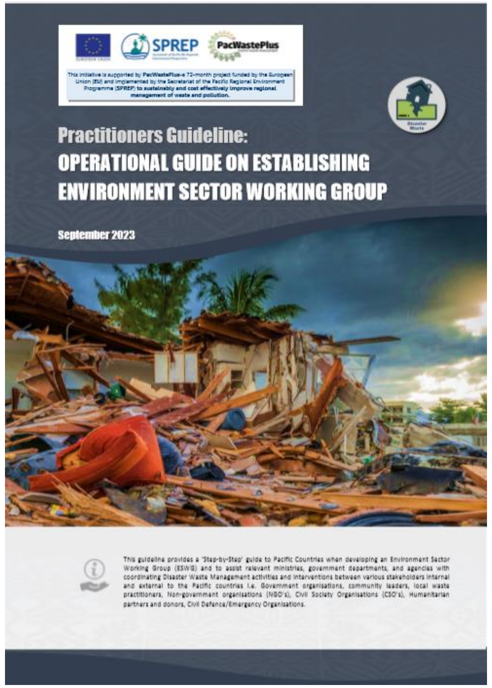
- ✓ Facilitate training on the DWMP
- ✓ Establish MOU/contract with private sectors
- ✓ Oversee the implementation of recommendations from previous disasters
- ✓ Lead Disaster Response Work

EUROPEAN UNION

SPREP Secretariat of the Pacific Regional Environment Programme

PacWastePlus PACIFIC WASTE MANAGEMENT

Operational Guide on the Establishment of an Environment Sector Working Group (ESWG)



EUROPEAN UNION

Case Study 2
Vanuatu

Standard Estimation Methodology for Calculating Volume of Disaster Waste

Determine:

1. the valuation of natural environment damages and biodiversity losses,
2. the volume and type of waste generated;
3. the funding needed to safely dispose all waste.
4. Funding needed to build back waste infrastructure.

✓ Identify the Risk Associated with the type of Disaster Waste Generated.

EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

Standard Estimation Methodology for Calculating Volume of Disaster Waste

Conclusion

- Natural Disaster can not be avoided but the impacts can be minimised through proper planning.
- Limited waste management infrastructure elevates our island nations vulnerability.

THANK YOU FOR YOUR PARTICIPATION AND HAPPY TO ANSWER ANY QUESTIONS

Visit our website to learn more

www.pacwasteplus.org

Overview of Disaster Waste Management in Fiji

Circular Approach to Waste Management in the Pacific

September 30th 2024 - October 04th 2024

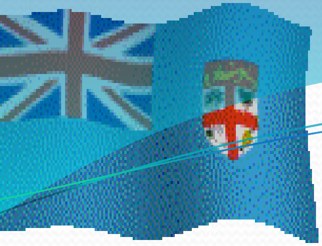
MINISTRY OF ENVIRONMENT AND CLIMATE CHANGE

DEPARTMENT OF ENVIRONMENT

OBJECTIVE

- Present Overview of Disaster Waste Management in Fiji

- Present the Scope and Output of the Regional Disaster Waste project currently implemented in Fiji in partnership with PacWaste Plus



BACKGROUND

Fiji consists of an archipelago of more than 330 islands—of which about 110 are permanently inhabited—and more than 500 islets, amounting to a total land area of about 18,300 square kilometres (7,100 sq mi).

Waste Collection is limited to municipal council boundaries initially but through the amendment of the Public Health Act in 2018 – waste collection has expanded to rural areas.

User pay system has introduced into sub-urban areas by the government.

14 Provinces that looks after the needs of traditional villages

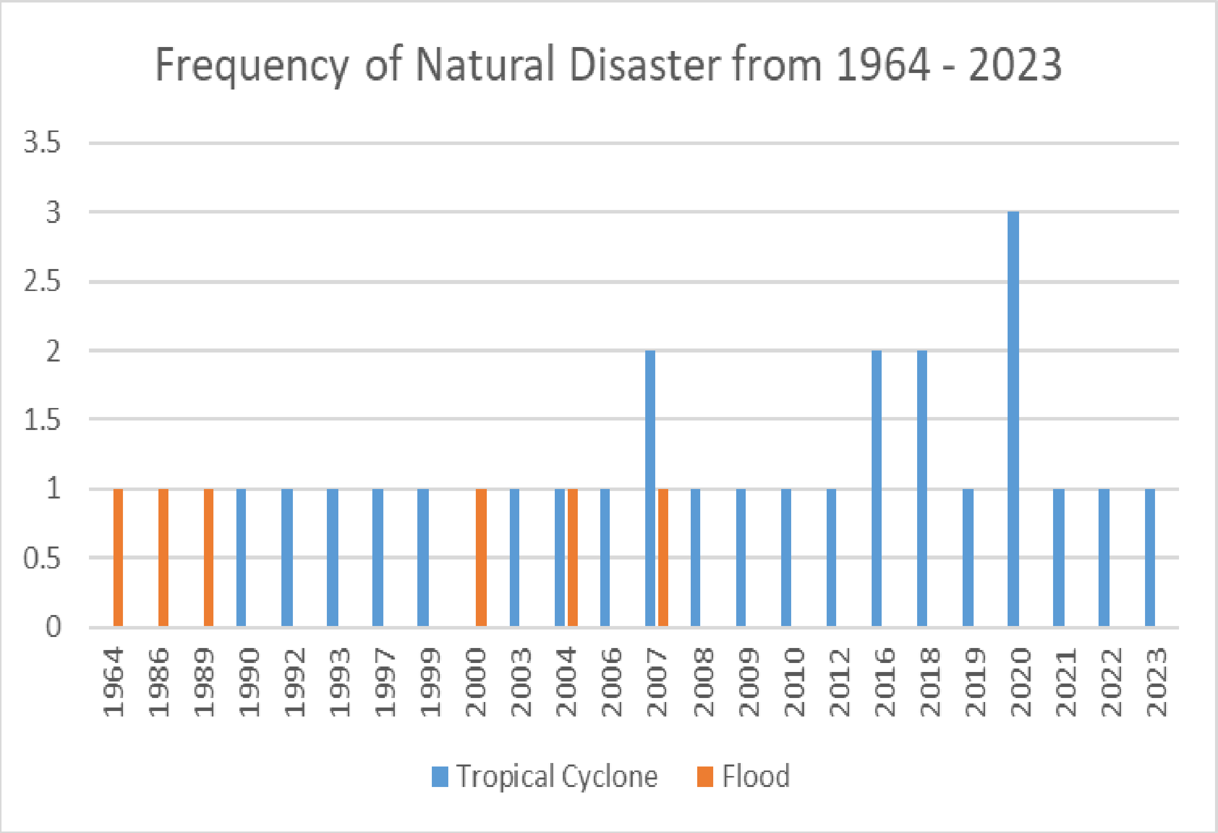
13 Municipal Councils that looks after towns and cities and is responsible for waste management

17 Districts with district officers that look after rural settings and maritime zones

There are 8 dumpsites owned and operated by Municipal Councils and 1 Sanitary Landfill owned by Government

OVERVIEW OF NATURAL DISASTER IN FIJI

Fiji is one of the most Vulnerable Countries in the World to Natural Disasters (Following Vanuatu and Tonga



DEPARTMENT OF ENVIRONMENT

- *Environment Management Act 2005*
  - *An Act for the protection of the natural resources and for the control and management of developments, waste management and pollution control and for the establishment of a national environment council and for related matters*
- *Mission*
  - *To promote the sustainable use and development of Fiji's environment and efficient implementation of policies, legislation and programs.*

NATIONAL DISASTER MANAGEMENT OFFICE

- Activated when there is an Emergency – once a State of Emergency is declared, NDMO powers supersedes any other agency
- Coordinate Disaster Response and Recovery
- Currently have no policy and plan- response is coordinated by Municipal council within Municipal Councils, Provincial Office and District Offices and this include:
  - Power Line Restoration
  - Water Restoration
  - Road Clearance
  - Drainage

DISASTER WASTE

- Refers to all types of solid waste that is usually generated as a result of a natural calamity in this case cyclone and floodings.
- These disaster waste generates high quantities of waste during a short span of time. (20% of annual waste being disposed at the landfill/dumpsite.
- Immediate attention is **prioritize** to other humanitarian assistance such as shelter, food, safe water supply, drainage and infrastructure restorations/facility repairs

AREA OF PRIORITIES

TYPES OF DISASTER WASTE

- Disaster wastes in the case of Fiji usually include **bulky wastes from buildings** (concrete rubble, corrugated iron, timber, steel, furniture), **house hold furniture and belongings damaged during disaster, power and telephone grids** (poles, cables, transformers, wires, electronic equipment), **water and sewerage distribution systems** (broken pipes and lids), chemical wastes (workshops and industries), **relief operations from evacuation centers and hospitals** (food, packaging, healthcare wastes, normal garbage generated by evacuees) and **natural debris** (trees, branches, bushes, palm fronds, mud and silt).

CURRENT PRACTICE

Municipal Councils have shredder for managing Organic Waste

Disaster Waste Management is Carried out by several Agencies depending on Location (Municipal Council within Municipal Boundaries/ Provincial Council and District Offices for Rural Areas including Maritime Zone)

Municipal Council Disaster Waste Contingency Plan

CHALLENGES FOR MANAGING DISASTER WASTE

No Allocated Budget for Managing Disaster Waste

No proper Disposal of Disposal Waste in areas outside Municipal Councils

No Standard for Management of Disaster Waste

SCOPE OF THE DISASTER WASTE MANAGEMENT

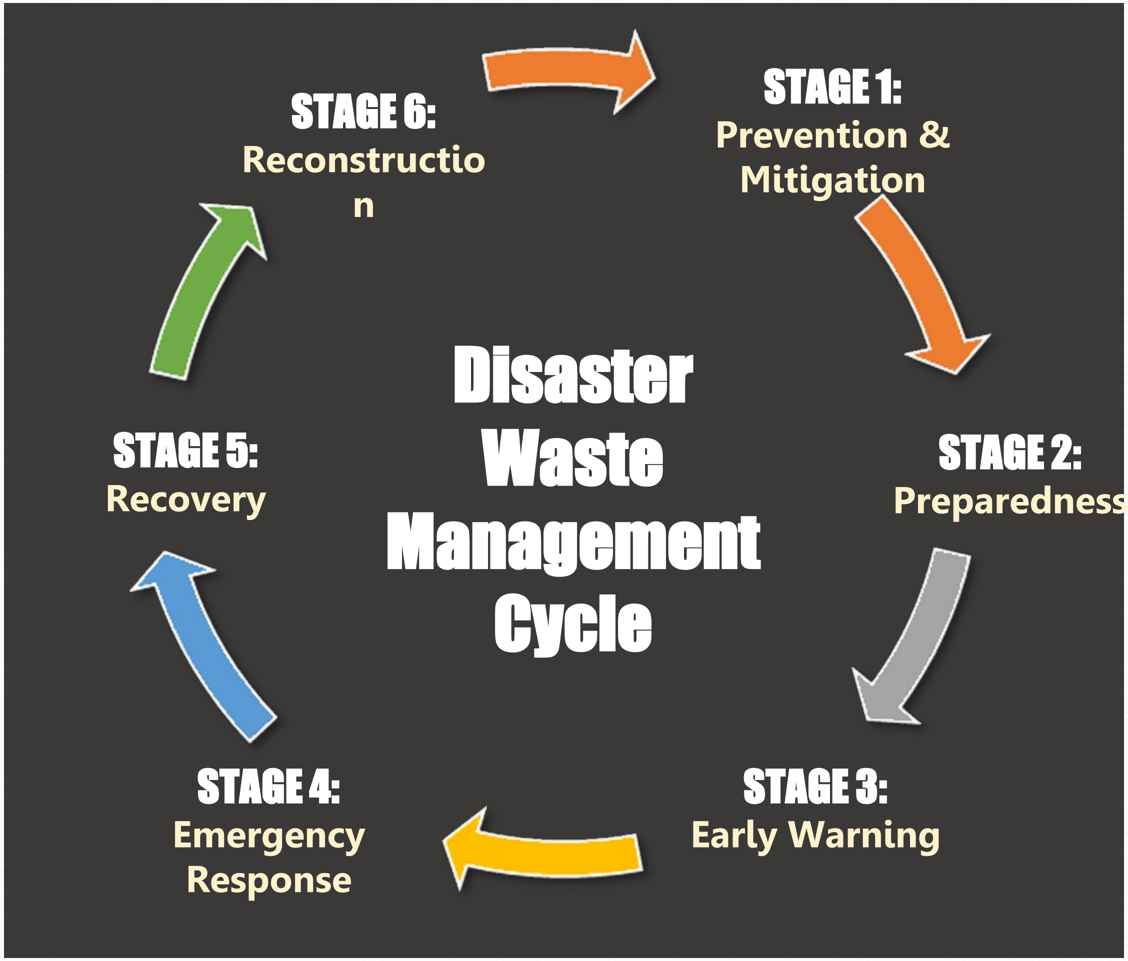
Establishment of National Disaster Waste Management Plan

Establishment of Environment Sector Working Group that will oversee the implementation of National Disaster Waste Management Plan

Establishment of National Standards for Disaster Waste Recording and Reporting

NATIONAL DISASTER WASTE MANAGEMENT

- Establish Key Activities to be carried out in each of the Disaster Management Cycle



NATIONAL DISASTER WASTE SECTOR WORKING GROUP

- Oversee the Implementation of the National Disaster Waste Management Plan
- Facilitate Training for Local Agencies
- Provide Recommendation and submission for Building Programme on Waste Management

NATIONAL STANDARD FOR RECORDING AND REPORTING DISASTER WASTE

Identify the volume and type of waste generated; and determine human recovery needs, based on information obtained from the affected population.

Identify long term risk of waste.

Vinaka Vakalevu
&
Tankiu Tumas for Listening

CLEAN PACIFIC ROUNDTABLE
FUNAFUTI, TUVALU
3rd August 2024

PLENARY SESSION ON DISASTER WASTE

4TH PACIFIC ROUNDTABLE

Country Experience

Case Study: Vanuatu

ENVIRONMENT STRUCTURE: DISASTER WASTE MANAGEMENT RESPONSE IN VANUATU

CLEAN PACIFIC ROUNDTABLE
FUNAFUTI, TUVALU
3rd August 2024

CLUSTER LEAD: DIRECTOR DEPARTMENT OF ENVIRONMENTAL PROTECTION & CONSERVATION

LOGISTICAL OPERATIONS: DEPC HEAD OF ENVIRONMENTAL PROTECTION DIVISION

NDMO OPERATIONS MANAGER

SHEFA NDMO OFFICER

- DEPC : ENVIRONMENTAL PROTECTION DIVISION
- PORT VILA CITY COUNCIL
- SHEFA PROVINCE

WASTE SECTOR PARTNERS: JICA, SPREP, WAN SMOL BAG, WORLD VISION & OTHERS

SANMA NDMO OFFICER

- SANMA ENVIRONMENT EXTENSION OFFICER
-LUGANVILLE MUNICIPAL WASTE MANAGEMENT OFFICER
- SANMA PROVINCE PLANNER

WASTE SECTOR PARTNERS: JICA, SPREP, WAN SMOL BAG, WORLD VISION & OTHERS

TAFEA NDMO OFFICER

- TAFEA ENVIRONMENT EXTENSION OFFICER
-LENAKEL MUNICIPAL WASTE MANAGEMENT OFFICER
- TAFEA PROVINCE PLANNER

WASTE SECTOR PARTNERS: JICA, SPREP, WAN SMOL BAG, WORLD VISION & OTHERS

MALAMPA NDMO OFFICER

- MALAMPA ENVIRONMENT EXTENSION OFFICER
-- MALAMPA PROVINCE PLANNER

WASTE SECTOR PARTNERS: JICA, SPREP, WAN SMOL BAG, WORLD VISION & OTHERS

PENAMA NDMO OFFICER

- PENAMA ENVIRONMENT EXTENSION OFFICER
- PENAMA PROVINCE PLANNER

WASTE SECTOR PARTNERS: JICA, SPREP, WAN SMOL BAG, WORLD VISION & OTHERS

TORBA NDMO OFFICER

- TORBA ENVIRONMENT EXTENSION OFFICER
- TORBA PROVINCE PLANNER

WASTE SECTOR PARTNERS: JICA, SPREP, WAN SMOL BAG, WORLD VISION & OTHERS

VANUATU NATIONAL INITIATIVES

Policy Development: 1st Disaster Waste Management Training in November 2019 to pilot the Regional Disaster Waste Management tool kit with funding from Canadian Government , SPREP, JICA J-PRISM II Project, and the University of Newcastle.

Workshop training on the development of Vanuatu's National Disaster Waste Management Contingency Plan with support from SPREP and J-PRISM II Team Experts

Disaster Waste Contingency Plan finalised

TC HAROLD RAPID DISASTER WASTE ASSESSMENTS

- Clean Up on Sanma Province and Penama Province:

1) Santo Island – Luganville, Show Ground, Banban, Butmas, Fanafo, South Santo
2) Malo Island – West Malo
3) Aore Island (Visual on the way to Malo Island)
4) Pentecost Island – South Pentecost and Central Pentecost 2

- Development of Community Disaster Waste Management Plan

EMERGENCY RESPONSE CHALLENGES

- **FUNDING:** Access to the Main Disaster Funding from the Disaster Management Office was an issue – other internal funding were diverted to fund the disaster waste assessment activities.
- **DELAY IN RESPONSE:** Disaster Waste Assessment Team comprising DEPC & Port Vila City Council undertook assessments at least three weeks after TC Harold came through Vanuatu.
- **LACK OF APPROPRIATE EQUIPMENTS/RESOURCES:**

1. Rapid Assessment was conducted on phone
2. No People Protective Equipment, Wood Chippers, Chain Saws, Minor Oil Spill Tool Kits
3. No Temporary Dumpsite secured in Luganville

- **COLLABORATION BETWEEN RELEVANT STAKEHOLDERS: Needs tobe strengthened**
- **ASSESSMENT FORMS:**

1. Technical Issues – Revision of Forms without knowledge of assessment teams
2. Technical Capacity/Guidance to undertake assessment and lack of baseline data to refer to

- **DATA ANALYSIS:** Delay in submission of assessment forms

THANK YOU

Tonga's Journey through Disaster Waste

What we've learned

Abstract

Join us at the Circular Economy Regional Workshop to explore Tonga's country experiece with disaster waste, and how having timely data impacts informed decisions.

WHO WE ARE

WASTE AUTHORITY LIMITED

Public Enterprise

Established in 2006 under the Waste Management Act 2005, Waste Authority Limited is the only entity within Tonga that is mandated to manage and dispose of all waste throughout the Kingdom.

Our Vision

A Clean, Green, and Healthy Tonga

So...What Happened in Tonga?

Background information

A volcano-tsunami disaster event that affected Tonga, causing tremendous damage to Tonga`s natural and build environment. It generated an overwhelming amount of disaster waste.

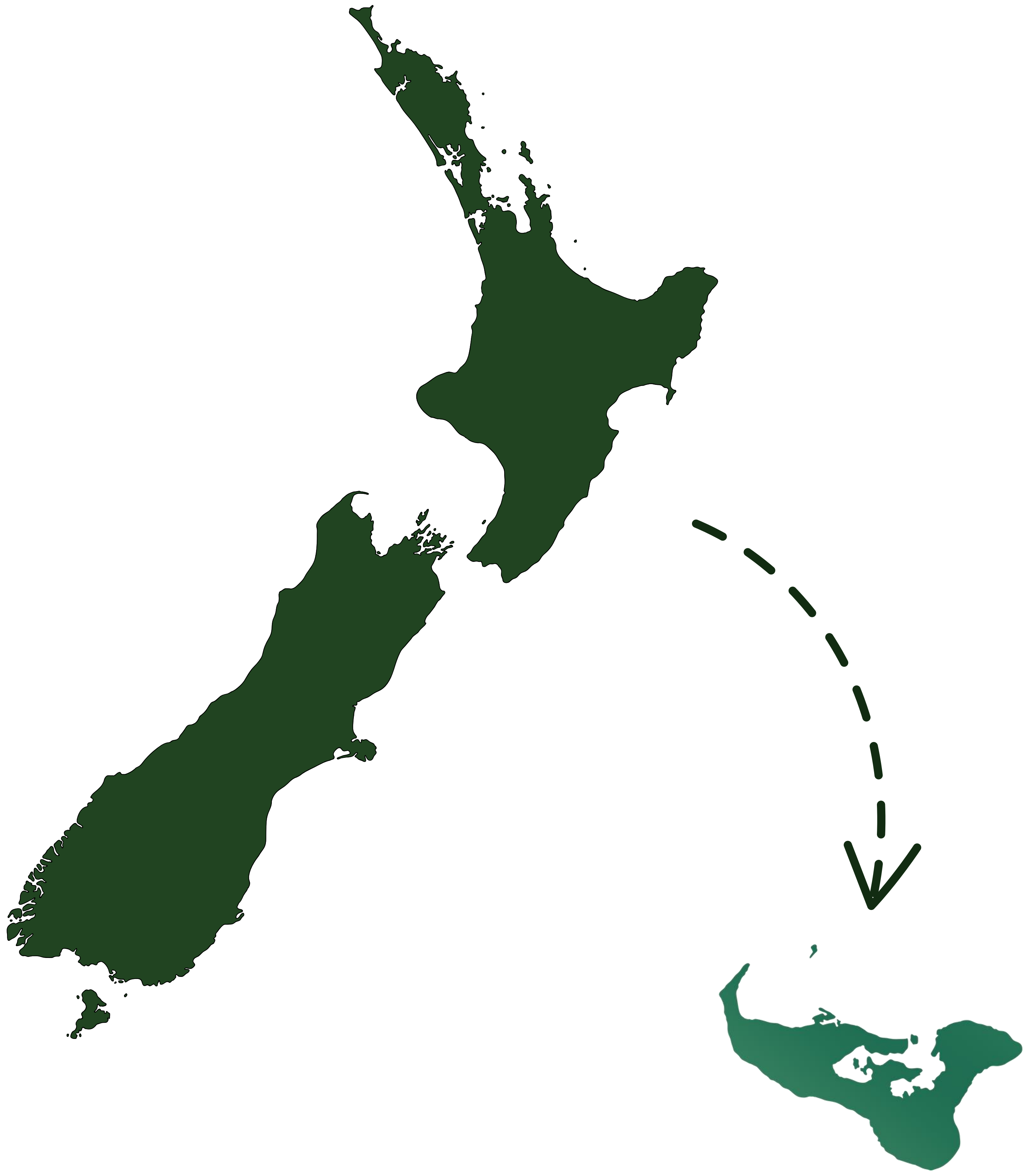
Date of incident
15 January 2022

The **weight** of a disaster

84% Affected

$208 Million in Damages

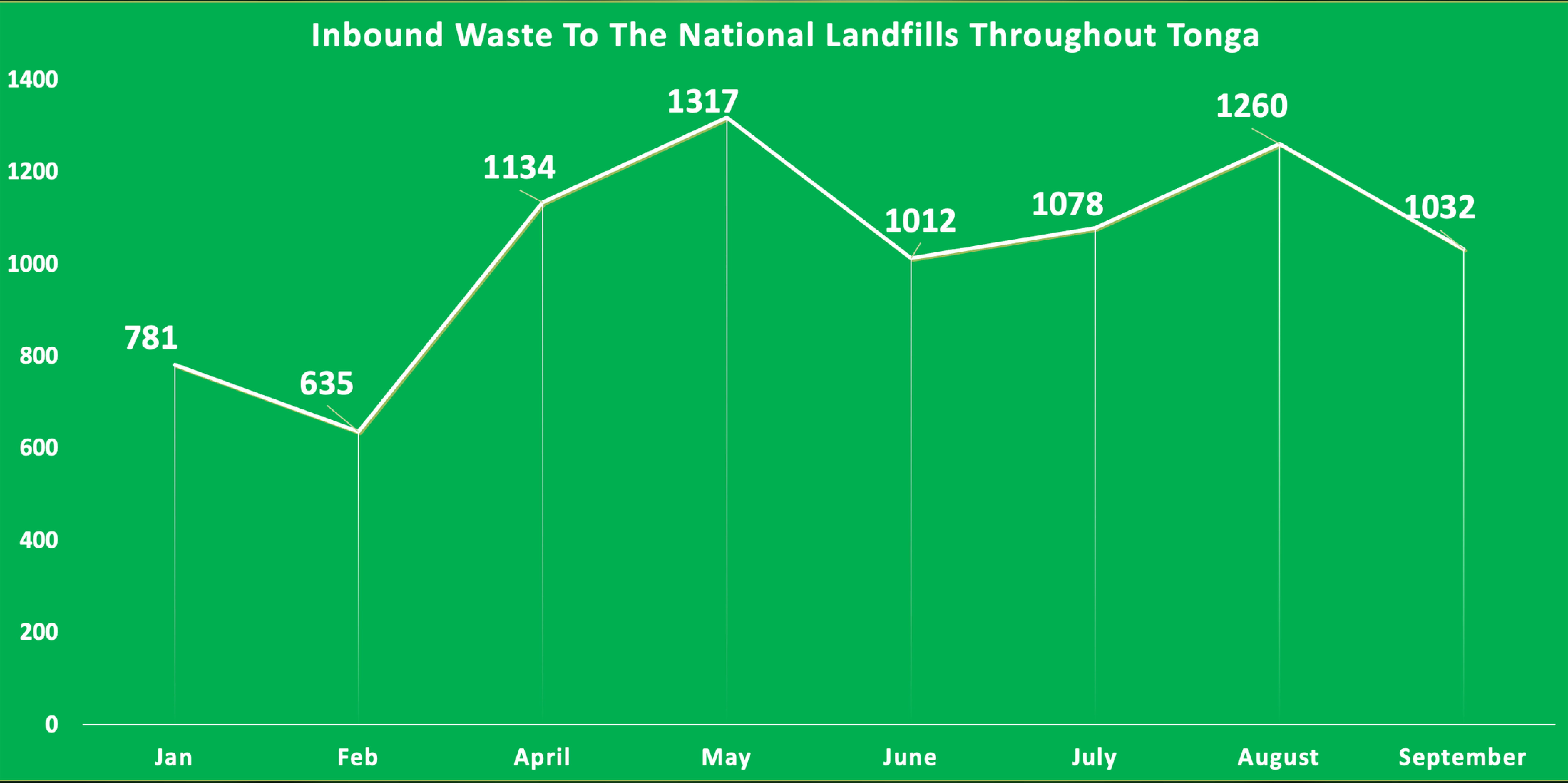
Equivalent to 18.5% of Tonga's Gross Domestic Product



UNSOLICITED

BILATERAL DONATIONS (UBD)

UBD to Tonga post-disaster provided relief but also added hidden waste, burdening local waste management systems


Inbound Waste To The National Landfills Throughout Tonga
1400
1200
1000
800
600
400
200
0
781
635
1134
1317
1012
1078
1260
1032
Jan
Feb
April
May
June
July
August
September

Waste **Data:** Our key to rebuilding **Resilience**

1..2..3..

