Towards Sustainable Plastic Waste Management in Tuvalu

by

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Candidate's Declaration

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of the author's knowledge, it contains no material previously published or written by another person, except where due reference is made in the text.

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Finally, I honor the memory of my late parents, Mr. Tulua Semilota and Ms. Malia Logoga. Though no longer with me, their love and values continue to guide me every step of the way.

Abstract

Plastic waste poses an escalating challenge for Tuvalu, a small island developing state with limited landmass, fragile ecosystems, and virtually limited domestic plastic recycling infrastructure. In Funafuti, the capital, plastic waste particularly single-use packaging and disposable nappies constitutes a significant share of household and institutional waste, exacerbating pressure on the already saturated national dumpsite and contributing to marine pollution. This study investigates the types of plastic waste, behavioural and systemic drivers of disposal practices, and opportunities for integrated waste management in Tuvalu through national, regional, and international lenses.

A mixed-methods approach was adopted, including household surveys, interviews with key stakeholders from government, healthcare, business, and communities, and an observational study for the hospital. The Theory of Planned Behaviour (TPB) was used to interpret behavioural factors.

Key findings reveal that public awareness of plastic waste issues is high, but structural barriers such as irregular collection, policy gaps, and fragmented institutional responsibilities undermine effective action. Although many residents' express willingness to reduce plastic use, this is often constrained by cost, lack of alternatives, and weak policy enforcement. Regional initiatives led by SPREP, such as Pacific Waste Management (PacWastePlus), and Pacific Ocean Litter Project (POLP), have provided technical and financial support. Yet, the sustainability of donor-driven programs remains uncertain. International frameworks, including the Basel Convention and the ongoing International Legally Binding Instrument on Plastic Pollution, including in the marine environment, offer potential pathways for Tuvalu to access support and strengthen national responses.

The study recommends a multi-tiered strategy combining local behaviour change, improved inter-agency coordination, and stronger engagement with regional and international mechanisms to ensure long-term sustainability in plastic waste governance.

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Abbreviations

CDS	- Container Deposit Scheme
DWM	- Department of Waste Management
EPR	- Extended producer responsibility
NGO	- Non-Government Organisation
PRIF	- Pacific Regional Infrastructure Facility
PacWastePlus	- Pacific Waste Management Project
PCB	- Perceived Control Behaviour
PMH	- Princess Margaret Hospital
POLP	- Pacific Ocean Litter Project
SIDs	- Small Islands Developing States
SOPs	-Standard Operating Procedures
SPREP	- Secretariat of the Pacific Regional Environment Program
TIWPAP	- Tuvalu Integrated Waste Policy and Action Plan
TPB	- Theory of Planned Behaviour
UNEP	- United Nations Environment Programme

Definitions

Fiji biscuit bucket- *durable* plastic containers usually 2L and 4L in volume, used to package and transport manufactured biscuit cracker in Fiji. These buckets are a popular export item from Fiji, especially to Tuvalu and neighbouring Pacific SIDs.

Infectious plastic waste- refers to plastic materials contaminated with pathogens, bodily fluids, or other substances capable of transmitting infectious diseases. This includes used syringes, gloves, tubing, PPE, and any plastic items exposed to blood, secretions, or contaminated laboratory waste.

Kaupule- It's a Tuvaluan word referring as local government authorities, operating as the executive arm of the Falekaupule. The *Kaupule* plays a key role in local governance, overseeing areas within the islands such as education, waste, public health, etc.

Mismanaged plastic waste- plastic waste that is not properly collected, treated, or disposed of through formal waste management systems. Instead, it is either openly burned, illegally dumped on land, or discarded into water bodies, leading to severe environmental and health consequences.

Macroplastics- larger plastics, typically greater than 0.5cm in size, like plastic bottles, and packaging materials.

Microplastics- tiny plastic particles, typically less than 5mm in size resulting from breakdown of larger plastic items or intentionally manufactures for use in cosmetics and industrial materials**.**

Nanoplastic **–** very tiny plastic particles, smaller than 1 micron.

Non-infectious plastic waste- plastic materials generated in healthcare settings that are not contaminated with blood, bodily fluids, or infectious agents, poses minimal risk of disease transmission. This includes packaging materials, plastic wrappers, clean IV fluid bags, food containers from restaurants, and office plastics.

Personal Protective Equipment (PPE)- specialized equipment worn by healthcare workers and other individuals to protect themselves from exposure to infectious agents, hazardous materials, or other health and safety risks, includes gloves, masks, gowns, face shields, and protective eyewear.

Plastic leakage-plastics that are not kept in circular loop or poorly manage at the end-of life thus leak into the environment.

Problematic plastics- plastic materials that presents significant environmental, health, or waste management challenges and are difficult to recycle or manage sustainably.