What did we learn when we started

Counting?

Table

Reports

Gallery

Downloads

Map

hide fields

1 - 30 1068 results	Date	Time	Waste Category	Photo of truck with...	Classification of Waste	Place of origin - Waste is from	Volume o Solid Waste / m3
	Search	Search	Show All		Show All	Search	Show All
	2024-09-24	12:18:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Fasi	8m3
	2024-09-27	08:05:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Toloa	8m3
	2024-09-27	17:33:00.000+13:00	Solid Waste		Bulky Waste Collec...	Kolomotu'a	8m3
	2024-09-04	13:32:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Uafu	8m3
	2024-09-09	10:36:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Fasi	8m3
	2024-09-18	13:24:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Touliki	8m3
	2024-09-12	10:53:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Fasi	8m3
	2024-09-27	11:35:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Fasi	8m3
	2024-09-04	13:03:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Fasi	8m3
	2024-09-24	10:25:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Fasi	8m3
	2024-09-26	11:44:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Touliki	8m3
	2024-09-20	09:56:00.000+13:00	Solid Waste		Mix Waste (Veve M...	Fasi	8m3

PREV Page 1 of 36 30 rows NEXT

SUMMARY FORM **DATA** SETTINGS

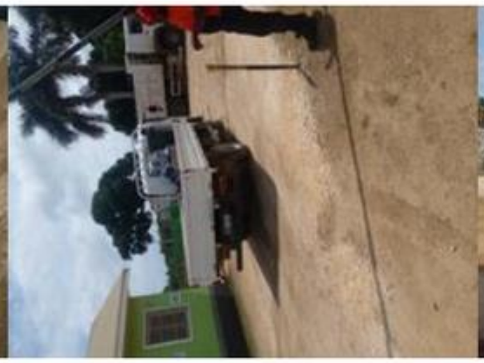
- Table
- Reports
- **Gallery**
- Downloads
- Map









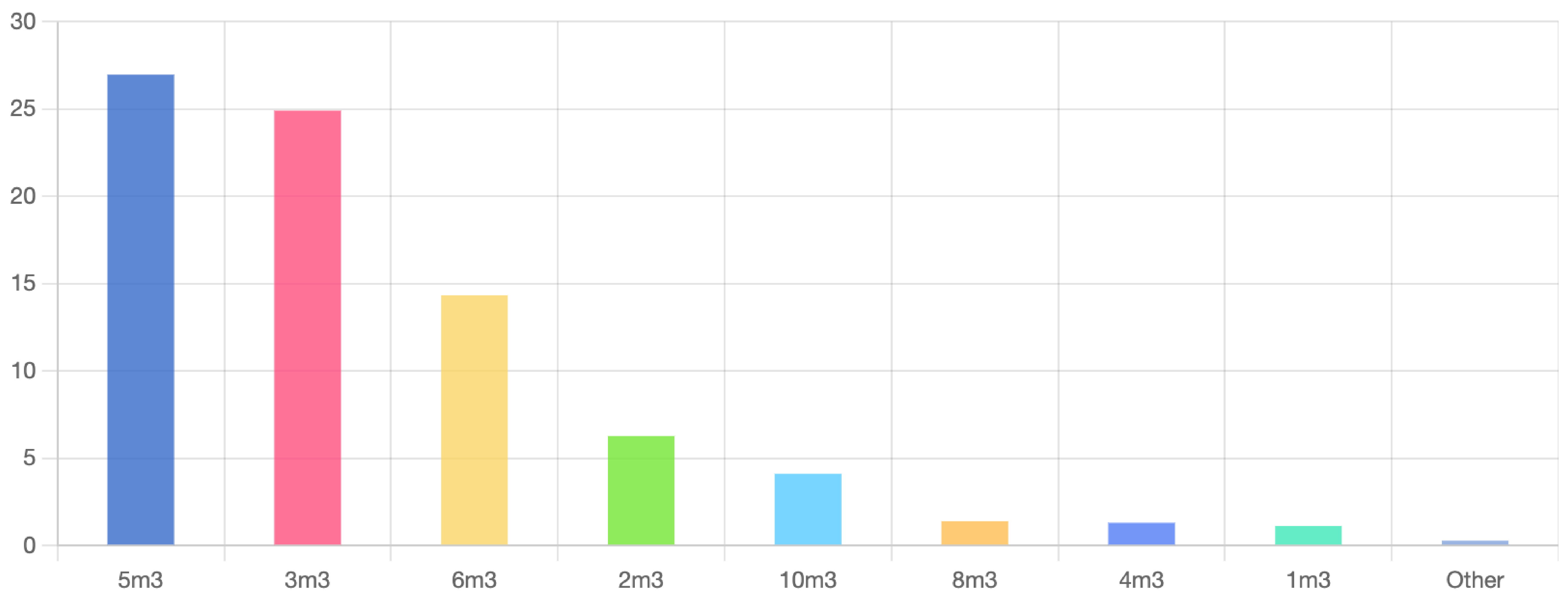







Volume of Solid Waste / m3

TYPE: SELECT_MULTIPLE. 862 out of 1068 respondents answered this question. (206 were without data.)



Value	Frequency	Percentage
5m3	288	26.97
3m3	266	24.91
6m3	153	14.33
2m3	67	6.27
10m3	44	4.12

Place of origin - Waste is from

TYPE: TEXT. 1068 out of 1068 respondents answered this question. (0 were without data.)

Value	Frequency	Percentage
Kolofo'ou	62	5.81
Tofoa	62	5.81
Havelu	36	3.37
Ma'ufanga	35	3.28
Vaini	27	2.53
Mala'evakapuna	21	1.97
Falemahaki	20	1.87
Veitongo	20	1.87
Tofoa	20	1.87
Longolongo	18	1.69
Fasi	16	1.5
Kolomotu'a	15	1.4
Uafu	15	1.4
Kolofo'ou	14	1.31
Hofoa	14	1.31

From Disaster to **Everyday Use**

My Projects

filter fields

Project name	Status	Owner	Date modified	Date deployed	Submissions
Tapuhia Landfill Data - September 2024	archived	me	Today at 6:44 AM	September 3, 2024	1068
Eua Landfill Data - September 2024	archived	me	Yesterday at 6:50 AM	September 3, 2024	101
Ha'apai Landfill Data - September 2024	archived	me	Yesterday at 6:49 AM	September 3, 2024	50
Vava'u Landfill Data - September 2024	archived	me	Yesterday at 6:46 AM	September 3, 2024	281
'Eua Landfill Data - August 2024	archived	me	September 25, 2024	August 2, 2024	103
Ha'apai Landfill Data - July 2024	archived	me	September 6, 2024	July 1, 2024	68
Eua Landfill Data - July 2024	archived	me	September 6, 2024	July 1, 2024	185
Vava'u Landfill Data - July 2024	archived	me	September 6, 2024	July 1, 2024	76
Tapuhia Landfill Data - August 2024	archived	me	September 3, 2024	August 2, 2024	1264
Vava'u Landfill Data - August 2024	archived	me	September 3, 2024	August 2, 2024	83

Lessons **Learned**

Appendix D: Power Point Presentations

SESSION #6: ORGANIC ACTIVITIES

- Appendix D29: How Organics Management supports the Circular Approach

This initiative is supported by **PacWastePlus**-a 72 month project funded by the European Union (**EU**) and implemented by the Secretariat of the Pacific Regional Environment Programme (**SPREP**) **to sustainably and cost effectively improve regional management of waste and pollution.**

How ORGANICS MANAGEMENT Supports the Circular Approach

Presented by Ms Hilary Boyes
PacWaste Plus Technical Officer

Circular Approach Workshop
3 October 2024

Session Outline

- Organics management and the circular approach
- PICTs Case Studies
- Using the Decision Support Tool
- Resources available
- Site visit

Odour

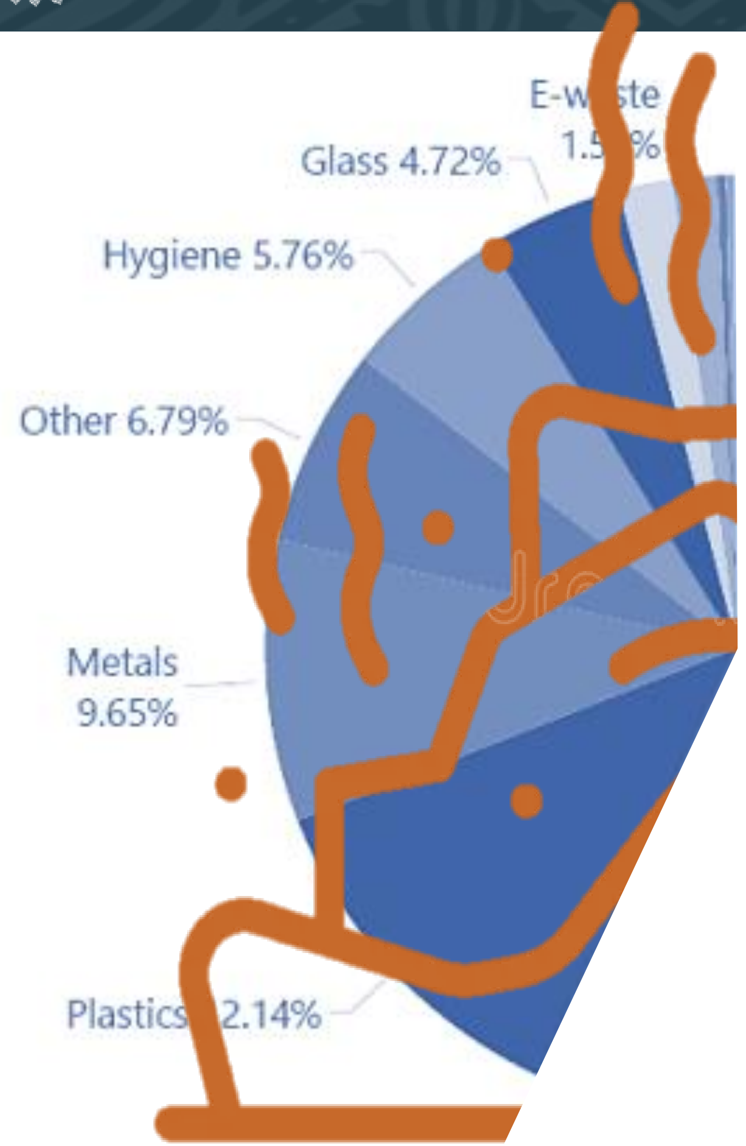
Methane

Leachate

Landfill capacity

Cost

417,000 tonnes
139,000 m3
$16.6 million



180,000 tonnes
60,000 m3
$7.2 million

56.9% =

Returning nutrients

Healthy soil / crop yeild

Employment

Climate resilience

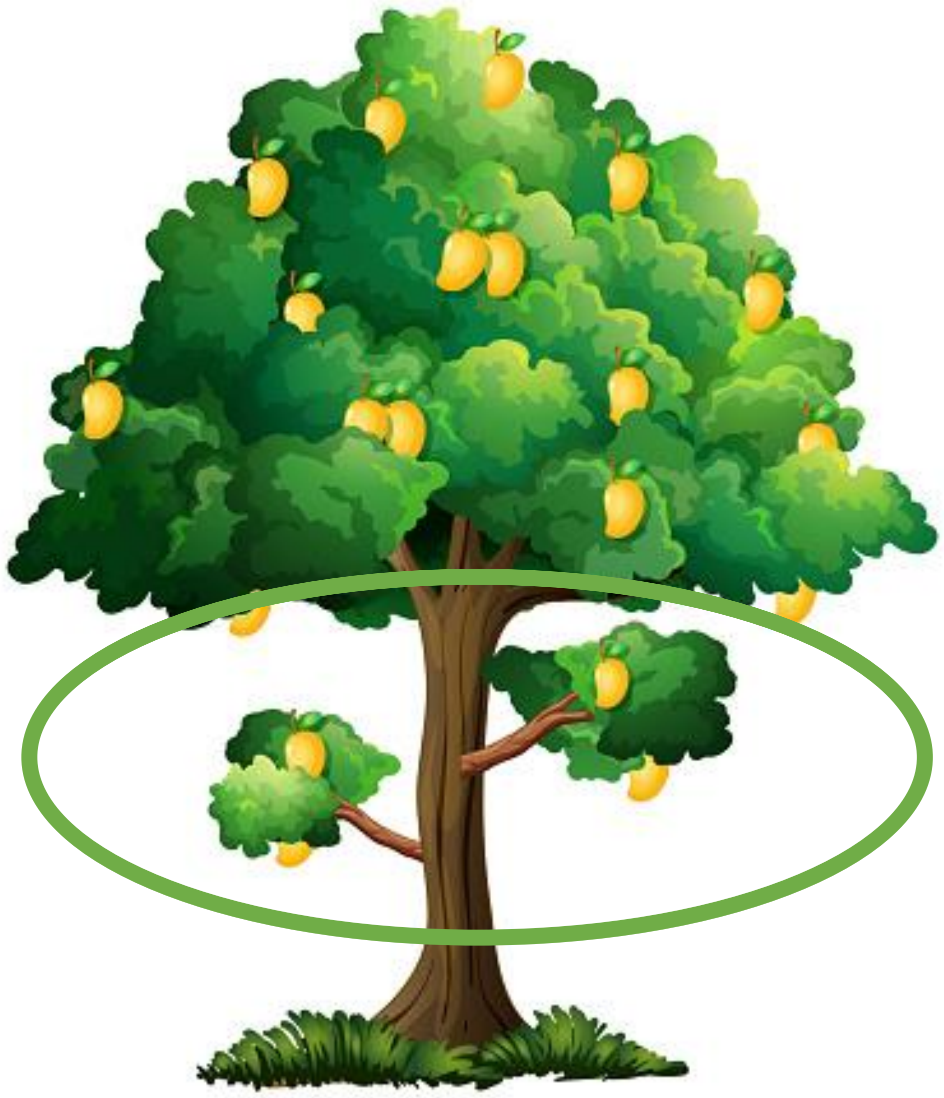
Savings

Less chemicals

Regional Waste Audit Analysis Report 2023
https://pacwasteplus.org/resources/regional-waste-audit-analysis-report/

How Organics Management Supports the Circular Approach

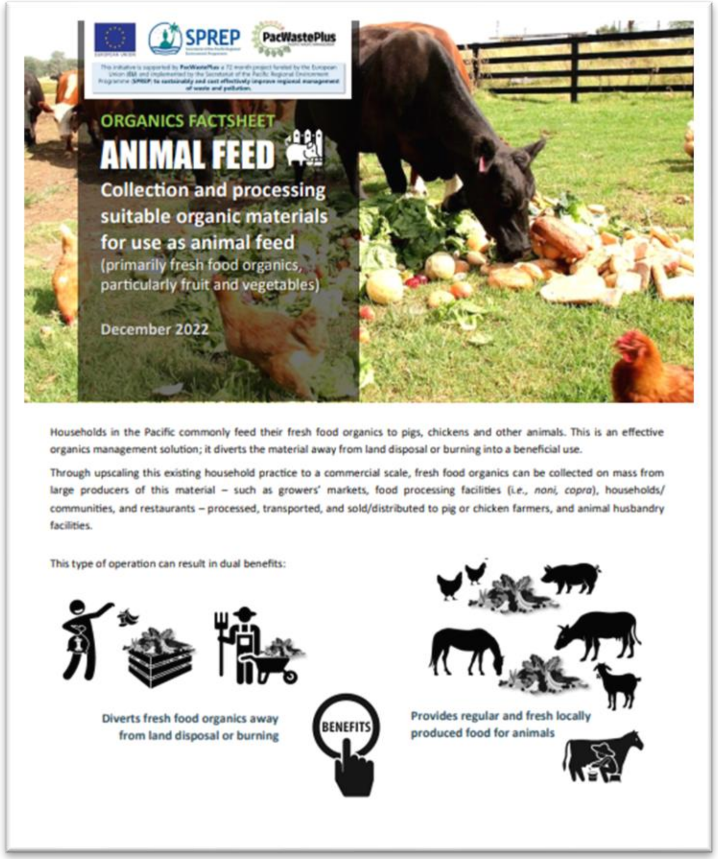
The Low Hanging Fruit



Why the Low Hanging Fruit?

Truly circular → Low technology / low cost → Scalable → Familiar / Traditional Knowledge → Proven / effective → Supports local industries & communities

Other Organics Management Solutions



ORGANICS FACTSHEET

ANIMAL FEED

Collection and processing suitable organic materials for use as animal feed (primarily fresh food organics, particularly fruit and vegetables)

December 2022

Households in the Pacific commonly feed their fresh food organics to pigs, chickens and other animals. This is an effective organics management solution; it diverts the material away from land disposal or burning into a beneficial use.

Through upscaling this existing household practice to a commercial scale, fresh food organics can be collected on mass from large producers of this material – such as growers' markets, food processing facilities (i.e., *noni, copra*), households/communities, and restaurants – processed, transported, and sold/distributed to pig or chicken farmers, and animal husbandry facilities.

This type of operation can result in dual benefits:

BENEFITS

Diverts fresh food organics away from land disposal or burning

Provides regular and fresh locally produced food for animals

ORGANICS FACTSHEET

MULCH AND WOODCHIPS

Collection and processing suitable organic materials to use as mulch and / or animal bedding (primarily garden and woody organics)

December 2022

Garden and woody organics are comprised of branch litter, whole trees, stumps, and pruned clippings from hedges generated during household and community landscaping or land clearing projects. Woody organics can also include untreated wood materials from pallets or used in construction. Mulching and chipping is the process of shredding this material to a consistent particle size, usually <100mm.

Mulched and chipped material can be useful for a variety of applications in the Pacific including landscaping, weed cover in gardens, and animal bedding. Application of mulch in landscaping can assist with water retention, improve aeration of clay soil, and provide nutrients to sandy soil.

Pacific landfills currently receive a high portion of garden and woody organics. This material includes "high fibrous" material such as coconut fronds, pandanus, and banana leaves which can be very strong and stringy. Processing and using this material as mulch/woodchips may provide an effective management solution without the need for the construction of a specialist compost facility or training.

The high fibrous vegetation in the Pacific requires careful selection of the type of mulch/chipper equipment to purchase. Research suggests that "drum style" chippers are better for processing this vegetation compared to disc/flywheel style chippers. More information on selecting appropriate equipment is provided later in this factsheet.

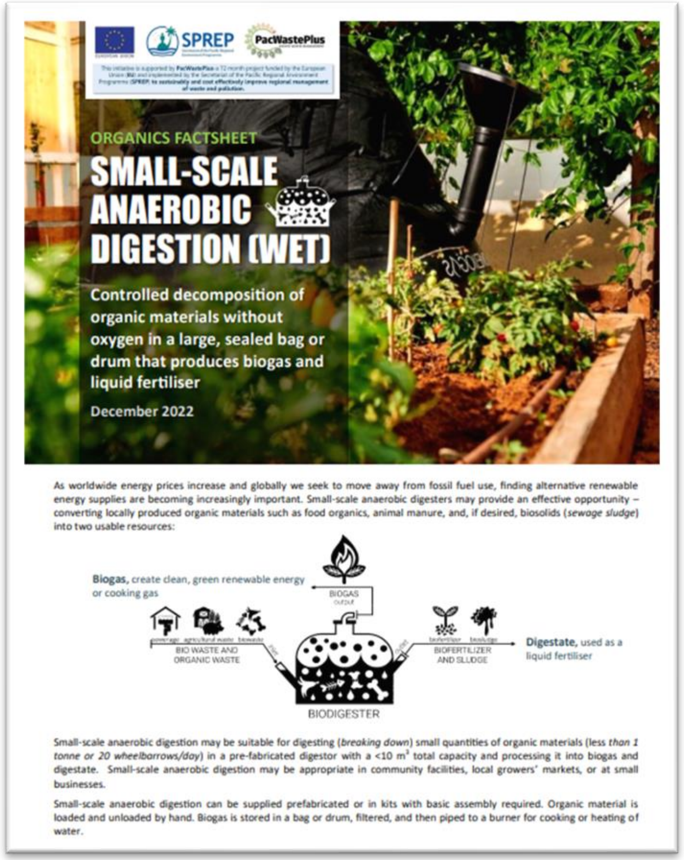
An effective use for mulch/woodchips may be as bedding and/or lining of pig and chicken pens to absorb the animal manure.

This use provides multiple benefits:

Animal welfare
Animals have a more comfortable pen in comparison to concrete or mud flooring

Less water use / contamination run-off:
Mulch in the pens will absorb animal manure. To clean the animal pens, mulch can be simply swept up, therefore reducing the need for large washdowns

Composting:
Once the mulch has absorbed the animal manure, it can be added to a composting process – providing an effective way to increase the nitrogen balance and enhance composting processes.



ORGANICS FACTSHEET

SMALL-SCALE ANAEROBIC DIGESTION (WET)

Controlled decomposition of organic materials without oxygen in a large, sealed bag or drum that produces biogas and liquid fertiliser

December 2022

As worldwide energy prices increase and globally we seek to move away from fossil fuel use, finding alternative renewable energy supplies are becoming increasingly important. Small-scale anaerobic digesters may provide an effective opportunity – converting locally produced organic materials such as food organics, animal manure, and, if desired, biosolids (*sewage sludge*) into two usable resources:

Biogas, create clean, green renewable energy or cooking gas

BIOGAS output

BIO WASTE AND ORGANIC WASTE

BIODIGESTER

BIOFERTILIZER AND SLUDGE

Digestate, used as a liquid fertiliser

Small-scale anaerobic digestion may be suitable for digesting (*breaking down*) small quantities of organic materials (less *than 1 tonne or 20 wheelbarrows/day*) in a pre-fabricated digestor with a <10 m^3 total capacity and processing it into biogas and digestate. Small-scale anaerobic digestion may be appropriate in community facilities, local growers' markets, or at small businesses.

Small-scale anaerobic digestion can be supplied prefabricated or in kits with basic assembly required. Organic material is loaded and unloaded by hand. Biogas is stored in a bag or drum, filtered, and then piped to a burner for cooking or heating of water.

Composting: Terminology

Organics or Organic Material

Materials that were once part of a living thing. Can include: kitchen scraps (food); garden cuttings, grass & branches; paper & cardboard.

Mulch

Woody garden organic materials, shredded but before undergoing a composting process.

Composting

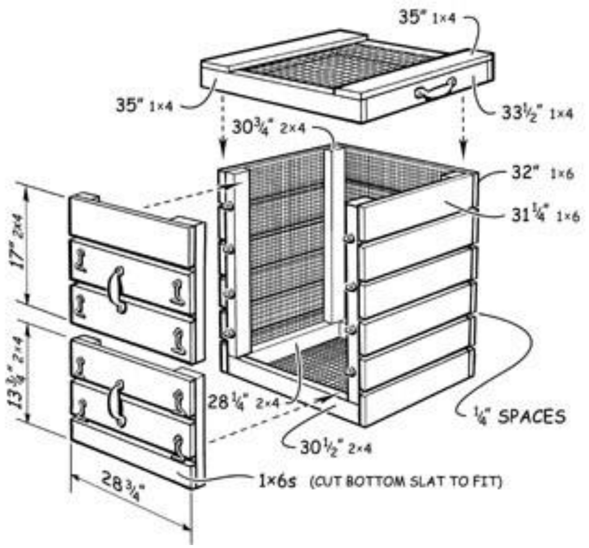
A natural biochemical process in which naturally occurring microorganisms transform raw organic materials into compost.

Compost

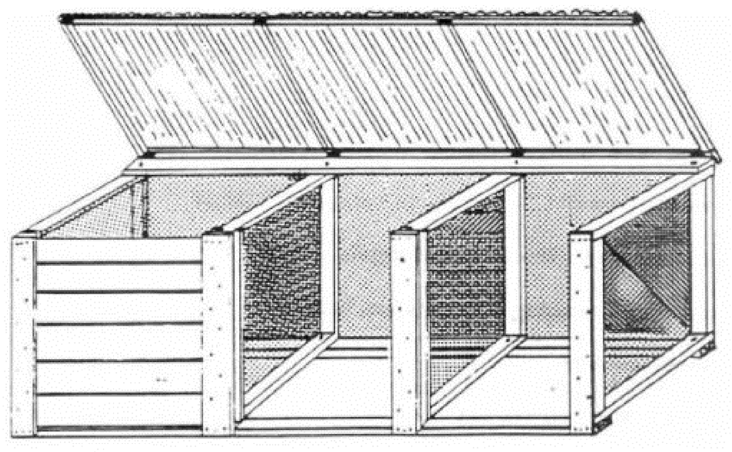
Organic material that has been broken down during composting and now looks and smells like dark, fertile garden soil.

Pacific Examples – Composting

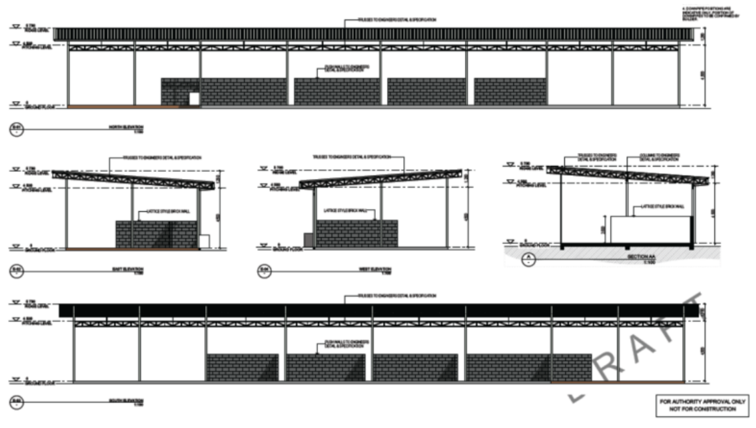
Household / backyard



Community-scale



Central / large facility

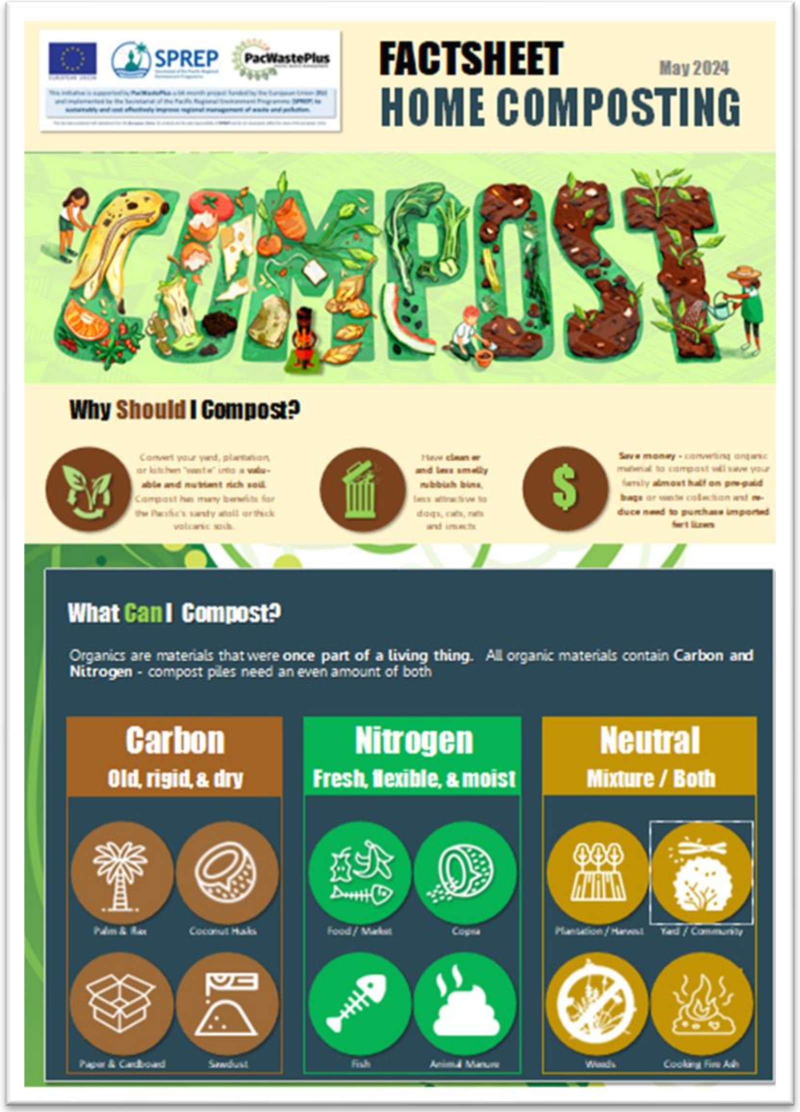


Household / Backyard

Programs to Promote Household Composting

- Provide compost bins
- Education programme –
  - how / why to use - benefits for garden
  - No organics in general waste
- Stop collection

Examples – Fiji, Niue, others?



Household / Backyard










Resources Available

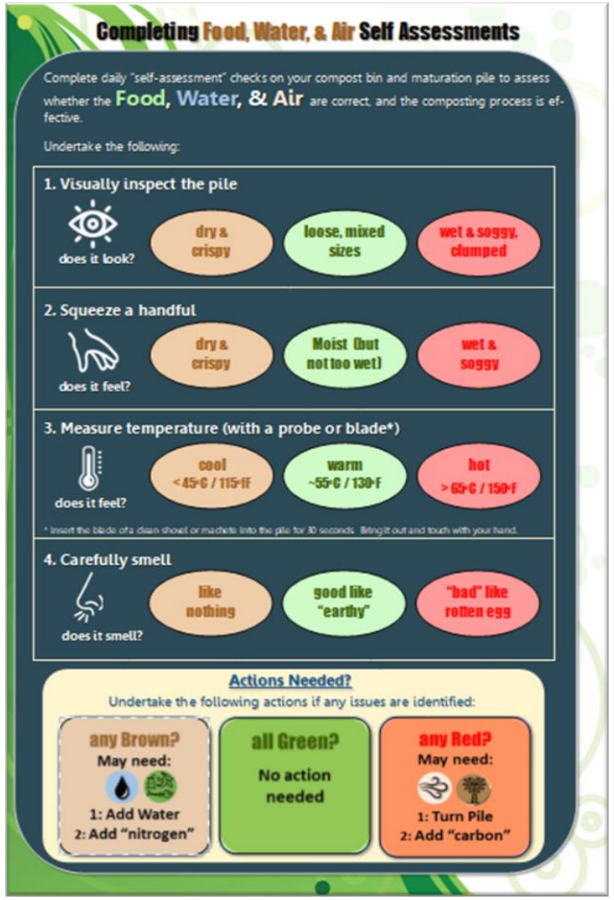

FACTSHEET
HOME COMPOSTING
May 2024
COMPOST
Why Should I Compost?
Convert your yard, plantation, or kitchen 'waste' into a valuable and nutrient rich soil. Compost has many benefits for the Pacific's sandy atoll or thick volcanic soils.
Have clean er and less smelly rubbish bins, less attractive to dogs, cats, rats and insects
Save money - converting organic material to compost will save your family almost half on pre-paid bags or waste collection and reduce need to purchase imported fertilizers
What Can I Compost?
Organics are materials that were once part of a living thing. All organic materials contain Carbon and Nitrogen - compost piles need an even amount of both


e a maturation pile where material turned from the compost
continue the composting process until ready for use
plete daily "self assessment" checks on your compost bin and
ion pile (see page 4)
Your Compost
proximately 4-6 months you should be able to use your com-
ed compost will be dark, smell & look "earthy", and the
perature will be stable.
How to use your compost?
- Mix with garden beds to improve the soil quality
- Use at the base of trees and shrubs
- Use as a soil conditioner when planting seedlings (fill the hole with half compost and half soil)


How Do I Compost?
Step 1 – Make a Compost Bin
Compost bins can be made using a variety of items - many of which may be considered "waste materials" themselves (so you can save them from landfill)
Keep in mind:
- Make sure it is big enough - you might need two or three?
- Compost will need oxygen (air flow) - make sure your bin is not completely sealed
- Too much water will impact compost - a cover is recommended during times of rain
- Compost needs to be turned regularly - make sure you have another bin or space to turn material into
- Secure from animals - dogs, pigs, cats, and rats
- Untreated timber will rot in the composting environment - you may need to replace regularly (they can be added to the compost!)
- Car tyres and chemical drums may have residual contaminants - which may not be suitable for use to construct a compost bin.

Step 2 – Add Materials (ensuring Food, Air, & Water)
Composting mimics nature's method of decomposition, where creatures too small to see (microbes) process organic materials and convert it to a nutrient rich product "compost".
Microbes, like humans and animals, need three elements to live and thrive: Food, Water, & Air
To build your compost pile, add organic materials daily (or as they are received), providing best Food, Water, and Air conditions for the microbes

Food	Your compost will need a carbon to nitrogen ration of 30:1. To achieve this ratio, follow this simple rule: Layer One bucket "nitrogen" material with one bucket "carbon" material, until your compost bin is full. "Neutral" items containing both carbon & nitrogen can be added without layering
Water	Add water to ensure your compost pile is damp - it should not dry out, but not be too wet. Keep protected against too much rain. Your compost pile should be damp all the way though. See the next page for how to test the moisture.
Air	Your compost pile should contain a mix of small and large items, up to 1-5cm diameter, allowing airflow into the compost. Your compost should be turned approximately 2-4 weekly to add oxygen into the pile


Completing Food, Water, & Air Self Assessments
Complete daily "self-assessment" checks on your compost bin and maturation pile to assess whether the Food, Water, & Air are correct, and the composting process is effective.
Undertake the following:

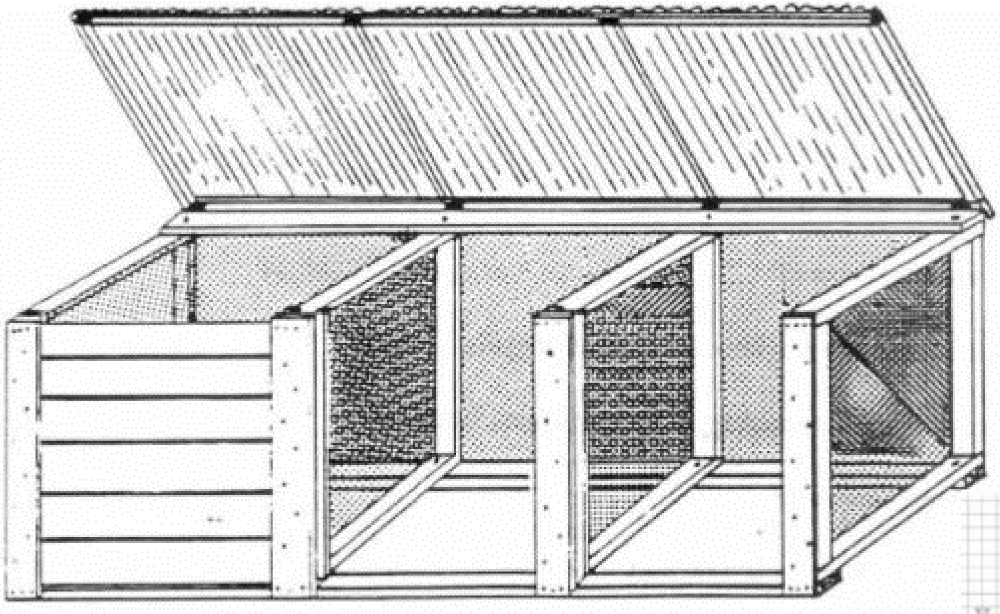
1. Visually inspect the pile	does it look?	dry & crispy	loose, mixed sizes	wet & soggy, clumped
2. Squeeze a handful	does it feel?	dry & crispy	Moist (but not too wet)	wet & soggy
3. Measure temperature (with a probe or blade*)	does it feel?	cool < 45°C / 115°F	warm ~55°C / 130°F	hot > 65°C / 150°F
4. Carefully smell	does it smell?	like nothing	good like "earthy"	"bad" like rotten egg

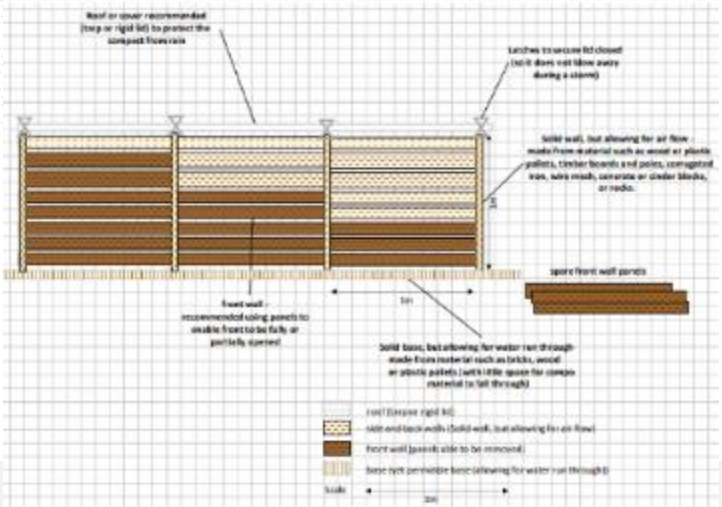
* Insert the blade of a clean shovel or machete into the pile for 30 seconds. Bring it out and touch with your hand.

Actions Needed?
Undertake the following actions if any issues are identified:

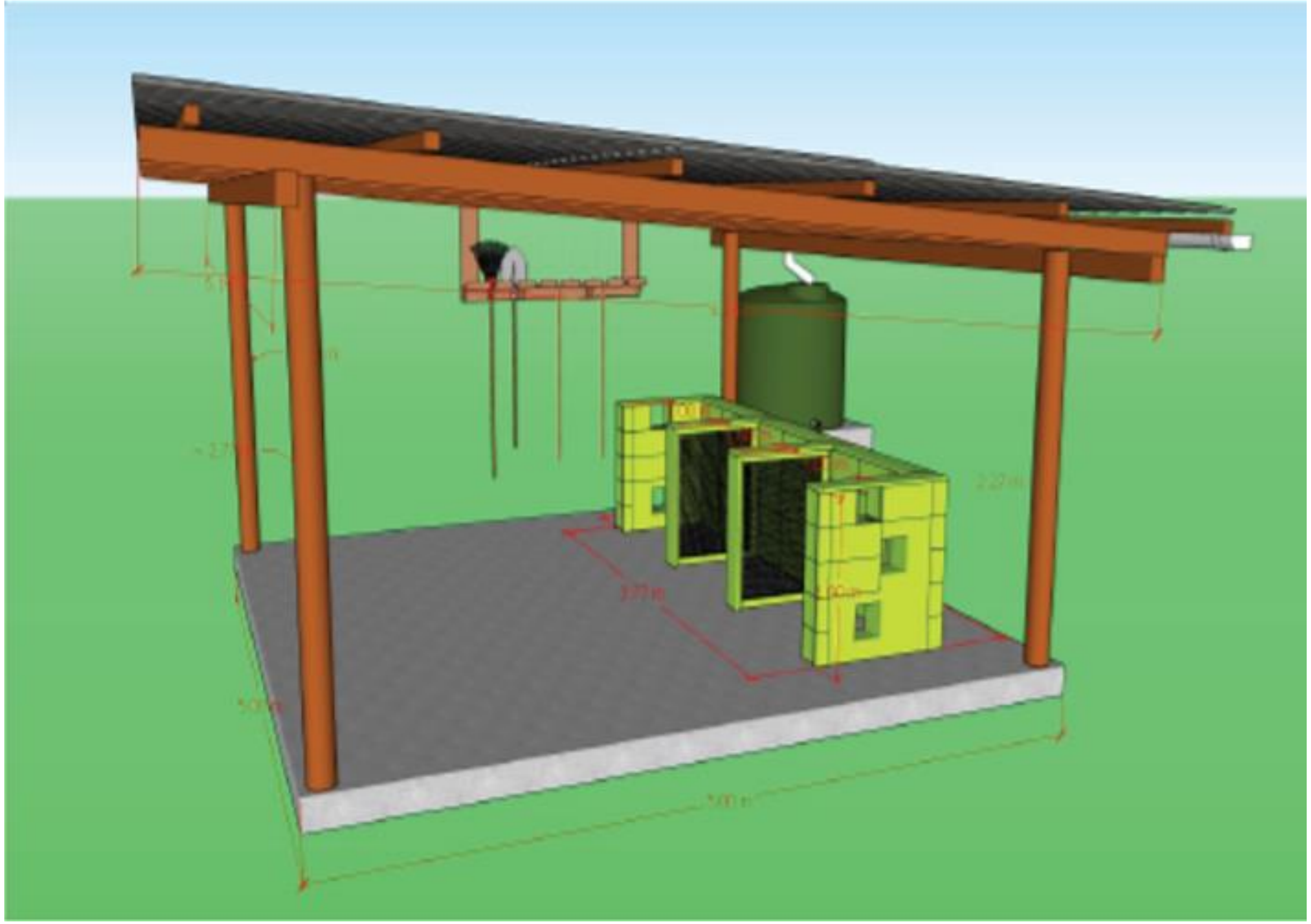
any Brown?	all Green?	any Red?
May need: 1: Add Water 2: Add "nitrogen"	No action needed	May need: 1: Turn Pile 2: Add "carbon"

Community Scale

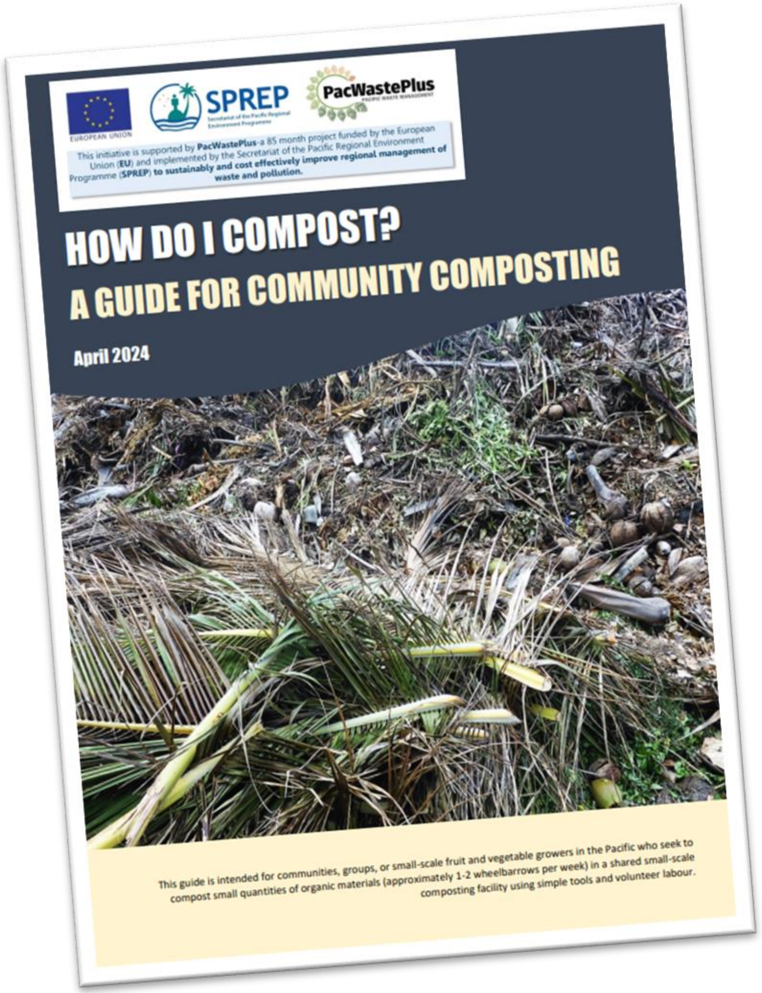


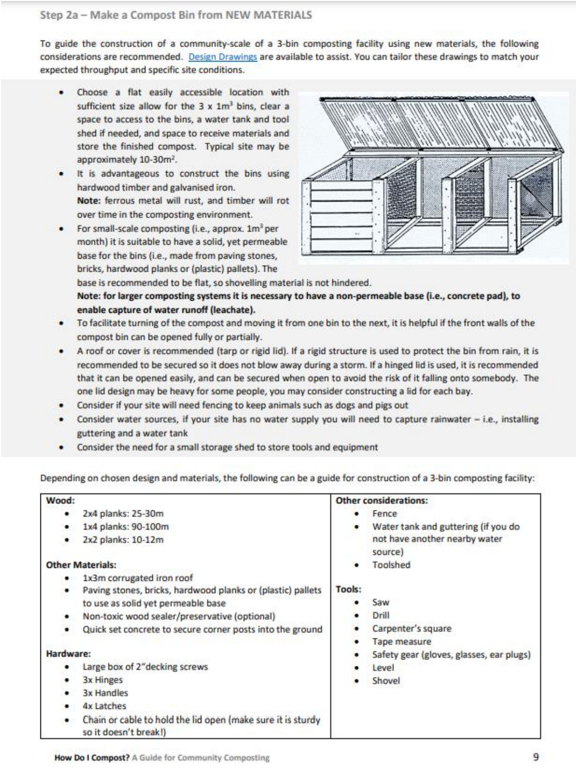


Fiji



Resources Available





Step 2a – Make a Compost Bin from NEW MATERIALS

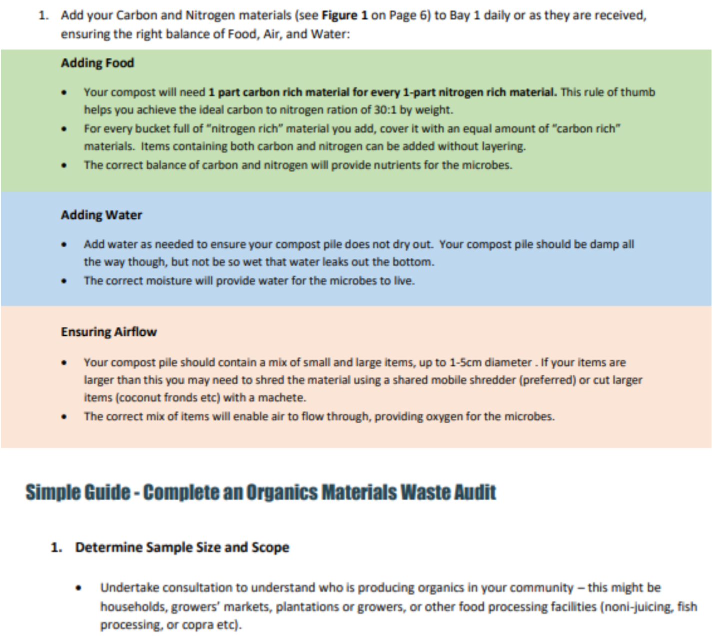
To guide the construction of a community-scale of a 3-bin composting facility using new materials, the following considerations are recommended. Design Drawings are available to assist. You can tailor these drawings to match your expected throughput and specific site conditions.

- Choose a flat easily accessible location with sufficient size allow for the 3 x $1m^3$ bins, clear a space to access to the bins, a water tank and tool shed if needed, and space to receive materials and store the finished compost. Typical site may be approximately 10-$30m^2$.
- It is advantageous to construct the bins using hardwood timber and galvanised iron.
  Note: ferrous metal will rust, and timber will rot over time in the composting environment.
- For small-scale composting (i.e., approx. $1m^3$ per month) it is suitable to have a solid, yet permeable base for the bins (i.e., made from paving stones, bricks, hardwood planks or (plastic) pallets). The base is recommended to be flat, so shovelling material is not hindered.
  Note: for larger composting systems it is necessary to have a non-permeable base (i.e., concrete pad), to enable capture of water runoff (leachate).
- To facilitate turning of the compost and moving it from one bin to the next, it is helpful if the front walls of the compost bin can be opened fully or partially.
- A roof or cover is recommended (tarp or rigid lid). If a rigid structure is used to protect the bin from rain, it is recommended to be secured so it does not blow away during a storm. If a hinged lid is used, it is recommended that it can be opened easily, and can be secured when open to avoid the risk of it falling onto somebody. The one lid design may be heavy for some people, you may consider constructing a lid for each bay.
- Consider if your site will need fencing to keep animals such as dogs and pigs out
- Consider water sources, if your site has no water supply you will need to capture rainwater – i.e., installing guttering and a water tank
- Consider the need for a small storage shed to store tools and equipment

Depending on chosen design and materials, the following can be a guide for construction of a 3-bin composting facility:

Wood: • 2x4 planks: 25-30m • 1x4 planks: 90-100m • 2x2 planks: 10-12m **Other Materials:** • 1x3m corrugated iron roof • Paving stones, bricks, hardwood planks or (plastic) pallets to use as solid yet permeable base • Non-toxic wood sealer/preservative (optional) • Quick set concrete to secure corner posts into the ground **Hardware:** • Large box of 2"decking screws • 3x Hinges • 3x Handles • 4x Latches • Chain or cable to hold the lid open (make sure it is sturdy so it doesn't break!)	**Other considerations:** • Fence • Water tank and guttering (if you do not have another nearby water source) • Toolshed **Tools:** • Saw • Drill • Carpenter's square • Tape measure • Safety gear (gloves, glasses, ear plugs) • Level • Shovel

How Do I Compost? A Guide for Community Composting 9



1. Add your Carbon and Nitrogen materials (see **Figure 1** on Page 6) to Bay 1 daily or as they are received, ensuring the right balance of Food, Air, and Water:

Adding Food

- Your compost will need **1 part carbon rich material for every 1-part nitrogen rich material.** This rule of thumb helps you achieve the ideal carbon to nitrogen ration of 30:1 by weight.
- For every bucket full of "nitrogen rich" material you add, cover it with an equal amount of "carbon rich" materials. Items containing both carbon and nitrogen can be added without layering.
- The correct balance of carbon and nitrogen will provide nutrients for the microbes.