Coconut toddy (kaleve)- a traditional syrup made from coconut sap

Chapter 1: Introduction

1.1 Background and Context

Plastic waste has become one of the most pressing environmental crises globally. Each year, more than 380 million tonnes of plastic are produced (OECD, 2022), yet only a fraction is effectively recycled or reused (Horvath *et al*., 2018; Evode *et al*., 2021; Ilyas *et al*., 2018). Owing to their durability, lightweight nature, and versatility (Pilapitiya & Ratnayake, 2024; Hossain *et al*., 2022), plastics are widely used across industries. However, these very properties contribute to their persistence in the environment, especially when plastic waste is mismanaged- that is, inadequately collected, treated, or disposed of in ways that allow it to leak into natural ecosystems. This results in increasingly plastic accumulation in landfills, dumpsites, and the marine environment (Barnes *et al.*, 2009).

The impacts of plastic waste are particularly acute in developing and geographically isolated regions with limited infrastructure (Horvath *et al.*, 2018). In the absence of robust recycling or waste recovery systems, plastic waste is often burned, buried, or dumped in the environment, causing ecological degradation, public health risks, and disruptions to food security.

1.1.1 Plastic Waste Challenges in Small Island Developing States (SIDS)

Small Island Developing States (SIDS), including Tuvalu, are particularly vulnerable to the challenges of plastic waste due to their isolation, limited land availability, and inadequate waste management infrastructure (Guinto and Makoto, 2017; SPREP, 2024a; PRIF, 2018). Many SIDS are heavily dependent on imported goods, most of which are packaged in plastics (Sagapolutele, 2017; SPREP, 2024; TLRHW, 2024). However, these nations lack the infrastructure, financial resources, and technical expertise needed to manage or recycle plastic waste effectively (SPREP, 2024a).

Unlike larger nations with advanced waste management systems (Vuk *et al.,* 2024; Verma *et al.,* 2016), SIDS often depend on open dumpsites, or incineration, which further contribute to environmental and public health hazards (Barrowclough,D. and Vivas, D, 2021; Government of Tonga, 2024; Morrison, R.J and Munro, A.J, 1999). In the absence of sustainable waste management strategies, plastic waste continues to accumulate, threatening marine ecosystems, biodiversity, and the livelihoods of island communities (Cook and Halden, 2020; Verlis and Wilson, 2020).

1.1.2 Environmental, Economic, and Social Impacts of Plastic Waste

Plastic pollution has far-reaching consequences across environmental, economic, and public health dimensions. In marine ecosystems, plastics break down into micro-plastics that are ingested by fish and other organisms, disrupting biodiversity and contaminating the food chain (UNEP, 2024). Larger plastic debris can entangle marine species such as turtles, fish, and seabirds, leading to injury or death (Akash and Vasudevan, 2021; Li *et al.,* 2021; Villarrubia-Gomez *et al*., 2024).

On land, plastic waste frequently clogs drainage systems (Akash and Vasudevan, 2021), causing urban flooding and creating mosquito breeding grounds that increase the risk of vector-borne diseases such as dengue and typhoid (Evode *et al.,* 2021; Macintosh *et al.,* 2020). The production and degradation of plastics also release greenhouse gases, including methane and ethylene, contributing to climate change (Ritchie and Roser, 2023).

The economic burden is particularly severe for Pacific Island Countries (PICs), where fisheries and tourism are vital industries. Plastic pollution reduces fish stocks through two main pathways: ingestion of plastics and entanglement in plastic debris. Marine organisms, including commercially important fish species, often ingest microplastics, leading to physical injuries, digestive blockages, and exposure to toxic chemicals (Dehm *et al*., 2020; Peng *et al.,* 2020). This disrupts growth, reproduction, and survival rates, ultimately reducing fish populations (Macintosh et al., 2020; Peng *et al.,* 2020; Filho *et al*., 2019a). Additionally, larger plastic items such as abandoned fishing nets entangle fish and other marine life, causing injury, suffocation, or death (Barrowclough and Eugui, 2021; Filho et al., 2019a). These impacts undermine both subsistence and commercial fishing, threatening food security and economic livelihoods across the region. Similarly, plastic debris on beaches and in marine environments deters tourists, resulting in economic losses and reduced government revenue (Filho *et al.,* 2019a).

Health impacts are also a growing concern. Burning plastics releases harmful pollutants such as dioxins, furans, mercury, and polychlorinated biphenyls (Verma *et al.,* 2016), which are linked to respiratory illnesses, reproductive disorders, and certain cancers (Aryan *et al*., 2019; TLRHW, 2024). Additionally, chemicals such as Bisphenol A (BPA), commonly used in plastic packaging, leach into the environment and act as endocrine disruptors substances that interfere with the normal functioning of the endocrine (hormonal) system, leading to imbalances that can disrupt metabolism, growth, reproduction, and development (Gore *et al*., 2024). These disruptors increase long-term health risks, including infertility, metabolic disorders, and hormone-related cancers (Gore *et al*., 2024; Cook and Halden, 2020).

Geographical context of Study Area (Funafuti, Tuvalu)

Funafuti, the capital atoll of Tuvalu, consists of a narrow ring of small islets surrounding a central lagoon. Among these, Fongafale is the largest and most developed islet, serving as the primary location for Tuvalu's government administration, business activities, and essential services. It functions as the national hub for economic and administrative affairs, where most of the country's population resides (Statistics, 2017). Despite its importance, Fongafale has a small land area of approximately 2 square kilometres, stretching about 12 kilometres in length and varying in width from just 10 to 400 metres.