Adding Water

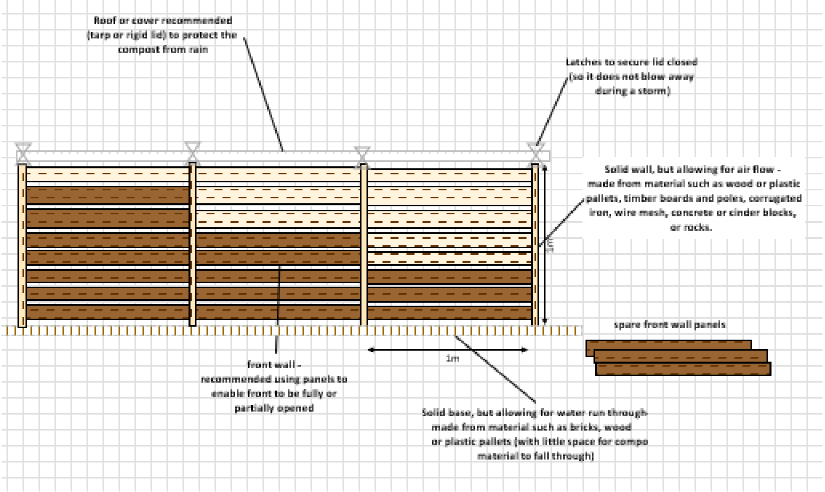
- Add water as needed to ensure your compost pile does not dry out. Your compost pile should be damp all the way though, but not be so wet that water leaks out the bottom.
- The correct moisture will provide water for the microbes to live.

Ensuring Airflow

- Your compost pile should contain a mix of small and large items, up to 1-5cm diameter . If your items are larger than this you may need to shred the material using a shared mobile shredder (preferred) or cut larger items (coconut fronds etc) with a machete.
- The correct mix of items will enable air to flow through, providing oxygen for the microbes.

Simple Guide - Complete an Organics Materials Waste Audit

1. **Determine Sample Size and Scope**
   - Undertake consultation to understand who is producing organics in your community – this might be households, growers' markets, plantations or growers, or other food processing facilities (noni-juicing, fish processing, or copra etc).



Animations

https://pacwasteplus.org/resources/small-scale-composting-framework-operations-plan-and-design-drawings/

Central / Large Scale

- Large Pile Composting
  - Cook Islands
  - Vanuatu

Bay Composting

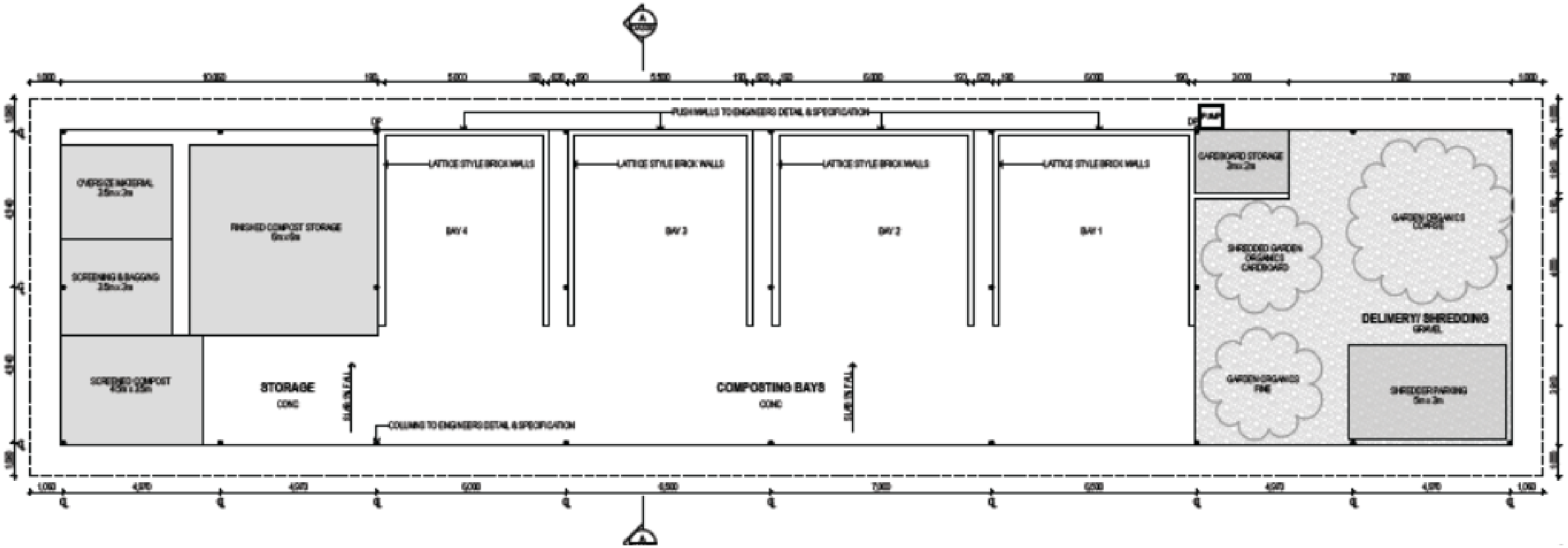
- Fiji
- RMI
- FSM (Yap)
- Tuvalu

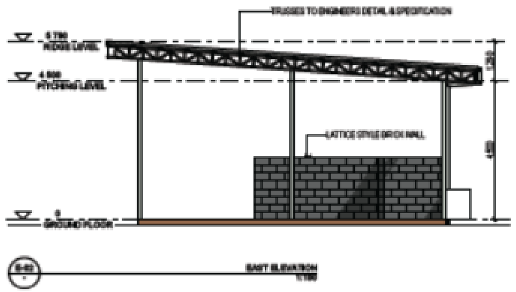
EUROPEAN UNION

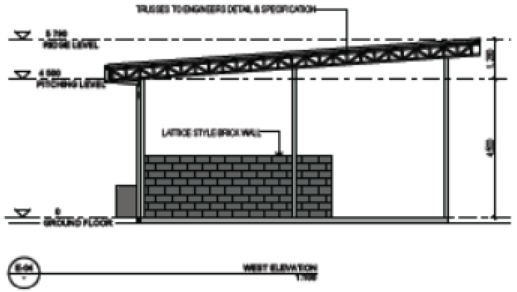
SPREP
Secretariat of the Pacific Regional Environment Programme

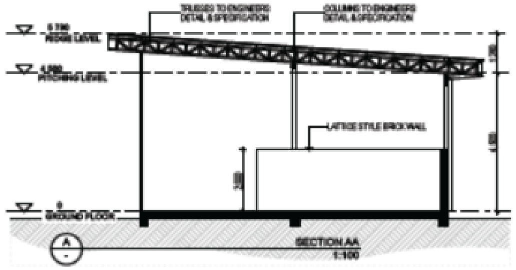
PacWaste
PACIFIC WASTE

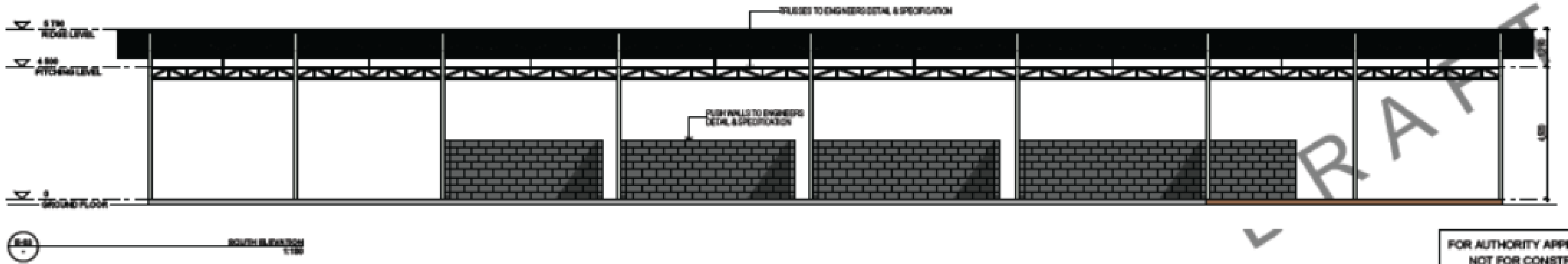
Chuuk











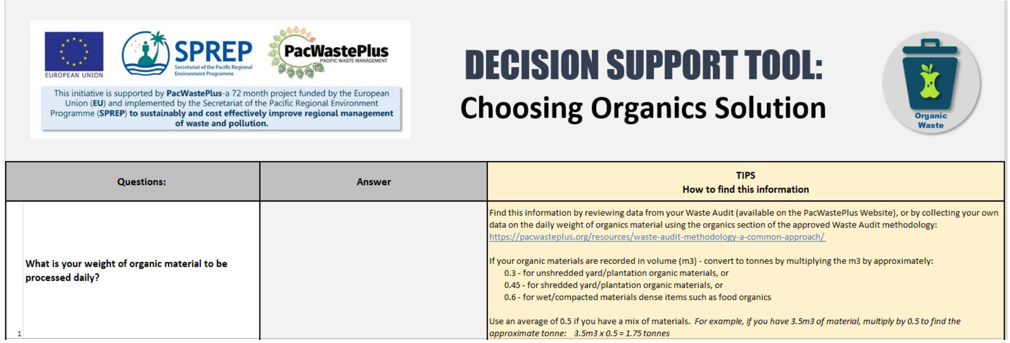
FOR AUTHORITY APPROVAL ONLY
NOT FOR CONSTRUCTION

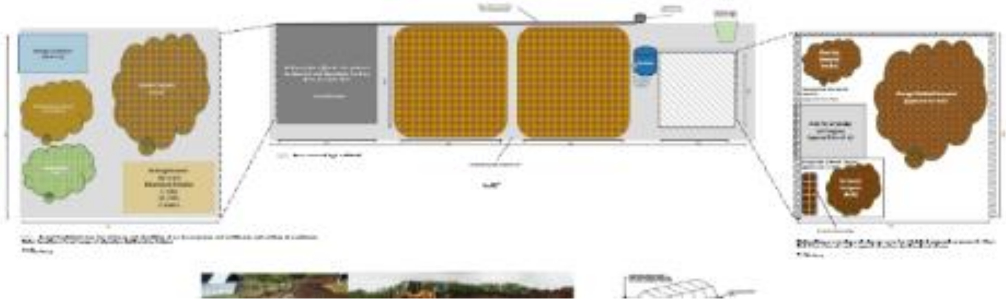
In-vessel

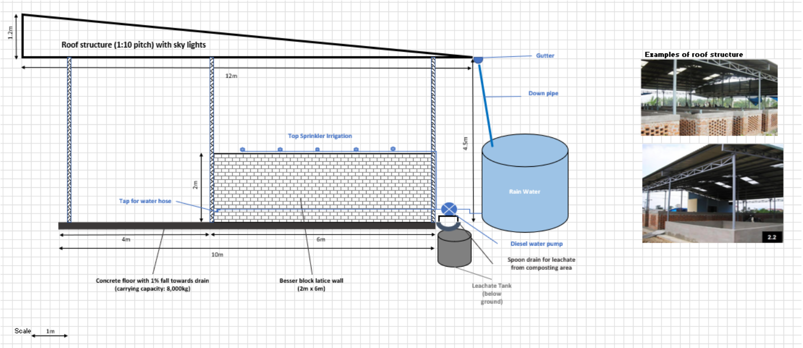
- Niue

Resources Available

- Decision Support Tool
- Framework Operation Plans
- Monitoring Templates
- Handbook – Composting Common Materials in the Pacific
- Pacific Standards – Guide for Facility Construction and Operation
- Editable Design Drawings
- Training
- Moodle courses
- Animations







The New Caledonia Case Study

Slaugherhouse waste + GW

500 kg / week

Every 2 weeks

VALORGA

The New Caledonia Case Study

Green Waste managed by the collectivity (SIVOM VKP)

700 T
GW/year

Grinding 4
times / year

VALORGA
Valorisation locale des matières organiques

The New Caledonia Case Study

Green Waste managed by the collectivity (SIVM SUD)

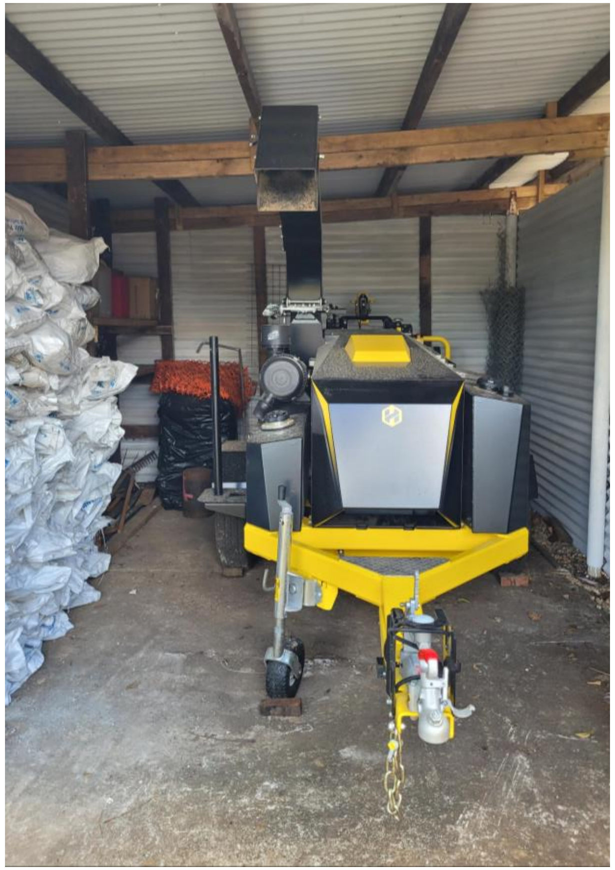
2 000 T GW/year

Vanuatu Case Study

22m^3 of organic material per day
- landscaping, markets, kava -

Large pile composting

Vanuatu Case Study



HANSA C65 chipper, small excavator (hired fortnightly), homemade sieve

Producing compost
- for sale to growers and landscape companies -

Vanuatu Case Study

Material Type	Cubic Metre Per Day	
	Estimated Current Quantity	Estimated Future Quantity
Mixed loads from landscaping / clean-up projects	17	20
Market organics	1	8
By-product from kava processing	4	10
Household organics	0	2
Cardboard	0	0.5
TOTAL	**22**	**40.5**

Opportunities:

- DEPC seeking to increase throughput – almost double
- Year-round production –
  - Wet season – site slippery, leachate, mature compost is unable to dry
  - Dry season – not enough water
- Reduce environmental hazards – currently no leachate capture, no water storage/infrastructure

Of Note:

- Site has noticeable slope (approx. 10m)
- Adjacent land uses = market and community field, residential houses, and a school

EUROPEAN UNION SPREP Secretariat of the Pacific Regional Environment Programme PacWastePlus PACIFIC WASTE MANAGEMENT

This initiative is supported by **PacWastePlus**-a 72 month project funded by the European Union (**EU**) and implemented by the Secretariat of the Pacific Regional Environment Programme (**SPREP**) **to sustainably and cost effectively improve regional management of waste and pollution.**

DECISION SUPPORT TOOL:
Choosing Organics Solution

Organic Waste

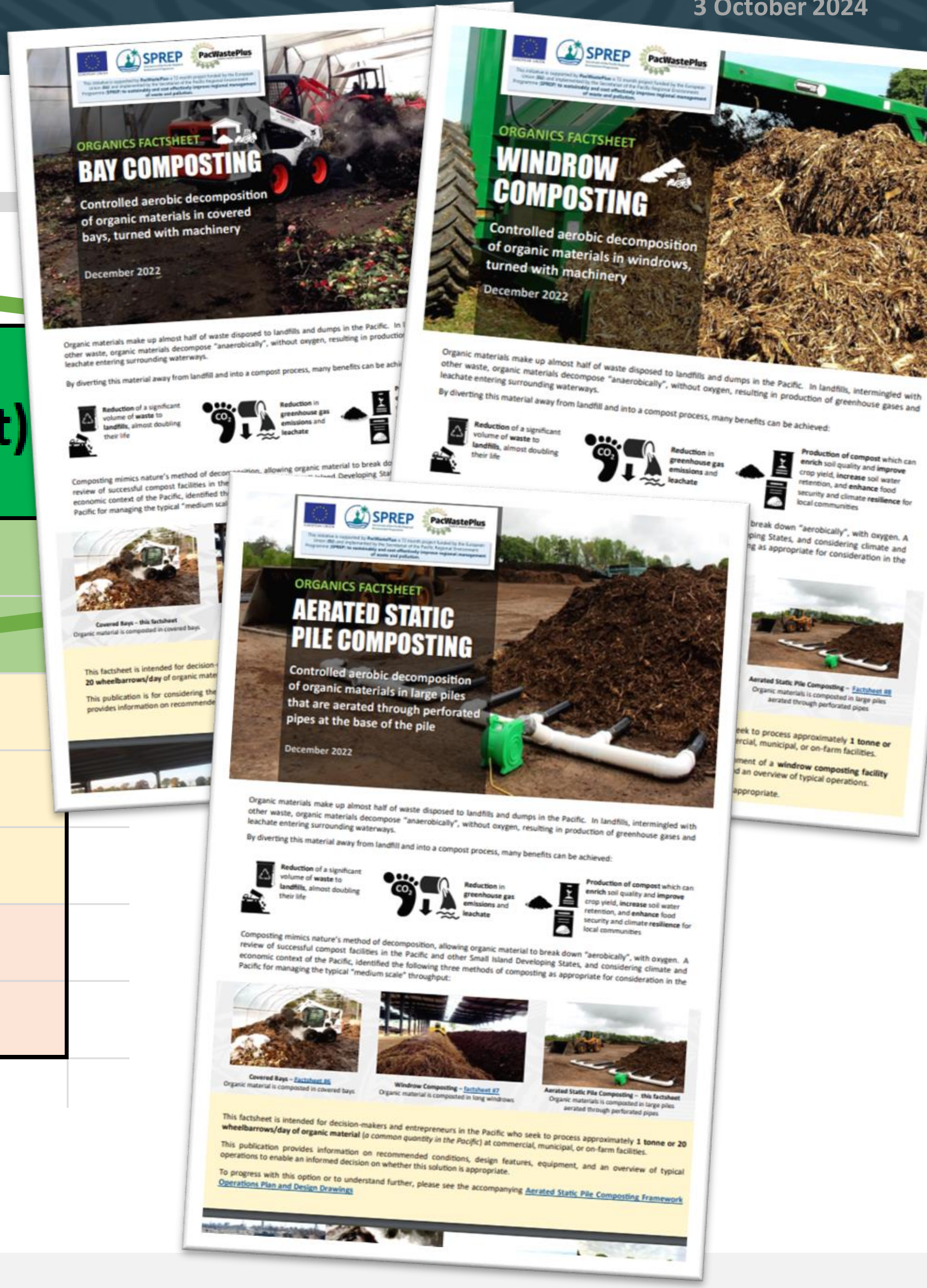
	Questions:	Answer	TIPS How to find this information
1	**What is your weight of organic material to be processed daily?**	>10 tonne/day	Find this information by reviewing data from your Waste Audit (available on the PacWastePlus Website), or by collecting your own data on the daily weight of organics material using the organics section of the approved Waste Audit methodology: https://pacwasteplus.org/resources/waste-audit-methodology-a-common-approach/ If your organic materials are recorded in volume (m3) - convert to tonnes by multiplying the m3 by approximately: 0.3 - for unshredded yard/plantation organic materials, or 0.45 - for shredded yard/plantation organic materials, or 0.6 - for wet/compacted materials dense items such as food organics Use an average of 0.5 if you have a mix of materials. *For example, if you have 3.5m3 of material, multiply by 0.5 to find the approximate tonne: 3.5m3 x 0.5 = 1.75 tonnes*

https://pacwasteplus.org/resources/decision-support-tool-choosing-organics-solution/

2	**What is the "Carbon" v "Nitrogen" ratio of your organic materials?**	**50 carbon / 50 nitrogen**	Analyse your organic materials received and roughly record what percentage of items are: "Carbon" (i.e., dead or brown materials such as dry palm and flax, coconut husks, cardboard, sawdust) "Nitrogen" (fresh or green materials such as food organics, fish or copra processing by-product, manure) Round to the nearest category - For example, if your items are about 70% Carbon and 30% Nitrogen, select 75 / 25 Be aware that some common organic materials, such as materials from yard/community clean-ups and plantation already contains a mix of Carbon and Nitrogen. For more information on identifying the Carbon and Nitrogen percentage of your ingredients, review the Pacific and Timor-Leste Composting Common Organic Handbook https://pacwasteplus.org/resources/composting-common-organic-materials-in-the-pacific-and-timor-leste-handbook-for-compost-operators/
3	**What is your main source of Nitrogen input?**	**Food/fish/copra organics**	organics, food organics, fish or copra processing by-product, animal manure, or human sludge) For more information on Nitrogen sources, please review the Pacific and Timor-Leste Composting Common Organic Handbook https://pacwasteplus.org/resources/composting-common-organic-materials-in-the-pacific-and-timor-leste-handbook-for-compost operators/
4	**How much budget is available for establishing facilities and equipment?**	**$100,001 - 250,000 USD**	Record the budget available for facility set-up/establishment (Capital Expenditure). Capital expenditure may typically include items such as site work and drainage, buildings, equipment such as shredders and turners, establishing a water supply, vehicles, fencing, and signage
5	**How much budget is available for ongoing operations (excluding labour)?**	**$5,001 - 20,000 USD / year**	Record the budget available for ongoing operation of the facility (Operating Expenditure). Operating expenditure may typically include items such as fuel, power, water, equipment maintenance, labour, and delivering community awareness

6	**How much labour is available (including volunteers)?**	**5-10 staff**	Record the estimated number of staff that will be working or volunteering in the organics facility
7	**What level training do your staff or volunteers have?**	**Medium (some training and/or experience in organics management)**	Record the level of expertise the staff or volunteers you will have for your organics facility operation, from: Low - staff/volunteers have received minimal training and have limited experience in organics management Medium - staff/volunteers have received some training or/and have some experience in organics management High - staff/volunteers have been trained and are experienced in organics management
8	**What level of workshop support do you have for equipment maintenance and servicing?**	**Medium (medium workshop, medium skilled mechanics)**	Record the level of workshop support you will have to support your organics operation, from: Low - limited facilities available - no workshop and limited equipment, and unskilled mechanics Medium - medium facilities available, no workshop but good equipment, and mechanics with some experience and knowledge High - good workshop facilities and equipment available, and skilled mechanics
9	**How sensitive is your surrounding area?**	**High (sensitive areas nearby)**	The sensitivity of your surrounding environment mean what is its vulnerability to any possible unplanned discharges from an organics operation such as contaminated water run-off, smell, noise, and traffic. Sensitive areas may include waterways such as rivers or the ocean, schools, and houses. "Nearby" - includes within approximately 100m of your proposed organics facility Record the sensitivity of your surrounding environment, from: Low - no sensitive areas such as waterways or houses nearby Medium - some sensitive areas such as waterways or houses nearby High - sensitive areas such as waterways or houses are nearby

	Ranked - Possible Organics Management Solutions for your Context:
1st	**Bay or Windrow Composting (with Mechanical Support)**
2nd	Aerated Static Pile Composting (with Mechanical Support)
3rd	Small Scale Composting (Manual)
4th	Small Scale Anaerobic Digestion
5th	In-vessel Compost
6th	Mulch and Woodchip
7th	Animal Feed
8th	Centralised Anerobic Digestion (Dry)



SWOT Analysis – Bay Composting

Strengths	Weaknesses
• Already a familiar practice in the Pacific • Well understood, proven technology, with extensive training materials available • Relatively low cost (*per tonne*) and high capacity form of commercial scale composting • Effectively manages risks of pathogens and plant propagules • Biosolids can be composted in a bay composting facility with controls to ensure pathogens are managed (**note**: *finished compost is not recommend to be used for growing food (in gardens or crop fields). A separate organic facility may need to be established to process this material*).	• Shredder/chipper, and mechanical turning equipment are expensive to purchase and maintain
Opportunities	**Threats**
• Increases food security and climate resilience for local communities • Scalable and easy to replicate where there are sufficient organics materials (such as on-farm at a grower co-op / association) and capital investment is available • Could be constructed on capped landfill sites to share hardstand and drainage infrastructure	• There may be cultural barriers to community purchasing compost • Requires behaviour change from community to separate organic materials for collection • Labour, transport, and operating costs mean composting facility is non-viable for amount of material available • Processing costs not covered by product sales and no gate fee available • Pollution of surface and groundwater due to poor design and operation • Odour complaints due to poor process design and operation • Equipment provided is not used, or is put to other uses

Familiar

Control process and impacts on environment

Building construction

Limited scope for expansion

SWOT Analysis – Aerated Static Pile Composting

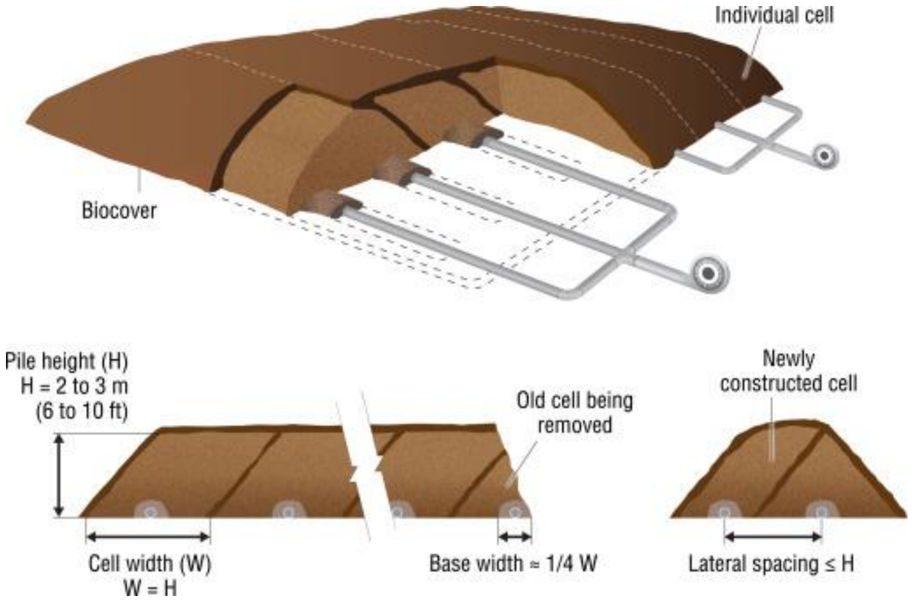
Strengths	Weaknesses
• Well understood, proven technology, with extensive training materials available • Relatively low cost (*per tonne)* and high capacity form of commercial scale composting • Requires less turning than windrow composting • Improved control of process and impacts on local environment • Effectively manages risks of pathogens and plant propagules • Biosolids can be composted in an aerated static pile com-posting facility with controls to ensure pathogens are managed (*note: finished compost is not recommend to be used for growing food (in gardens or crop fields)*. A separate organic facility may need to be established to process this material). • Shredder/chipper, and mechanical turning equipment are expensive to purchase and maintain • Requires a large area and large amounts of fresh water • Can pollute air and water if poorly built or managed • Requires impermeable hardstand and drainage, which can be expensive to install	• Shredder/chipper, and mechanical turning equipment are expensive to purchase and maintain
Opportunities	**Threats**
• Could be constructed on capped landfill sites to share hardstand and drainage infrastructure • There may be cultural barriers to community purchasing compost • Requires behaviour change from community to separate organic materials for collection • Labour, transport, and operating costs mean composting facility is non-viable for amount of material available • Processing costs not covered by product sales and no gate fee available • Pollution of surface and groundwater due to poor design and operation • Odour complaints due to poor process design and operation • Equipment provided is not used, or is put to other uses	• There may be cultural barriers to community purchasing compost • Requires behaviour change from community to separate organic materials for collection • Labour, transport, and operating costs mean composting facility is non-viable for amount of material available • Processing costs not covered by product sales and no gate fee available • Pollution of surface and groundwater due to poor design and operation • Odour complaints due to poor process design and operation • Equipment provided is not used, or is put to other uses

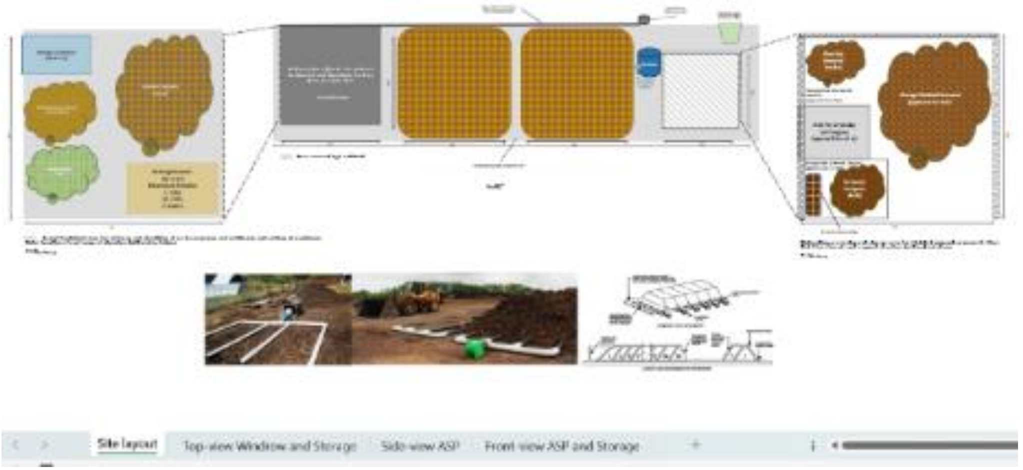
Control process and impacts on environment

Quicker to construct

Adaptable for material throughput

Aerated Static Pile





The New Caledonia Case Study

Sewage sludge + GW – Mango Environnement

Background

2015: Launch of a test center for the co-composting of wastewater treatment plant sludge and green waste - Dumbéa

1 200 T sludge + 1 200 T GW

Testing process + product

VALORGA
Valorisation locale des matières organiques

The New Caledonia Case Study

Sewage sludge + GW – Mango Environnement

- **6 000 T GW + 6 000 T sludge**
- 4 800 T of compost

VALORGA

The New Caledonia Case Study

Key factors

- Choose the right location
- Identify the sources of feedstock and adapt infrastructure accordingly (avoid over-investing)
- Have qualified/trained personnel
- Plan for equipment maintenance (tractor, loader, etc.)
- Use: raising product awareness

Bonus: Be part of a network that shares experiences (processes, technologies, equipment), collaborates on product promotion to increase usage and reduce stock

VALORGA
Valorisation locale des matières organiques

Pick the LOW HANGING Fruit…..

….. And turn it into COMPOST!!

ANY QUESTIONS?

SPREP SUPPORT

EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT

ISLANDS
Pacific Ocean

J-PRISM

PACIFIC OCEAN LITTER PROJECT

SWAP
Sustainable Waste Actions in the Pacific

SITE VISIT

Appendix D: Power Point Presentations

SESSION #7: SUSTAINABLE FINANCING FOR WASTE MANAGEMENT

- Appendix D30: How Sustainable Financing Schemes support de Circular Approach
- Appendix D31: Experience sharing from New Caledonia

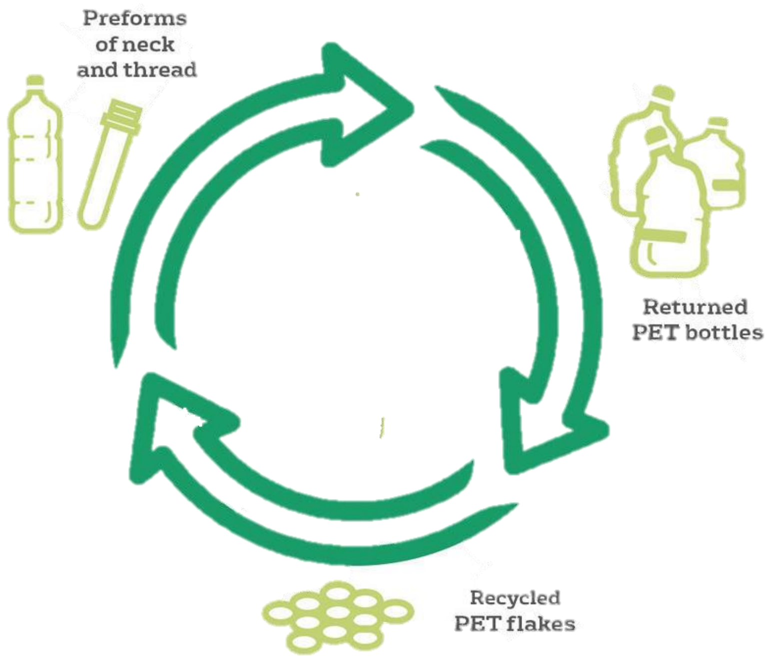
This initiative is supported by **PacWastePlus**-a 72 month p... European Union (**EU**) and implemented by the Secretariat of the Pacif... ...nment Programme (**SPREP**) **to sustainably and cost effectively improv... ...anagement of waste and pollution.**

How Sustainable Financing Schemes Support the Circular Approach

Presented by Ms Hilary Boyes
PacWaste Plus Technical Officer

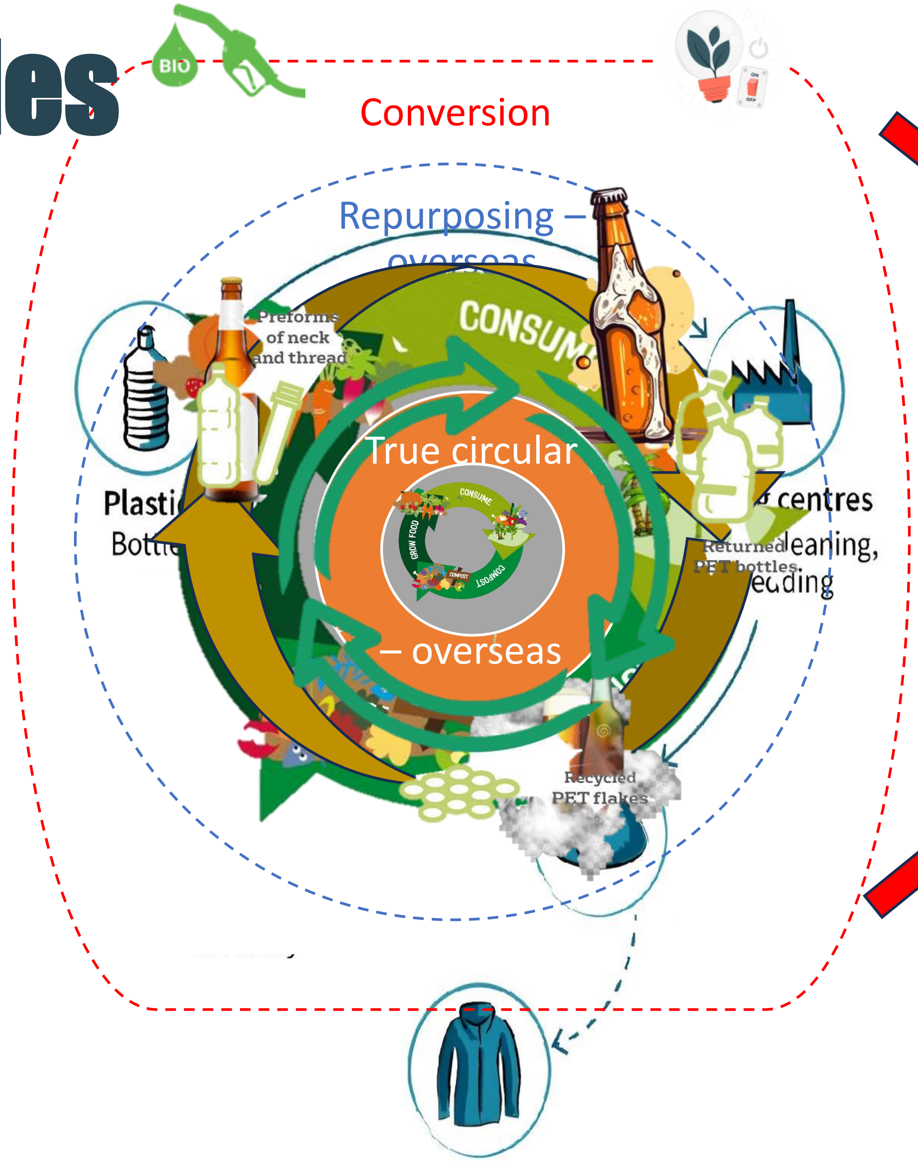
4 October 2024

Session Outline

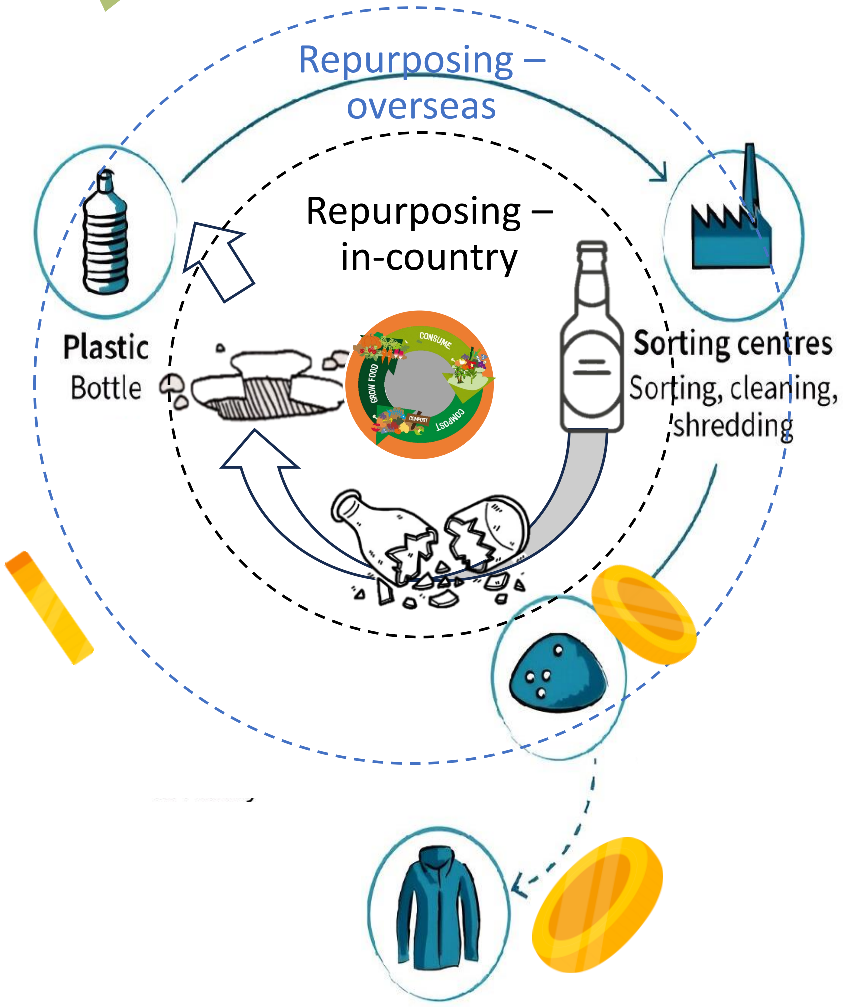


- How Sustainable Financing supports the circular approach
- PICTs Case Studies
- Decision Support
- Resources available

Different Circles



Funding Circular Approach

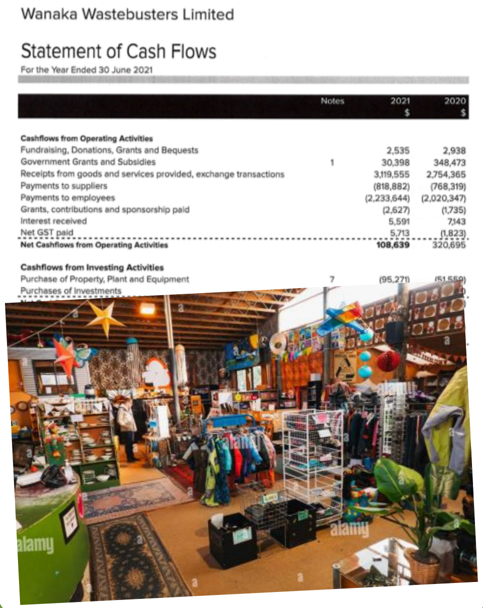


Financing Options for Waste Management

Tipping fee

Prepaid Bag

Taxes (i.e., property tax)



Wanaka Wastebusters Limited

Statement of Cash Flows

For the Year Ended 30 June 2021

	Notes	2021 $	2020 $
Cashflows from Operating Activities			
Fundraising, Donations, Grants and Bequests		2,535	2,938
Government Grants and Subsidies	1	30,398	348,473
Receipts from goods and services provided, exchange transactions		3,119,555	2,754,365
Payments to suppliers		(818,882)	(768,319)
Payments to employees		(2,233,644)	(2,020,347)
Grants, contributions and sponsorship paid		(2,627)	(1,735)
Interest received		5,591	7,143
Net GST paid		5,713	(1,823)
Net Cashflows from Operating Activities		**108,639**	320,695
Cashflows from Investing Activities			
Purchase of Property, Plant and Equipment	7	(95,271)	(51,559)
Purchases of Investments			

Dump shops

Incentivising use of local renewable resources in production and manufacture

Incentivising local production, use of traditional knowledge in design and manufacture

Financing options

Importation Bans

Import Quality Controls

SUSTAINABLE FINANCING (DEPOSIT & FEE SCHEMES)

What:

- Container Deposit, Container Return, or Bottle Return Schemes
- Advance Recovery Fee and Deposit (ARFD)
- Product Stewardship Schemes (PSS)
- Extended Importer / Producer Responsibility (EPR)
- *Levy schemes*

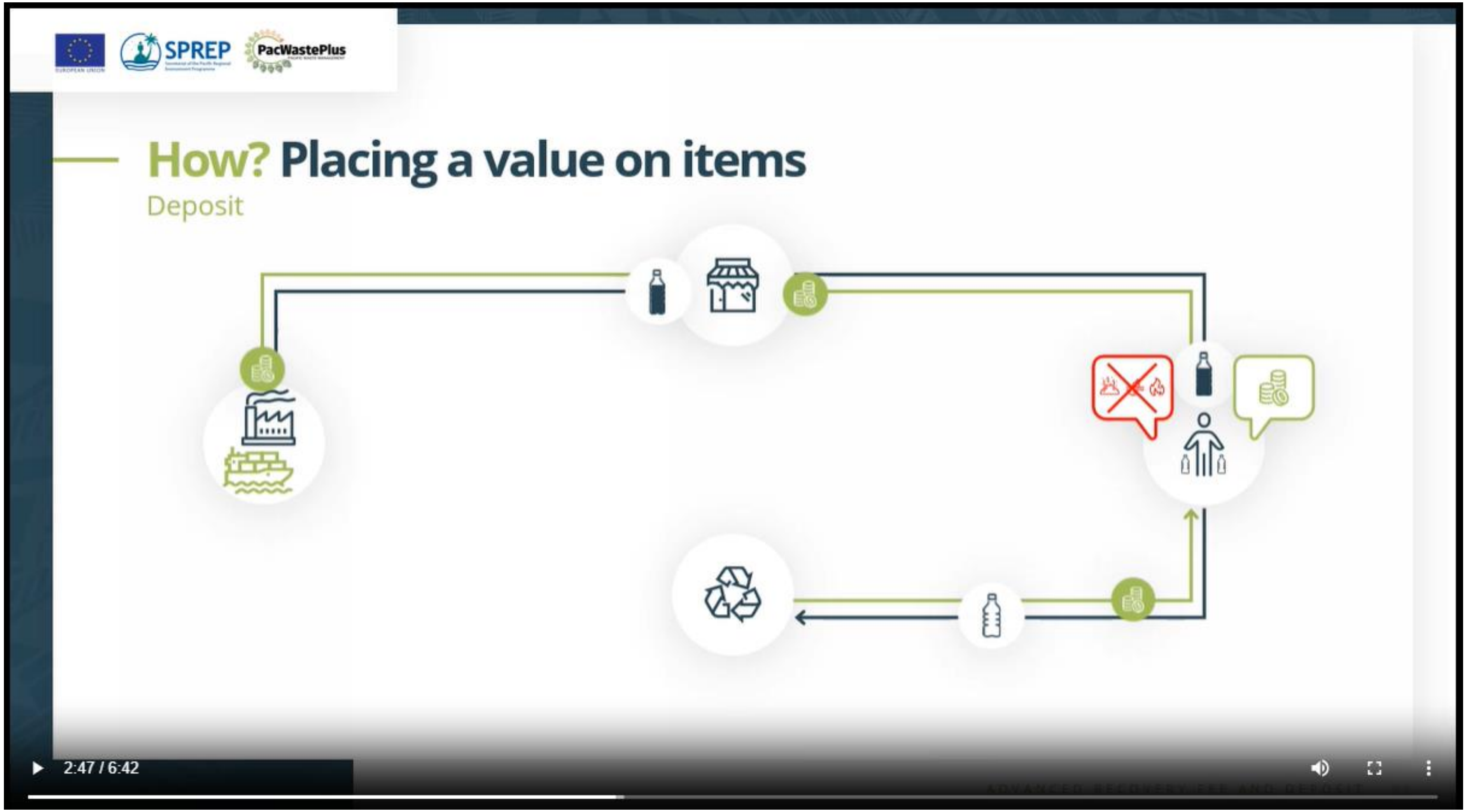
Incentivising use of local renewable resources in production and manufacture

Incentivising local production, use of traditional knowledge in design and manufacture

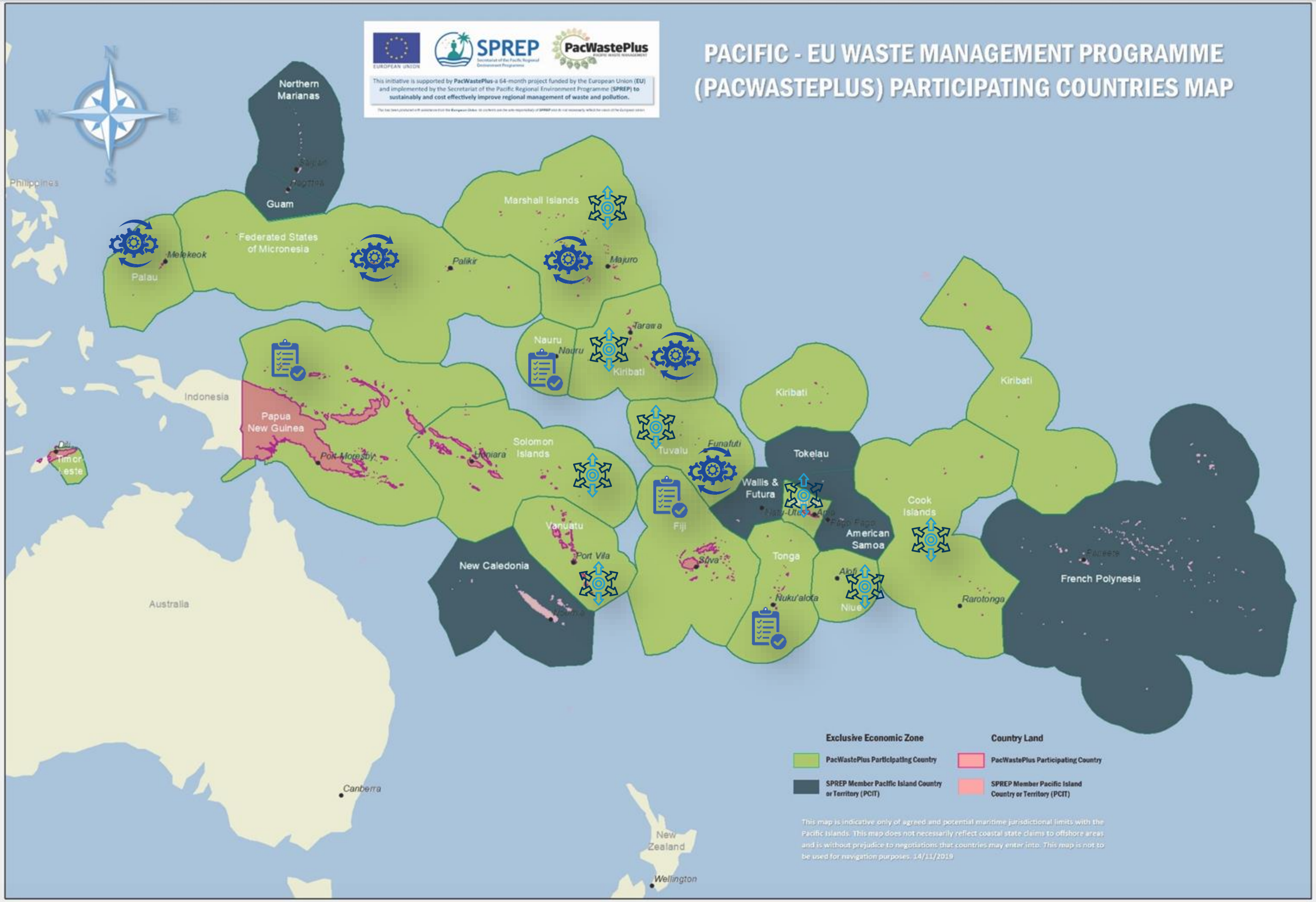
Financing options

Importation Bans

Import Quality Controls



https://pacwasteplus.org/ARFD-Scheme-MP4



SUSTAINABLE FINANCING IN THE PACIFIC

Operation
FSM, Kiribati, Palau, RMI, Tuvalu

Design / Expansion
Cook Islands, Fiji, Nauru, Niue, Samoa, Solomon Islands, Vanuatu
*Kiribati, Palau, RMI, Tuvalu

Feasibility Study
Tonga, PNG

FSM

- PET
- Aluminum

Kiribati

- PET
- Aluminum

Palau

- PET, HDPE
- Aluminum
- Glass
- TetraPak

RMI

- PET
- Aluminum

Tuvalu

- PET
- Aluminum
- E-waste
- EOL vehicles
- ULAB

	FSM	Kiribati	Palau	RMI	Tuvalu
Scheme Performance	86%	90%	84%	85%	67%

Source: https://www.reloopplatform.org/

Vanuatu Case Study

PSS's Goals:

- Divert eligible items from landfill into recovery
- Reduce amount of eligible items that are littered or released to the environment
- Equitable / operational across all 6 provinces of Vanuatu, through readily accessible redemption centres
- Scheme structured as to fully fund the collection, transport, pre-processing, and sale to market (extended producer responsibility)
- Suitable financial incentive for consumers to return eligible items
- Scheme operation should create new employment opportunities in all 6 provinces

Goals Fit With:

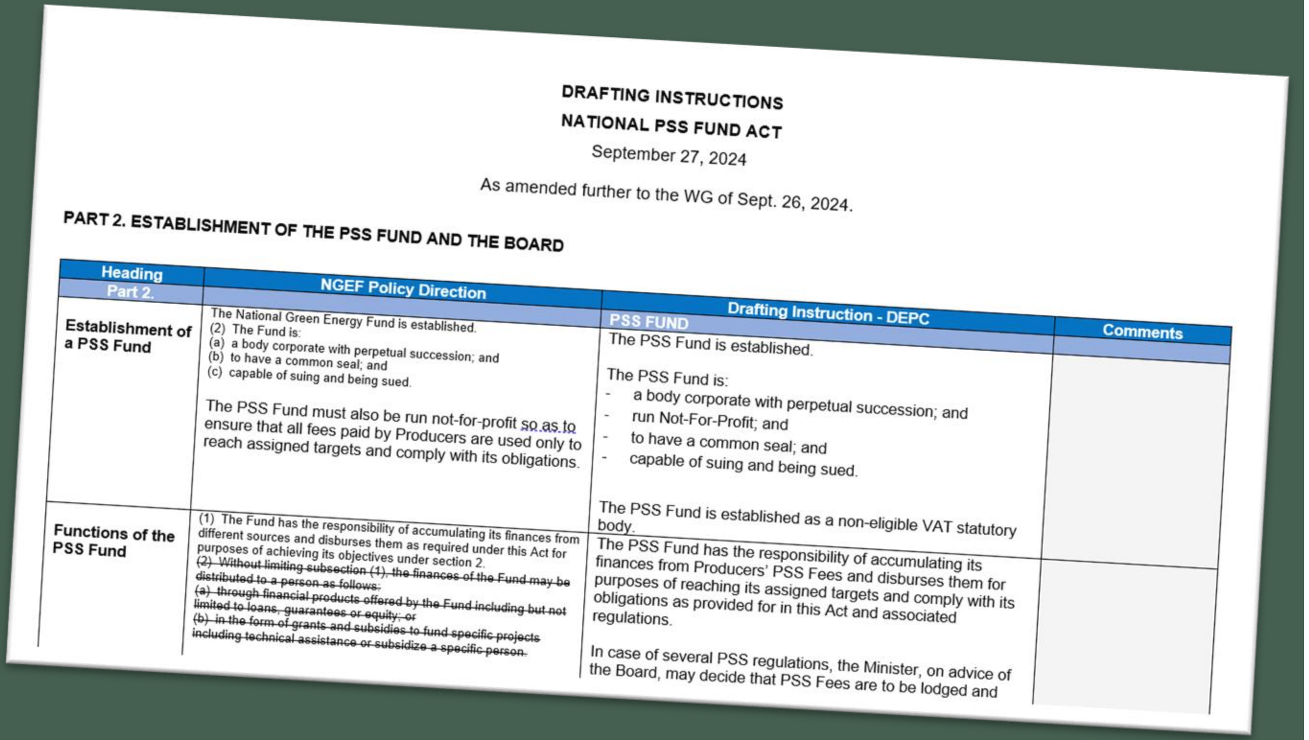
- **VANUATU 2030 The People's Plan**
- **Vanuatu National Waste Management and Pollution Control Strategy (2016–2020):**
    - Objective 4.1: To reduce waste generated and landfilled.
    - Objective 5.1: To implement effective waste collection and disposal throughout Vanuatu
    - Objective 7.1: To increase public awareness on their waste management responsibilities
    - Objective 7.2: To introduce and enhance community participation on waste management
- **Vanuatu National Environment Policy and Implementation Plan (2016–2030)** which calls for the establishment of incentive schemes that implement the polluter pays principle by encouraging cleaner production and waste recovery (PO 3.3.)
- Article 7 (d) of the Constitution of Vanuatu:
- Every person has a fundamental duty to "*protect the Republic of Vanuatu and to safeguard the national wealth, resources and environment in the interests of the present generation and of future generations*."
- **Vanuatu's national position, and regional role as PSIDS Chair at the INC plastic negotiations.**

Vanuatu Case Study

- Long design phase
- Working Group – strong opinions, not always aligned with DEPC
- Minister involvement

- Getting close to finalising scheme – draft Drafting Notes for legislation and regulations

- Key features:
  - **PSS Act** and **Regulations** for each waste type
  - **Statutory Board** – 49% Government / 51% Private
  - Scheme Finance held **OUTSIDE government**
  - Fund Manager recruited/contracted to run the scheme, at direction of the Board
  - Returns controlled by targets


DRAFTING INSTRUCTIONS
NATIONAL PSS FUND ACT
September 27, 2024

As amended further to the WG of Sept. 26, 2024.

PART 2. ESTABLISHMENT OF THE PSS FUND AND THE BOARD

Heading Part 2.	NGEF Policy Direction	Drafting Instruction - DEPC PSS FUND	Comments
Establishment of a PSS Fund	The National Green Energy Fund is established. (2) The Fund is: (a) a body corporate with perpetual succession; and (b) to have a common seal; and (c) capable of suing and being sued. The PSS Fund must also be run not-for-profit so as to ensure that all fees paid by Producers are used only to reach assigned targets and comply with its obligations.	The PSS Fund is established. The PSS Fund is: - a body corporate with perpetual succession; and - run Not-For-Profit; and - to have a common seal; and - capable of suing and being sued. The PSS Fund is established as a non-eligible VAT statutory body.	
Functions of the PSS Fund	(1) The Fund has the responsibility of accumulating its finances from different sources and disburses them as required under this Act for purposes of achieving its objectives under section 2. ~~(2) Without limiting subsection (1), the finances of the Fund may be distributed to a person as follows:~~ ~~(a) through financial products offered by the Fund including but not limited to loans, guarantees or equity; or~~ ~~(b) in the form of grants and subsidies to fund specific projects including technical assistance or subsidize a specific person.~~	The PSS Fund has the responsibility of accumulating its finances from Producers' PSS Fees and disburses them for purposes of reaching its assigned targets and comply with its obligations as provided for in this Act and associated regulations. In case of several PSS regulations, the Minister, on advice of the Board, may decide that PSS Fees are to be lodged and	

Vanuatu Case Study

- **<u>Recommendations based on our learnings:</u>**

  - Working Group – important, but ensure they are aware of their role:
    - Advising -v- Deciding

  - Minister involvement – important, but valuable if understand/aligned with the goals

  - Finance is a key topic – start conversations with high-level representatives early

  - Having a precedent / template Act clarified process:
    - Managing Agency -v- Government Run
      -v- Statutory Board

New Caledonia Case Study

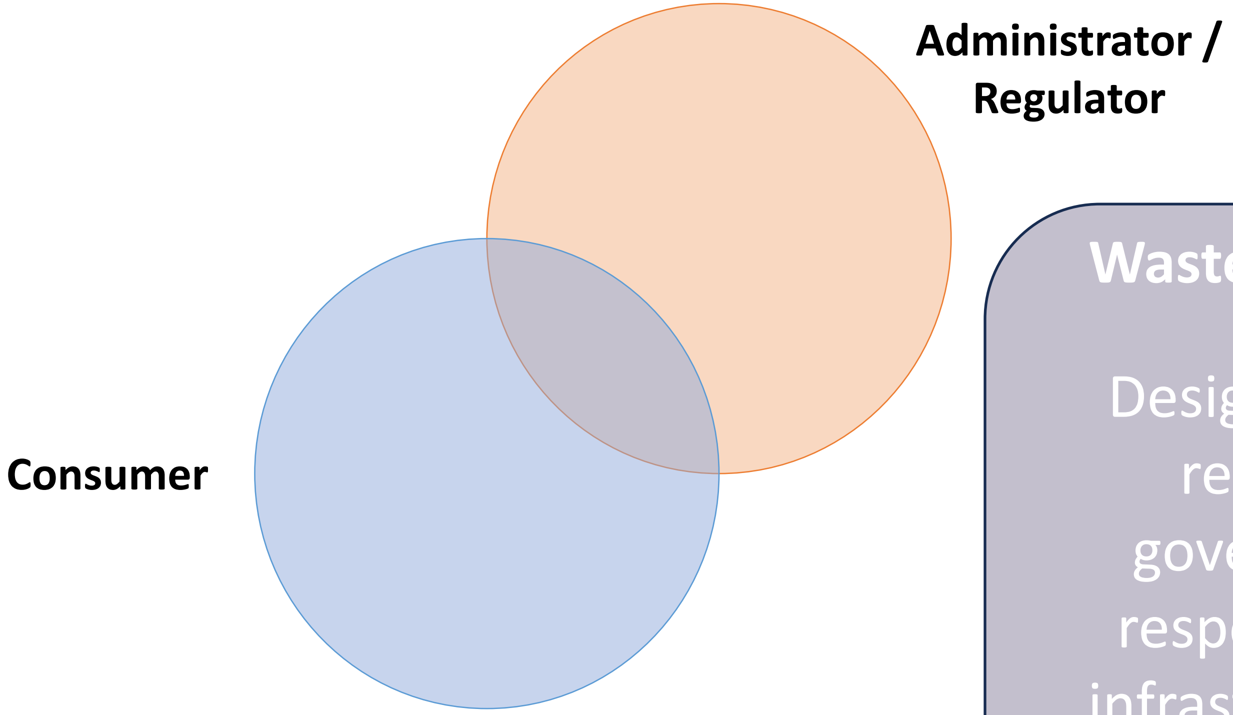
Effective Design

Consumer

Administrator / Regulator

Manufacturer / Importer / Operator

Effective Design



Waste Management Scheme

Designed for products to be returned, but requires government to assume all responsibility for collection infrastructure / networks etc. Not financially self-sustaining

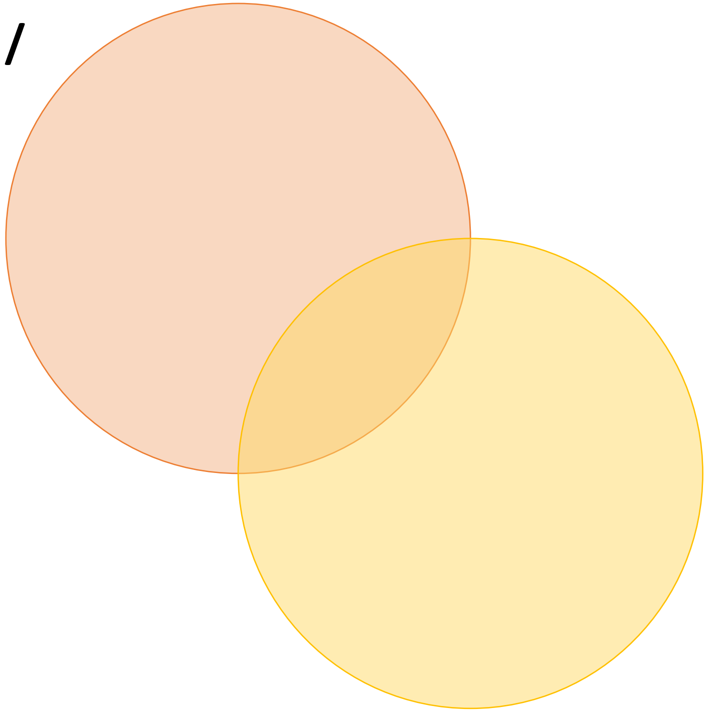
Effective Design

Consumer

Administrator / Regulator

Manufacturer / Importer / Operator

Effective Design



Revenue Raising Scheme

Community largely not engaged, limited collection depots; as costs rely on industry; low return rates.

Effective Design

Consumer

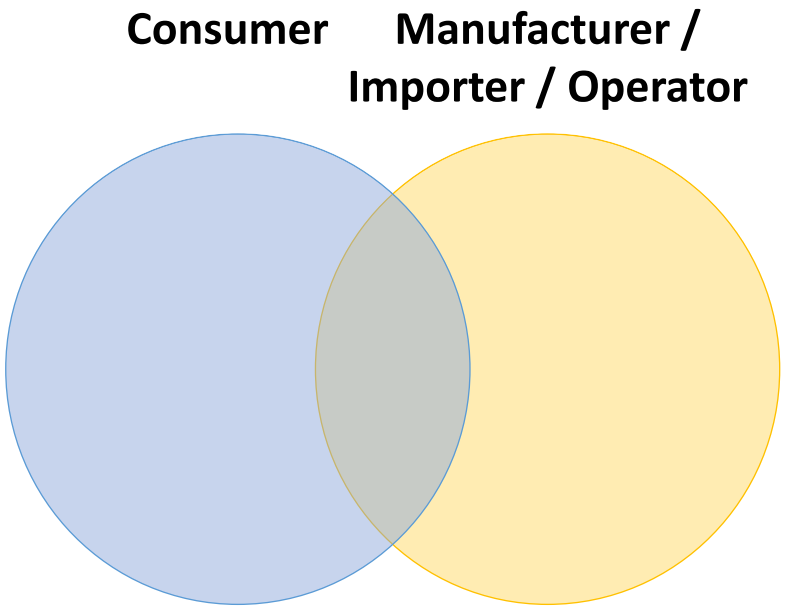
Administrator / Regulator

Manufacturer / Importer / Operator

Effective Design

Voluntary Scheme

No Government oversight, entirely managed by industry, typically few redemption centres, usually not successful long-term (global experience)



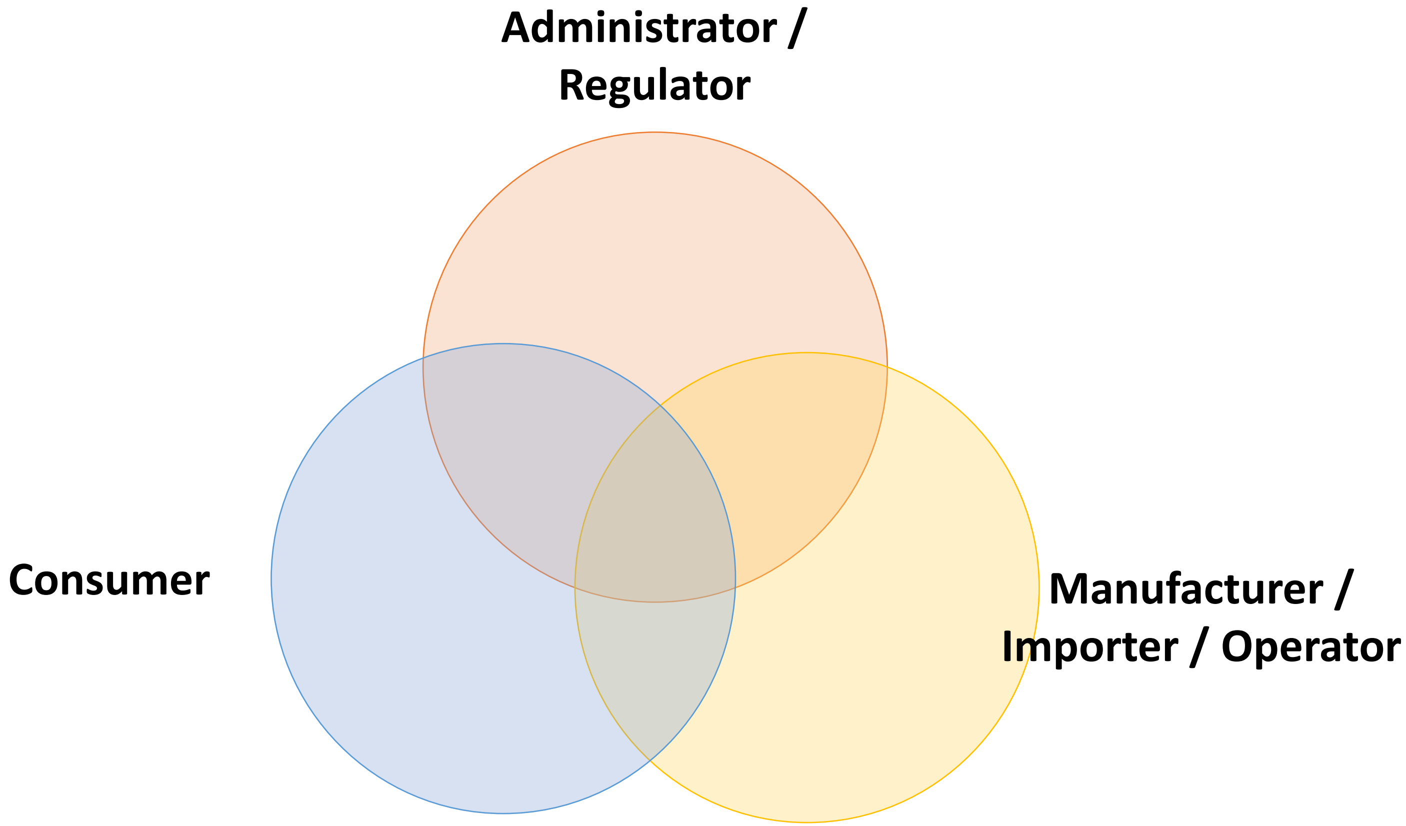
Effective Design

Consumer

Administrator / Regulator

Manufacturer / Importer / Operator

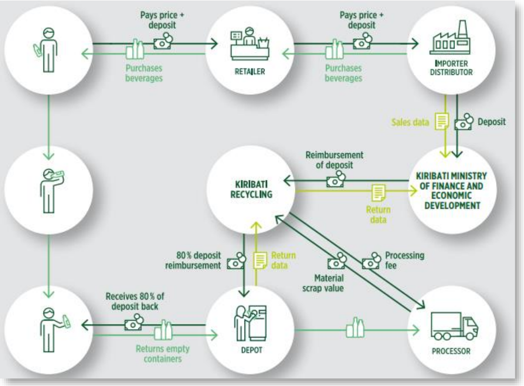
Effective Design



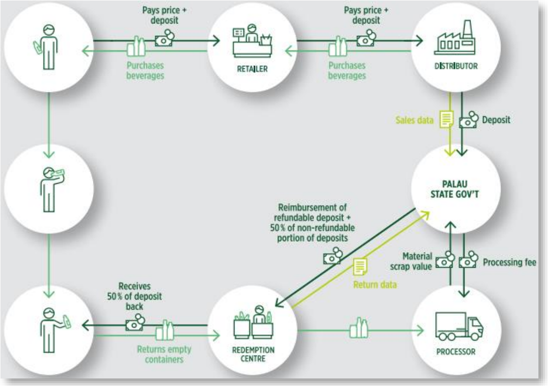
Fee and Deposit Schemes

Well designed scheme,
achieving recycling goals,
fair and transparent processes
Social inclusion / community participation,
Government oversight enabling appropriate reporting, ensuring scheme achieves goals expected from constituents

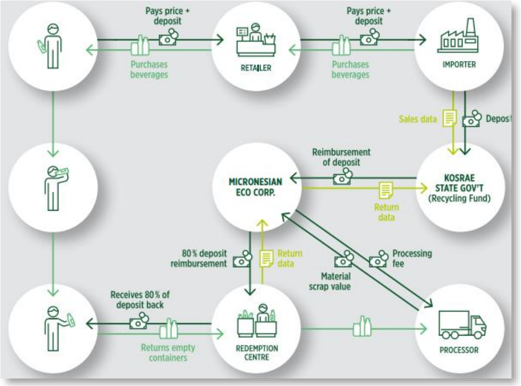
NO "ONE SIZED FITS ALL"



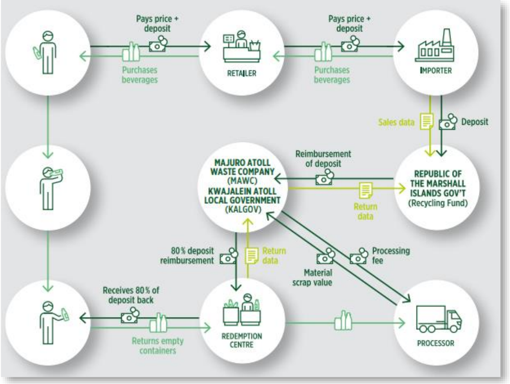
Kiribati



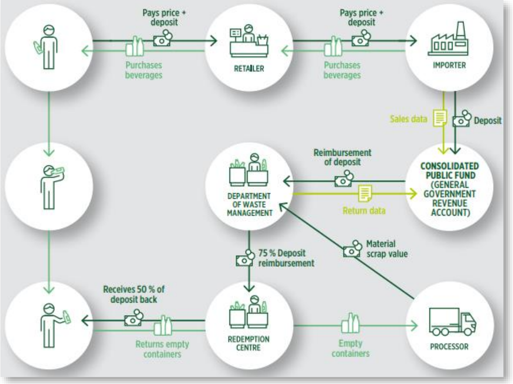
Palau



FSM



RMI



Tuvalu

Economic Model

PSS model

SCENARIO	6

SCENARIOS

A map and a description of each Scenario is included in the 'MANUAL' sheet

SCENARIOS	
2 Main Islands Depots	1
2 Main Islands Depots + 2Trucks	2
6 Main Province Islands Depots	3
6 Main Province Islands Depots + 5Trucks	4
23 Depots in 13 Main Islands	5
13 Main Islands Depots + 5Trucks	6

INFLATION RATE	5,00%	
INCLUDE COSTS OF THE PROCESSING FACILITIES ?	YES	
DEPOSIT FEE (per container)	10	VUV
NON-RECYCLABLE PENALTY FEE	2,70	VUV
LPB CONTAINERS ARE RECYCLABLE ?	YES	
HDPE CONTAINERS ARE RECYCLABLE ?	YES	
GLASS CONTAINERS ARE RECYCLABLE?	YES	
OTHER CONTAINERS ARE RECYCLABLE?	NO	

Variables

- ✓ Collection scenarios
- ✓ Deposit fee
- ✓ Non-recycling penalty fee
- ✓ Material Recyclability (LPB, glass, HDPE)
- ✓ Inflation rate
- ✓ Inclusion/exclusion of processing costs

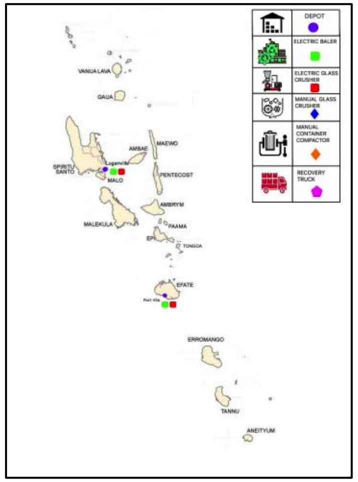
Outcomes

- ✓ Return rates
- ✓ System effectiveness
- ✓ Environmental impact
- ✓ Return on Investment
- ✓ Operational cost & net Results
- ✓ PSS Financing

Collection Depot Network

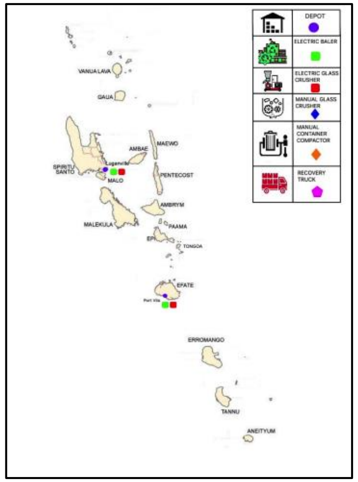
- Assessed various PSS design options, from the most minimal to the most ambitious

SCENARIO 1



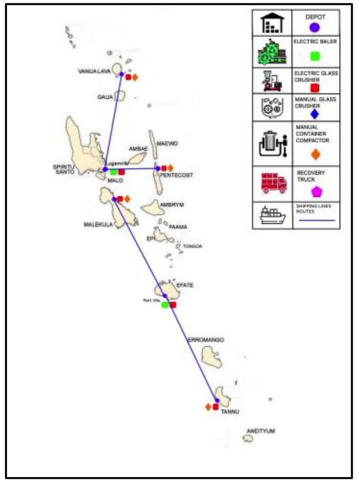
2 Depots in 2 main islands
No collection service

SCENARIO 2



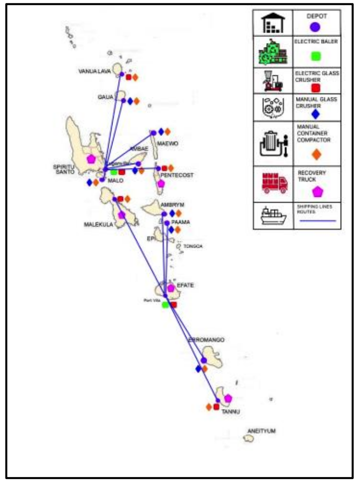
2 Depots in 2 main islands **with collection service**

SCENARIO 3



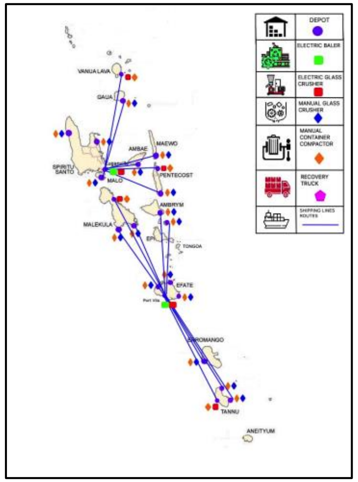
6 Depots in main island of 6 provinces
No collection service

SCENARIO 4



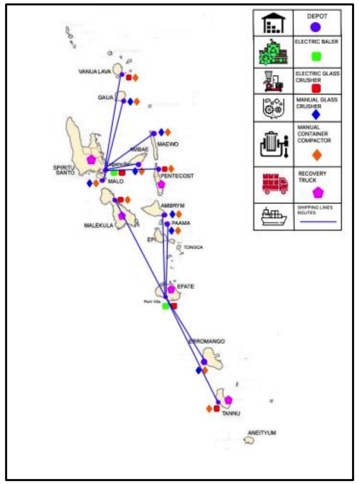
6 Depots in main island of 6 provinces **with collection service**

SCENARIO 5



23 Depots in 13 main islands
No collection service

SCENARIO 6



13 Depots in 13 main islands **with collection service**

1) INITIAL DATA: NUMBER OF CONTAINERS OF EACH TYPE IN 2024 (previous year)

	2023			2024				
TYPE OF CONTAINER	KILOGRAMS	Nº BOTTLES	TYPE OF CONTAINER	Nº BOTTLES	% Cont.	KILOGRAMS	% Kg
PET	1.472.000	49.066.667	PET	51.029.333	24,40%	1.530.880	23,18%
HDPE	168.300	5.610.000	HDPE	5.834.400	2,79%	175.032	2,65%
GLASS	2.768.000	8.141.176	GLASS	8.304.000	3,97%	2.823.360	42,75%
ALUMINIUM	1.489.000	114.538.462	ALUMINIUM	120.265.385	57,51%	1.563.450	23,68%
LPB	400.000	18.181.818	LPB	18.545.455	8,87%	408.000	6,18%
OTHER	100.000	5.000.000	OTHER	5.150.000	2,46%	103.000	1,56%
TOTAL	6.397.300	200.538.123	TOTAL	209.128.572		6.603.722	

*Data From: Recycling Network Pre-Feasibility Study

MANUAL | Dashboard | INITIAL DATA | INITIAL INVESTMENT | HANDLING COSTS | INTERNAL SHIPMENT

2) INITIAL INVESTMENT: QUANTITIES AND PRICES OF THE INITIAL INVESTMENT OF THE SCHEME

EQUIPMENT PRICES	
CONCEPT	PRICE
BIG BALER	12.000.000,00 VUV
BIG GLASS CRUSHER	1.500.000,00 VUV
CONTAINER COMPACTOR	20.000,00 VUV
SMALL GLASS CRUSHER	20.000,00 VUV
BIG TRUCK	5.700.000,00 VUV
SMALL TRUCK / VAN	3.700.000,00 VUV
FIBER GLASS DEPOTS	600.000,00 VUV

ADMINISTRATION INITIAL INVESTMENT	
CONCEPT	PRICE
New or upgraded systems /software	16.000.000,00 VUV
Any external advice or auditing	14.000.000,00 VUV
LEGACY WASTE FUND	39.329.930,00 VUV
XXXXX	0,00 VUV
TOTAL ADMINISTRATION INVESTMENTS	69.329.930,00 VUV

MANUAL | Dashboard | INITIAL DATA | INITIAL INVESTMENT | HANDLIN

COLLECTION	VANUA LAVA (Torba)	FIBER GLASS CONTAINERS	3	1.800.000,00 VUV
		BIG GLASS CRUSHER	1	1.500.000,00 VUV
		CONTAINER COMPACTOR	1	20.000,00 VUV
			TOTAL	3.320.000,00 VUV
	PENTECOST (Penama)	FIBER GLASS CONTAINERS	3	1.800.000,00 VUV
		BIG GLASS CRUSHER	1	1.500.000,00 VUV
		CONTAINER COMPACTOR	1	20.000,00 VUV
			TOTAL	3.320.000,00 VUV
	MALEKULA (Malampa)	FIBER GLASS CONTAINERS	3	1.800.000,00 VUV
		BIG GLASS CRUSHER	1	1.500.000,00 VUV
		CONTAINER COMPACTOR	1	20.000,00 VUV
			TOTAL	3.320.000,00 VUV
	TANNA (Tafea)	FIBER GLASS CONTAINERS	3	1.800.000,00 VUV
		BIG GLASS CRUSHER	1	1.500.000,00 VUV
		CONTAINER COMPACTOR	1	20.000,00 VUV
			TOTAL	3.320.000,00 VUV
		TOTAL COLLECTION		13.280.000,00 VUV

3) **ADMINISTRATION COSTS:** COSTS OF RUNNING THE SCHEME IN THE ADMINISTRATION SIDE (QUANTITIES AND PRICES)

2024 ADMINISTRATION COSTS (per year)		
Salaries Staff in Administration	5.200.000	VUV
Software Programs Maintenance	1.500.000	VUV
Awareness Programs Expenses	1.000.000	VUV
Audit and Report Expenses	600.000	VUV

ADMINISTRATION MAINTENANCE COSTS						
CONCEPT		2024	2025	2026	2027	2028
ADMINISTRATIVE COSTS FOR RUNNING THE SCHEME						
Staff Salaries. - People Working in the Administration of the	1	5.200.000,00 VUV	5.460.000,00 VUV	5.733.000,00 VUV	6.019.650,00 VUV	6.320.632,50 VUV
Software Programs Maintenance		1.500.000,00 VUV	1.575.000,00 VUV	1.653.750,00 VUV	1.736.437,50 VUV	1.823.259,38 VUV
PUBLIC AWARENESS AND EDUCATION						
Awareness Programs Expenses		1.000.000,00 VUV	1.050.000,00 VUV	1.102.500,00 VUV	1.157.625,00 VUV	1.215.506,25 VUV
MONITORING AND EVALUATION						
Audit and Report Expenses		600.000,00 VUV	630.000,00 VUV	661.500,00 VUV	694.575,00 VUV	729.303,75 VUV
TOTAL ADMINISTRATION MAINTENANCE		8.300.000,00 VUV	8.715.000,00 VUV	9.150.750,00 VUV	9.608.287,50 VUV	10.088.701,88 VUV

4) HANDLING COST: COSTS OF RUNNING THE SCHEME IN THE COLLECTION SIDE (QUANTITIES AND PRICES)

PRICES	
1 person salary Year FULL TIME	5.200.000,00 VUV
Price 1liter petrol	200,00 VUV
Price 1KW/h	100,00 VUV

DISTANCES		Liters/100km	Consume per Trip	Cost per Trip
LUNGAVILLE	350	15	52,5	10.500,00 VUV
MALAKULA	262	10	26,2	5.240,00 VUV
PENTECOST	90	10	9	1.800,00 VUV
PORT VILA	140	15	21	4.200,00 VUV
TANNA	208	10	20,8	4.160,00 VUV

WORKING DAYS &TRIPS PER YEAR	NUMBER
VANUA LAVA	12
LUNGAVILLE	24
MALAKULA	24
PENTECOST	24
PORT VILA	48
TANNA	24
GAUA	6
MAEWO	6
AMBAE	6
MALO	6
AMBRYM	6
PAAMA	6
ERROMANGO	6

5) INTERNAL SHIPMENT: CAPACITY AND PRICES OF THE SHIPMENT FROM THE ISLANDS TO THE MAIN FACILITIES OF RECYCLING COMPANY

BIG BAG CAPACITY	
VOLUMEN	2.5 M3
PET Bottles	3.500
HDPE Bottles	3.000
GLASS Bottles	4.000
ALUMINIUM Cans	5.000
LPB	3.000
OTHER	3.000

BIG BAG INTERNAL SHIPMENT	
VANUA LAVA - LUNGAVILLE	5.000,00 VUV
GAUA - LUNGAVILLE	5.000,00 VUV
MALO - LUNGAVILLE	5.000,00 VUV
AMBAE - LUNGAVILLE	5.000,00 VUV
MAEVO - LUNGAVILLE	5.000,00 VUV
PENTECOST - LUNGAVILLE	5.000,00 VUV
MALEKULA - PORT VILA	5.000,00 VUV
AMBRYM - PORT VILA	5.000,00 VUV
PAAMA - PORT VILA	5.000,00 VUV
ERROMANGO - PORT VILA	5.000,00 VUV
TAANA - PORT VILA	5.000,00 VUV

LIVE DEMO

21 STEP PATHWAY
Identify Need
01
Pre-feasibility
02
Political Support
03
Working Group
04
Feasibility Study
05
Legislative Assessment
06
Consultation
07
System Design
08
Policy
09
Legal Drafting
10
Consultation
11
Political Endorsement
12
System Needs / Infrastructure
13
Legal Adoption
14
System Creation
15
Training
16
Legacy Waste
17
Awareness
18
19
SCHEME IMPLEMENTATION
M&E/ Auditing
20
System Expansion
21
Legend:
Feasibility
Legislative / political
Communication
System Creation
EUROPEAN UNION
SPREP
Secretariat of the Pacific Regional Environment Programme
PacWastePlus
PACIFIC WASTE MANAGEMENT
ADVANCED RECOVERY FEE AND DEPOSIT

01

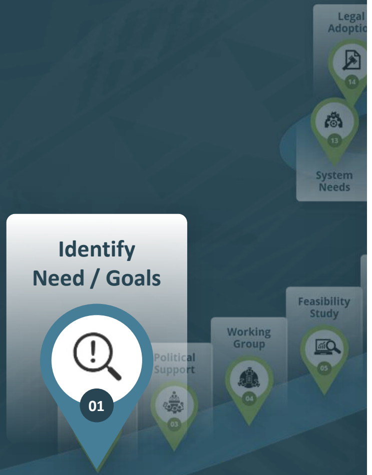
Identify Needs / Scheme Goals

Identify problem
What problem seeking to solve

Identify existing waste management practices
Materials flow, disposal, existing recycling, litter / burning

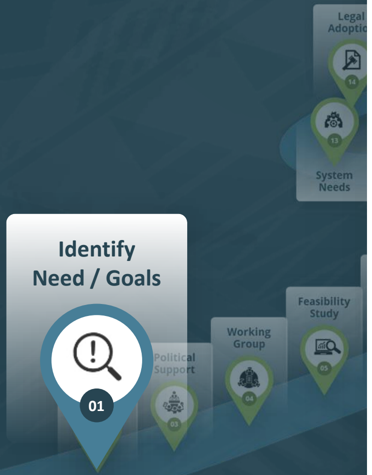
Identify current funding and funding gaps
What are the problematic waste materials and items

Identify purpose
What overarching purpose or outcome is sought



01

Identify Needs / Scheme Goals



What Involved to Complete Step	Information / Consultation Recommended to Complete Step	Resources Available
Identifying what the scheme seeks to achieve will influence almost all aspects of scheme design – i.e., if seeking primarily to: • manage litter, this may influence decisions around type of items collected, ease for community to access Collection Depots, and level of the Deposit component of the ARFD. • enable "product stewardship" or provide for shared responsibility for waste management (across importers, consumers, and the government), this may influence decisions around when to collect the ARFD (at import or upon return), and type of Collection Depots selected. • fund the purchase of equipment to provide in-county recovery/circular economy solutions for waste management, this may influence the level of the Fee component of the ARFD. This step will assist gathering of data to: 1. Review and understand the operation and performance of any existing ARFD / Container Deposit / buy-back Schemes (voluntary or otherwise). 2. Understand the general flow of End-of-Life materials and the current situation for litter and waste management. 3. Identify current situation for financing of waste management and identify potential financing gaps. 4. Confirm what is sought to achieve for future waste management through the implementation of an ARFD scheme.	• Findings from a recent Waste Audit or complete a Waste Audit using a consistent methodology Waste Audit Methodology: A Common Approach • Findings from a recent litter survey or complete a Litter Survey using a consistent approach such as the Australian Litter Measure • Data / reports from existing/previous ARFD / "buy-back" schemes – items collected, depot operation, information on materials processing, and items exported. • Information from recyclers – current recycling activities, information on materials processing, items exported, and challenges/ barriers / opportunities for recycling. • Information from customs and exporters – data on items imported and exported. • Information from government waste team – current waste flow and materials management, data from kerbside recycling, and challenges/ barriers / opportunities for recycling. • Data from Treasury / Finance, and Waste – current financing for waste management.	Complete a Waste Audit  Complete a Litter Survey  Guide for investigative questioning 

01

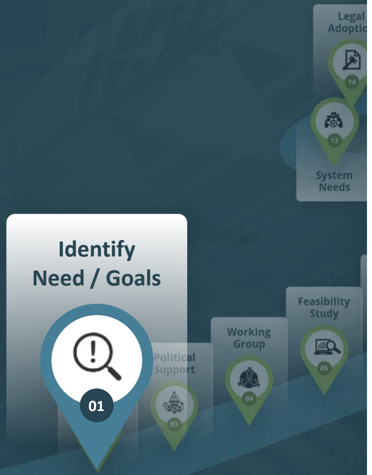
Identify Needs / Scheme Goals

Flow of Potentially Recyclable Materials

The current management of the potentially recyclable materials is key information when designing an ARFD for scheme design. Complete the following table to illustrate where recyclable materials end up once they reach the end of their useful life. Gather as much information as possible but do not dwell if data to answer every question is not available. (Note: further details will be asked on the management of these materials below in Step 2).

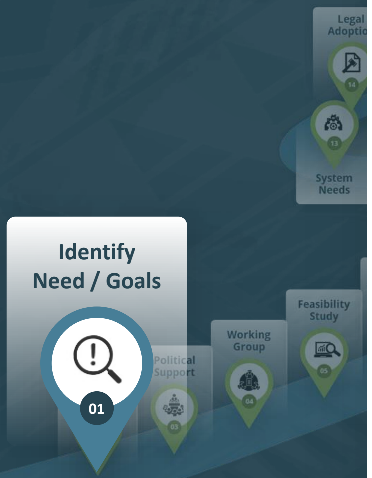
Some of the data necessary to complete the table below (and in Steps 2 and 5) will be sourced from the Private Sector such as importers such as existing recyclers or exporters. These organisations may hesitate to share data as there may be commercial sensitivity (they may not want their competitors or communities to see volumes or export arrangements, etc). It is recommended to respect their privacy and find a mutually agreeable way for the data to be obtained – consider signing a confidentiality agreement and commit to only using the data in internal discussions and in a generalised consolidated way (i.e., not able to see individual operations), or share data via an independent agency (i.e., Department of Treasury / Finance, an accounting firm, or external consultant) who will undertake the generalisation and consolidation. **Private Sector recyclers will be key partners in an ARFD scheme. If the trust of these agencies is broken at an early stage in the process it may be difficult to regain.**

Item	Landfill / Dumpsite		Collected for Recycling		Stockpiled		Exported		Litter		Dumping / Burnt		Comments / Other Disposal Provide Details and Weight/Volume
		Weight *		Weight *		Weight *		Weight *		Weight *		Weight *	
PET bottles (plastic)	Y/N		Y/N		Y/N		Y/N		Y/N		Y/N		
Aluminium cans	Y/N		Y/N		Y/N		Y/N		Y/N		Y/N		
Glass bottles	Y/N		Y/N		Y/N		Y/N		Y/N		Y/N		
Other containers – HDPE, LPB, tin food cans	Y/N		Y/N		Y/N		Y/N		Y/N		Y/N		



01

Identify Needs / Scheme Goals



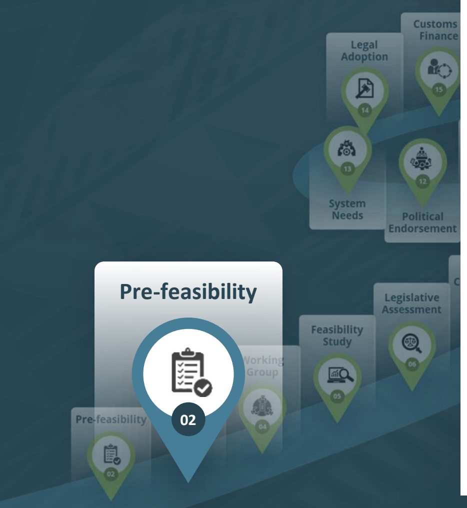
Consider possible ARFD Scheme Goals as illustrated below, and assign each one a priority by dragging it into one of the four boxes:

Other priorities may be identified for the scheme to achieve – such as Alignment with the Sustainable Development Goals (e.g., Target 12.5 'reduce waste generation by 2030'). Write or illustrate these and place in the priority list.

Priority	Comments
Top Priority (recommend ~3 items)	
Medium Priority	
Low Priority	
No priority (not relevant)	

02 Undertake a pre-feasibility analysis

- **Identify products to target**
  What are the problematic waste materials
- **Identify stakeholders**
  Who should be involved in scheme design
- **Consider scheme components**
  Options for materials processing, collection depots, scheme financial management, scheme model
- **Identify the role of the government**
  What is the appropriate role of government agencies
- **Identify “parent” legislation**
  Where can a scheme fit within legislative environment



02

Undertake a pre-feasibility analysis

Geographical Context

Complete the table to assess population spread and geographical context.

Population of country	
How many inhabited islands	
How many provinces	
Population of main island or capital	
How many towns/cities of more than 30,000 people	
How many communities with more than 1,000 people	
What is the community structure	
Considering the island / community furthest from the main town/capital, how does this community get deliveries of food and household items – what are the infrastructure and existing transport networks?	
Considering shipping and land transport - what does it cost for delivery of a pallet of goods to this community?	
Are there any local "taboo's" or customs that may provide a barrier for households to return "waste" materials (and receive a refund)?	
Are there any existing village structures or schemes (i.e., youth groups, community loan schemes, etc) that may provide an opportunity for households to return "waste" materials (and receive a refund)?	

The following illustration highlights scheme return rates from across global ARFD scheme comparing deposit rates in USD (y axis). This graph illustrates that to achieve a recycling rate of around 80% (re

What factors may be important for Collection Depots to enable an effective ARFD. Options are provided to the right – consider each and answer yes (if important) or no (if not). Add comments or further important factors in the "other" category. These results may improve understanding of the best Collection Depots style or styles. Different material types (beverage containers v bulky waste) and different communities (capital island v outer provinces) may have different requirements for Collection Depots. Note thoughts / ideas for further analysis in later steps. 	Consider what Collection Depot to achieve	Y/N	Comments
	Equal access to all communities across the country		
	Inclusive access and operating hours – people of all ability levels and working hours can access		
	Establish meaningful employment opportunities		
	Link in with existing infrastructure		
	Community owned and operated		
	High consideration for managing fraudulent activities		
	Appropriate to local setting and community		
	Schemes provide a "product stewardship" approach (if a retailer sells an item, they are required to "buy" it back)		
	Other:		
	Other:		

03

Political Support

- **Identify and Liaise with Political “Champion”**
  Who will support scheme initiative at the political level
- **Develop High-level Briefing Paper**
  Summarising results from pre-feasibility study
- **Support for Next Steps**
  Complete feasibility study and form a multi-agency “Working Group”

03

Political Support

The Political Champion may request a briefing paper that they can table at the next sitting of Cabinet or Government Advisor Committee etc.

This paper would be intended to briefly describe what an ARFD is and what the implications may be for the country. A briefing paper is typically less than 5 pages. Use an approved Ministry template or follow the following general format:

	Briefing Paper Text	*Example*
Purpose		*Seeking to implement an ARFD scheme to improve rates of recycling across the country and enable a "product stewardship" model to provide a shared responsibility for waste management (across importers, consumers, and the government)*
Background		*A scheme would require provision of two elements:* 1. *an incentive for consumers to recycle, changing behaviour away from littering, burning, or disposing to landfill* 2. *a self-sustainable funding source for governments/recyclers to undertake the collection, transport, processing, and export/recycling of recoverable materials.* *Scheme in operation across the world and in 5 PICs and are a proven way*
Benefits		*Summarise findings from waste audit and litter assessment*
Legal Considerations		*Summarise findings from legal assessment*

04

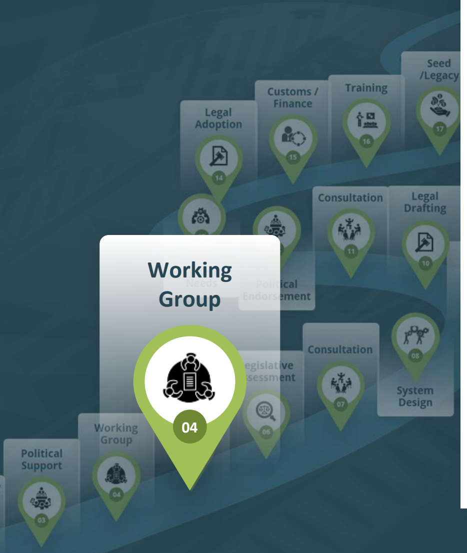
Establish a Working Group

Bring Together Key Stakeholders
Assist in the design of the sustainable financing system

Form the Working Group
Determine agreed role and function – Consider establishing a TOR or MOU

Relevant Representatives may include:

- Department of Environment
- Attorney General's Office / Crown Law
- Department of Customs
- Department of Finance
- Department of Community / Women’s Affairs
- Local Government
- Private Sector – importers, retailers, recyclers

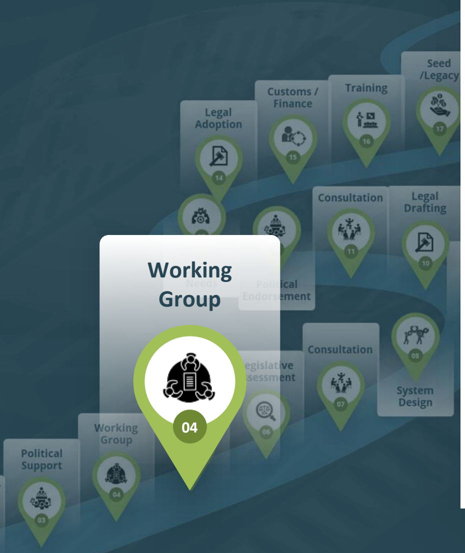


04

Establish a Working Group

1. Identify scheme partners	Step 2 illustrated, at a high-level, how a scheme may operate, and we identified the key players. It is these key players that sh considered to be part of the multi-agency Working Group. Consider the key players below and add any others identified above – i.e., Local Government? AG Office? Write in the box pro may be appropriate to represent that group during the design of the ARFD.

IMPORTERS / LOCAL MANUFACTURES	RETAILERS	CONSUMERS	RECYCLERS	SCHEME EQUALITY	FINANCE	CUSTOMS	
What agency may be appropriate to represent importers and manufactures during ARFD scheme design?	What agency may be appropriate to represent retailers during ARFD scheme design?	What agency may be appropriate to represent communities during scheme design?	What agency may be appropriate to represent recyclers during scheme design?	What agency may be appropriate to represent marginalised during scheme design?	Is Finance required to be represented during scheme design?	Is Customs required to be represented during scheme design?	Wha stak shou repr durii desi Atto Gen



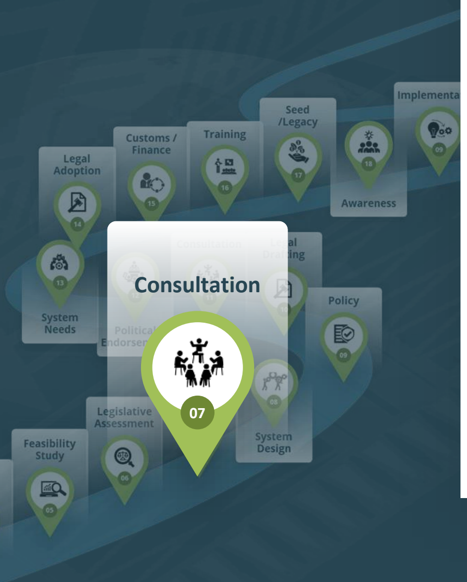
07

Consultation

Stakeholder Identification
Identify and understand key stakeholders, including minority groups or those who sit on the outer edge of communities

Stakeholder Communication Plan
Identify consultation messages and engagement methods appropriate to inform, consult, involve, collaborate, and empower identified stakeholders

Incorporating Feedback
Reflecting results from consultation into scheme design, ensuring feedback is built into and influences scheme design



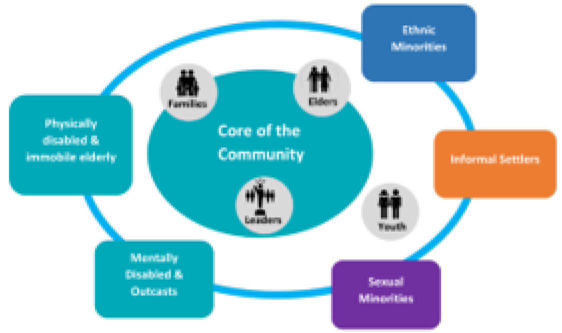
07

Consultation

During the stakeholder identification exercise it is recommended to specifically consider minority groups such as:

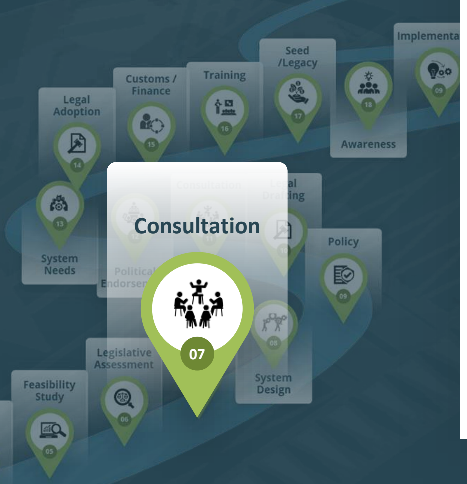
- residents of informal settlements, ethnic minorities
- low visibility due to mobility constraints caused by a physical or mental disability
- groups with non-conforming sexual and gender identities.

The voices of these groups may be commonly overlooked during regular consultation. It may be useful to complete a drawing exercise to identify these groups – first illustrating the core groups, and those who sit on the outer edges. Pay attention to those groups who sit on the outer edges and may be socially excluded due to overlapping disadvantages they face.



Stakeholder Identification / Analysis Matrix

Stakeholder (list agencies (from Step 2.4)	List Organisations / Agencies	Potential Interest in Project	Influence in Community	Appropriate Level of Participation during Consultation (from spectrum above: Inform, Consult, Involve, Collaborate, Empower)	Specific Needs during Consultation	Actions to Engag during Consultati
Example *People with disabilities* SCHEME EQUALITY	*Creative Centre (School for People with Special Needs)* *Disabled People's Organisation* *Ministry of Education* *Deaf/Blind Foundation*	*Potential to earn income from collection of recyclable items* *Possible employment as operators of Collection Depots*	*Influence in community is generally low so extra effort to consult may be required*	*Involve* *Empower*	*Extra measures to ensure ability to be included in consultation processes and project awareness:* - *Extra effort to ensure engagement* - *disability accessible and safe venue*	- *Engage with count Disabled People's Organisation (DPO* - *accommodate spe needs during consultation (see below for example*



08 Detailed Scheme Design

Design the Scheme
Utilise result from feasibility study and consultation to confirm appropriate design

Items consider:

- What seeking for scheme to achieve
- Scheme financial management
- What items to include and materials processing
- Collection depots
- Logistics providers and scheme partners
- Managing legacy waste
- Scheme management and governance
- Scheme reporting
- Scheme promotion and advertising

08

Detailed Scheme Design

10. Scheme Management	Summarise the identified management for the scheme and identified responsibilities by dragging the icons (or writing the options) into the table provided (delete icons not selected). Icons to use if desire:

Agency / partnership identified to be Scheme Manager*	How Scheme Manager identified, how selected / engaged	Summarise Key Activities for Scheme Manager – daily tasks, or targets to reach	Reporting and record keeping requirements for Scheme Manager	Summarise offences for Scheme Manager	Outline measures if identified tasks / targets not reached

* Options: Public Sector, Private Sector, Managing Agency, Partnership / Combination, Other

09 Policy

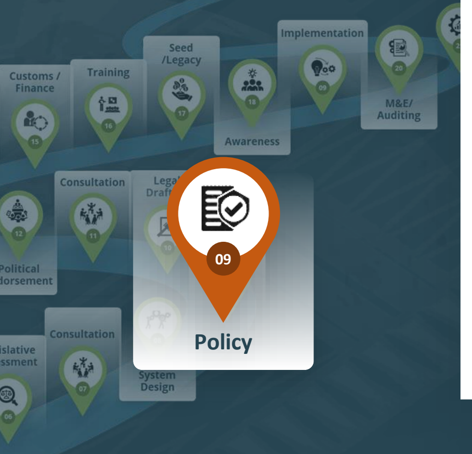
Policy to Consolidate Decisions on Scheme Design
Utilising results from the feasibility study, consultation, and system design analysis

Drive Introduction Scheme
Basis for political submission and drafting guidance

09 Policy

1. Policy Paper Drafting	Through completion of Steps above, the design of an ARFD appropriate for the specific context should be complete. The purpose of a policy paper is to summarise the proposed scheme for decision makers to review and comment on. Use the approved Ministry policy paper template if available or follow the general table of contents as provided. Some details may be identified and included in steps above, copy and paste the relevant information. Note: in Step 10.## further commentary on the recommended principles is provided along with exact text from existing schemes in Kiribati, Tuvalu, and Palau.

Example Table of Contents	Policy Text
Purpose/Objective	
Outline clear purpose/objective	
Scheme Activities	
Summary of key activities of scheme	
Legislative Implications	
New Act / Regulations proposed	
Reforms to existing Act / Regulations	
Scheme Financials	
Establish the dedicated fund and ringfence fees to scheme purposes only	
Identify what purposes the fund may be used for	
Identify who administers the fund	
Specify the role of Customs	
Identify who shall pay into the fund and how this will be done	
Identify procedures for payment from the fund	



EUROPEAN UNION SPREP Secretariat of the Pacific Regional Environment Programme PacWastePlus PACIFIC WASTE MANAGEMENT

10 — Legal Drafting

Draft Scheme Legislation
Utilising the approved policy paper and scheme design, draft identified scheme legislation and/or regulation

Reform, Repeal Existing Legislation
Draft required reforms or repeals to existing legislation as required (e.g., Environment, Customs, Finance, Criminal)

Future Proofing
Consider scheme amendments or future needs for legislation (e.g., providing scheme inclusions in a Schedule that can be amended if required)

10

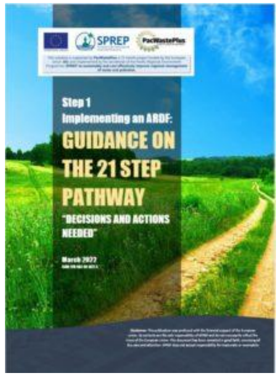
Legal Drafting

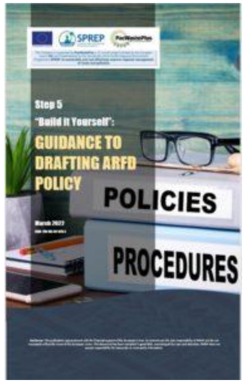
1. Drafting Instructions	Use the approved Government / Ministry drafting instruction template if available or follow one of the guidance documents provided. Some details may be identified and included in steps above, copy and paste the relevant information. In the second table below, exact text from existing schemes in Kiribati, Tuvalu, and Palau is provided for consideration of wording for legal drafting. This wording may not be appropriate for different context' so use only as appropriate and if consistent with findings, analysis, and decisions made throughout the completion of steps above. SPREP / PacWastePlus also have annotated versions of scheme legislation from Australian schemes - please request if that guidance would be useful.

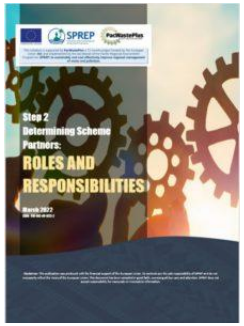
Templates for Drafting Instructions:

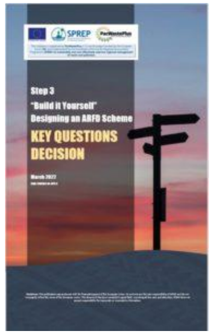
CONTACT INFORMATION	
URGENCY CONSIDERATIONS	
What is the proposed title	
What is the legislative problem to be remedied	
What is the legislation to do	
How is the legislation going to do it	
Who or what is the legislation to apply to	
How does the proposal relate to existing law	
What transitional and savings arrangements are needed	
What other consequential and related changes are required	
Details of any unresolved difficulties with the proposal	
Details of any matters that these instructions do not cover	

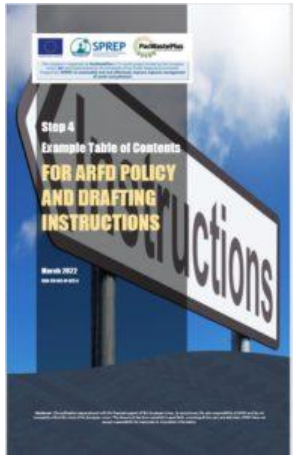
REPORTS / DOCUMENTS

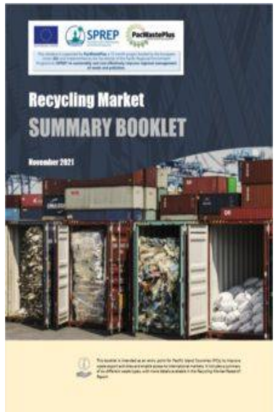


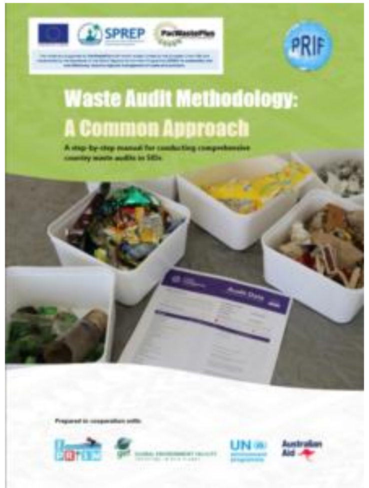


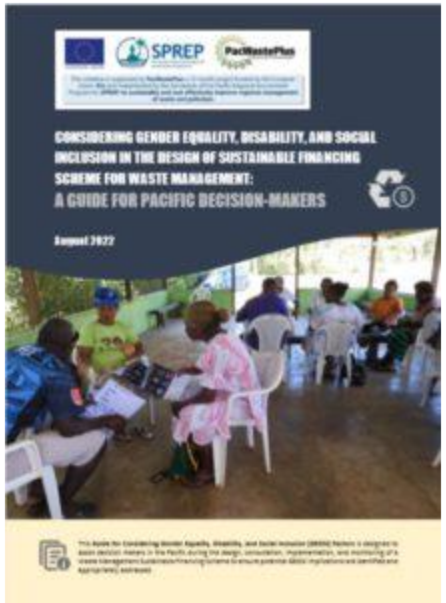












All resources can be found at:
https://pacwasteplus.org/resources/

ANY QUESTIONS?

WASTE MANAGEMENT: A CHALLENGE

Alone, I go faster. Together we go further!

- Workshop on Circular Economy in the Pacific

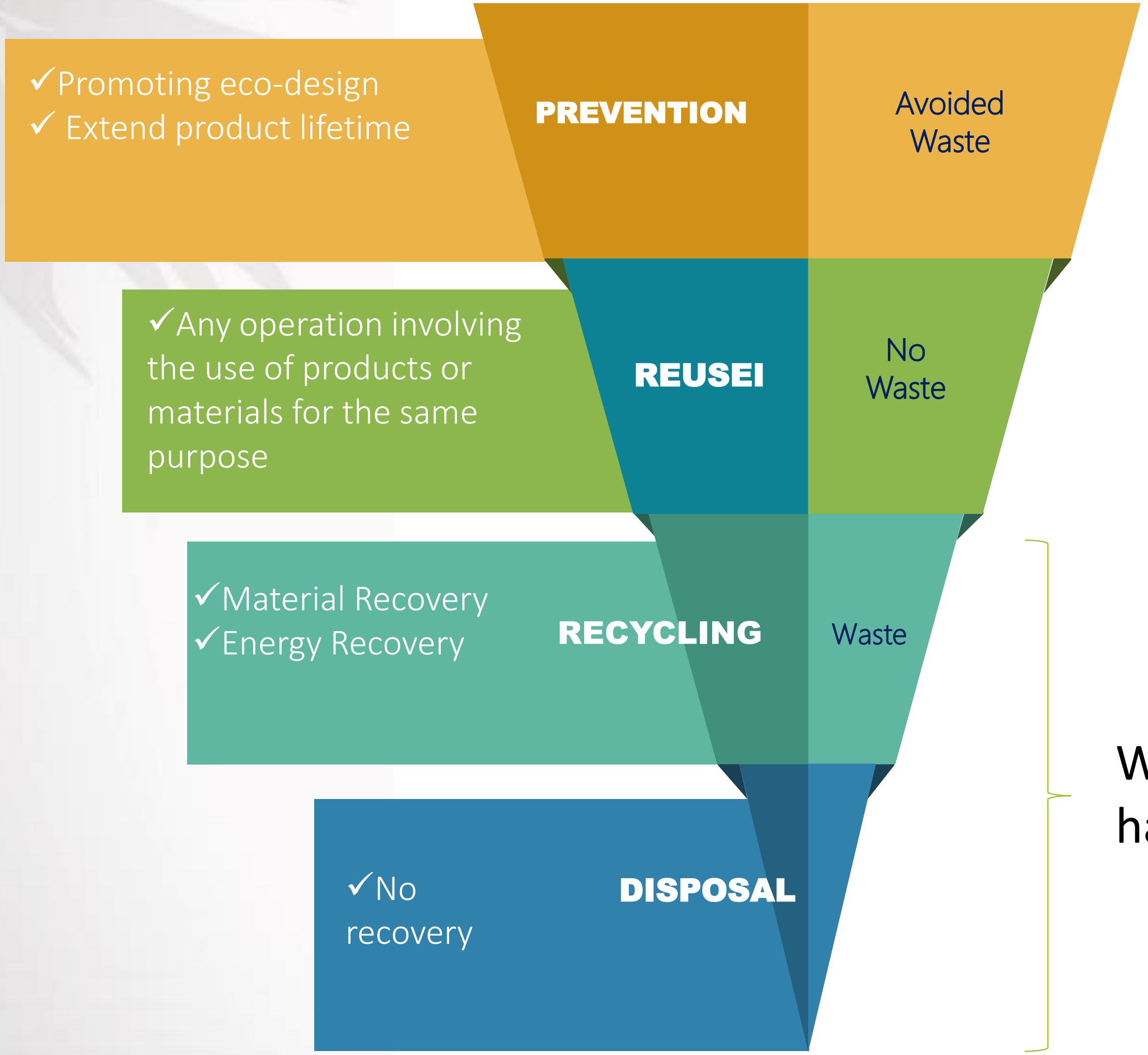
Vanuatu – Week 41

CONTENT

1. REGULATORY FRAMEWORK OF EPR
2. SUSTAINABLE FINANCING
3. TRECODEC & KEY FIGURES

1

REGULATORY FRAMEWORK OF EPR



Extended Producer Responsibility (EPR) is based on the **‘polluter pays’ principle**

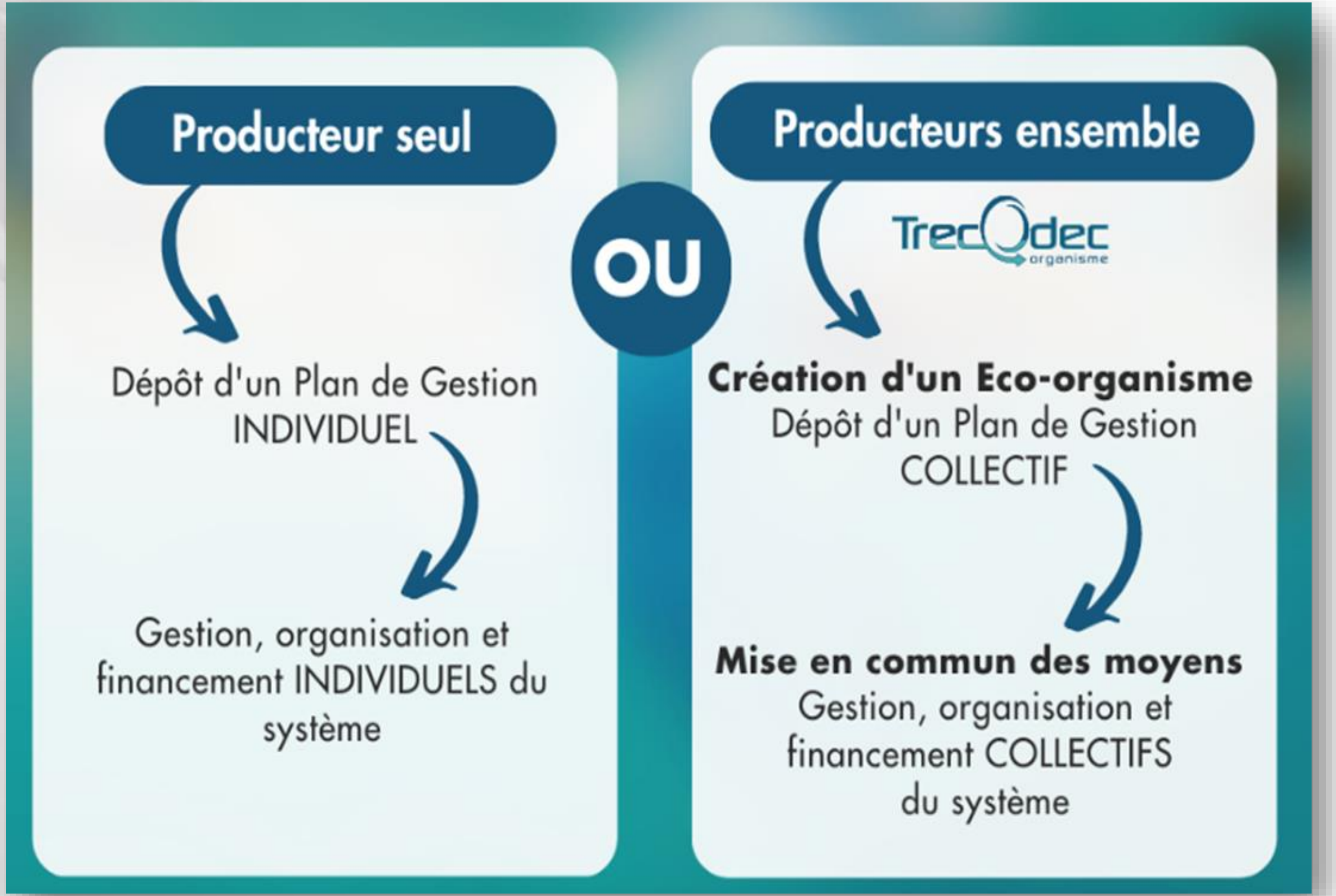
Economic stakeholders including manufacturers, distributors and importers are responsible for the entire lifecycle of products they place on the market, from eco-design to end-of-life.

Waste management of regulated sectors must be handled by producers.

Trec0dec organisme

1

Regulations adopted by the Provinces (Southern Province, Northern Province, Loyalty Islands Province) responsible for environmental conservation.



- Optimising waste management
- Improving waste recovery and recycling
- Preventing waste generation

  ↳ Circular economy approach

❶ Approach: it's circular, non-linear thinking

Identification of the producers concerned

- Statistical analysis by subject
- Compilation of declarations
- Evaluation of marketing
- Search for orders of magnitude to size the solution

Systemic analysis: a global approach to problems

- **Modelling, scenario-building, taking action:** this enables you to set benchmarks for the best possible management of the development of the CEO.
- **Make arbitration and decisions** based not only on knowledge of the causes, but also on knowledge of the consequences, by assessing the potential benefits and risks of the choices made. The decision is oriented towards the future.

Validation of decisions by sampling

- In probability sampling, units are selected at random, whereas in quota sampling a non-random method is used. e.g. EP impact on product price in absolute and relative terms.

Iteration

- Repeat until you get a consistent result

TrecOdec organisme

2

Financing the waste treams

Consumers (businesses, local authorities, households) generating waste bear the cost of waste recovery by paying an eco-participation fee when purchasing regulated products.

Eco-tax = amount included in the product's sale price

Eco-participation rates are public, transparent and adjustable.

They are approved in Provincial Approval Commissions.

2

Model for calculating the fee

A / B = Eco-participation

Overheads

- Payroll costs and percentage of corporate costs
- Allocation keys approved by Trecodec Board of Directors
Depreciation
- Annua Budget

Communication

- Communication Plan

+

COLLECTION

- Target: households and professionals
- ~ 1.500 PDC & public drop off
- Entire NC territory

+

DISPOSAL

- Local pre-treatment (packaging, further sorting, cutting, etc.)
- Storage
- Export
- Local processing

÷

TRECODEC PRODUCERS

Volume / Producers engaged in the eco-organisation

=

ECO - TAX

- Unit contributions

Collection Goals

TrecOdec organisme

② The fair cost of the eco-tax

Annual eco-participation per Capita (2020 population: 271,960)

3.011 Fcfp
28 USD

TrecOdec organisme

3 TRECODEC & KEY FIGURES

2008

SP-5 streams

AUP - HU - VHU - PAU - PU

2009

Launching of the eco-taxes

2013

NP-5 streams

AUP - HU - VHU - PAU - PU

2014

PS

Filière D3E

2019

ILP-6 streams

AUP - HU - VHU - PAU - PU - D3E

2021

SP- New streams

5 Sous-filières HU - déchets connexes

1 Sous-filière D3E

Filière PP

Filière EMB

NP

Filière D3E

2024

Team of 11 staff

History of regulated wastestreams

3

- 6 regulated waste streams : household batteries, car batteries, tyres, Used Oil, ELV and E-waste

New waste streams to be incorporated in 2025

TrecOdec organisme

3

81% of waste collected within the South Province

142.821
Tonnes of waste collected and reprocessed selectively 2009-2023

693 Producers, ~ 400 businesses

58 Shareholders

+/- 80% waste collected within the North Province

1.500 Collection points (no refund)

32 Multi-stream collection operators

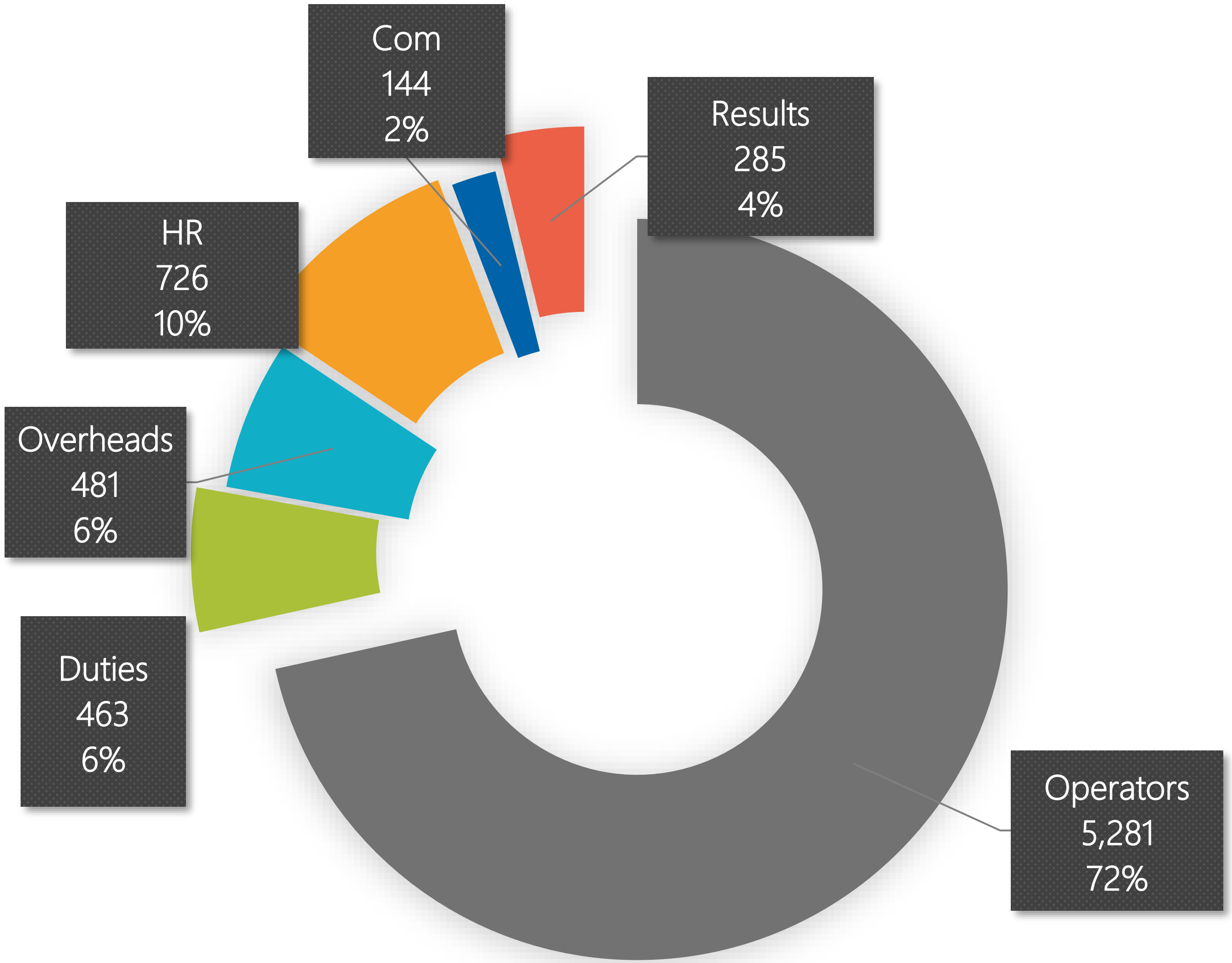
11 Staff

15 Multi-stream processing operators

7 Partners (Circular Economy)

Our Key Figures

Breakdown of turnover 2009-2023



En millions de Fcfp

TrecOdec organisme

3

Circular Economy 2023

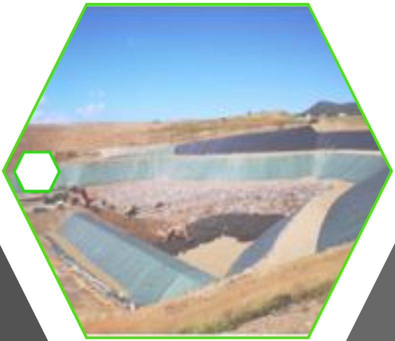
Reuse

CSP: 1.530 T of used tyres for the bottom structure of the new cell in the landfill

Repair

ALD: Major household appliances & small equipment

37T



Repair

Renew: IT equipment

18T

Reuse

BAKO composting plant: 139 T of used tyres for draining

Valorisation

Recygem:

Material resale: ~12 %

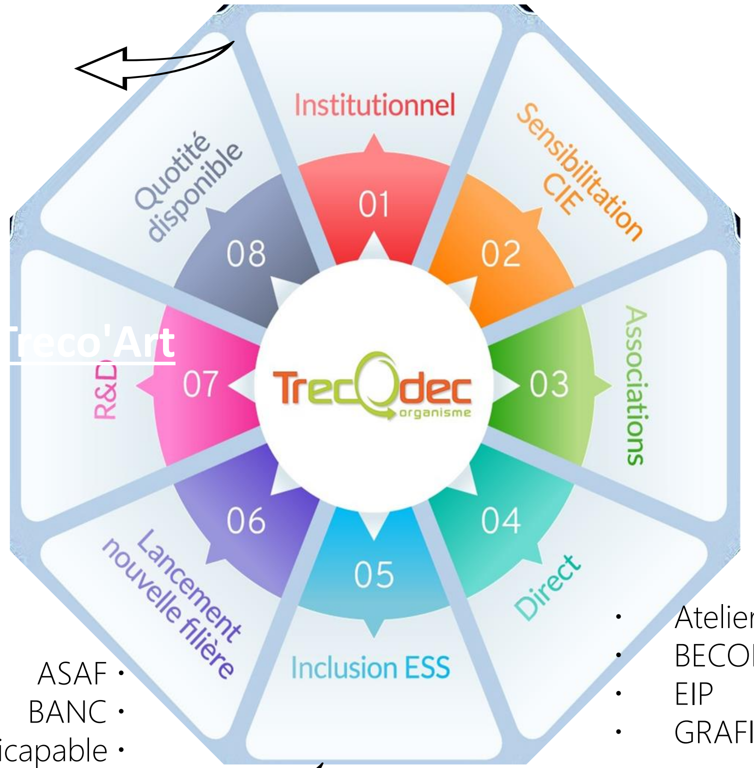
AWARENESS

Treco'Art: Winner of the French EWWR 2023 trophy in the 'Company' category

Communication and awareness

La voix du caillou
Actu NC
Azur Média
Océane FM
Melchior
ACP

Veron &Ci
Pollutec



- Accd'OM
- CIE
- Concours Piles
- SIVM
- Treco'Art

- Caledoclean
- EPLP
- Témoignage d'un passé
- UFC que Choisir

- Atelier B2
- BECOM
- EIP
- GRAFIKA

- MADN
- Point Pub
- Wamland

ASAF
BANC
Handicapable
Hanvie
Réinfo

3

Treco'Art

Trecodec
organisme

Thank You!