Fongafale accommodates Tuvalu's only international airport, main seaport, government offices, public infrastructure and healthcare services (Department of Waste Management, 2017). Over half of the country's total population resides on this islet, resulting in significant population density and increasing pressure on limited land and waste management systems.

Given its central role in governance, infrastructure, and population, Fongafale has been selected as the primary study site for this research. Data collection activities, including household surveys, healthcare facility observations, and site visits to disposal areas, were all conducted within this islet. A map illustrating the layout of Fongafale will be inserted below as Figure 1, providing important spatial context for the research.

This geographical framing is critical for understanding the constraints Tuvalu faces in managing plastic waste, particularly in relation to land scarcity, proximity to the marine environment, and the absence of dedicated space for formal disposal or recycling infrastructure.

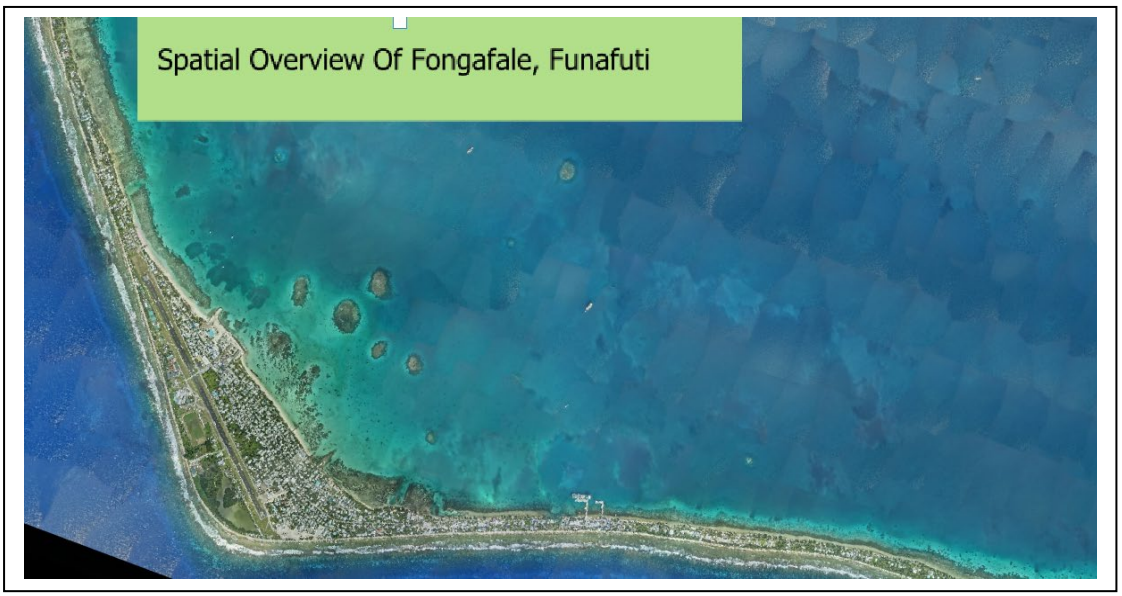

Figure 1: Map of Fongafale islet, Funafuti

This geographical framing is critical for understanding the constraints Tuvalu faces in managing plastic waste, particularly in relation to land scarcity, proximity to the marine environment, and the absence of dedicated space for formal disposal or recycling infrastructure.

1.1.3 Need for Sustainable Plastic Waste Management in Tuvalu

Tuvalu, a remote low-lying atoll nation in the Pacific, faces distinct and pressing challenges in managing plastic waste. These stem from limited land availability, a lack of formal treatment infrastructure, and heavy reliance on imported, plastic-packaged goods (PRIF, 2018; SPREP, 2024a). The country's only formal dumpsite in Funafuti is nearing capacity (Government of Tuvalu, 2019a; Sagapolutele, 2017), while informal disposal practices such as open dumping along coastlines, airstrips, and community spaces are becoming increasingly common (pers. obs).

Compounding these physical and logistical constraints are broader systemic issues. These include limited financial resources, weak institutional capacity, low community engagement, and inadequate enforcement of waste-related policies (Barrowclough and Eugui, 2021; SPREP, 2024a; Sagapolutele, 2017). As a result, plastic waste continues to accumulate, particularly in densely populated areas like Fongafale, posing serious risks to public health, marine ecosystems, and national food security (Siaosi *et al*., 2012).

Tuvalu's situation reflects the wider vulnerabilities of Small Island Developing States (SIDS), yet it also presents a compelling case for localized and practical waste management interventions. The country's scale and geography provide a manageable context for piloting targeted strategies that could later be adapted across similar Pacific Island nations. The need for a more sustainable and inclusive approach to plastic waste management in Tuvalu is urgent especially considering its environmental sensitivity and reliance on marine resources for subsistence and economic survival.

1.2 Problem Statement

Despite increasing regional and international attention to plastic pollution, Tuvalu lacks current, disaggregated data on plastic waste generation, disposal behaviours, and sector-specific management practices. Previous studies have primarily focused on general waste audits and offer limited insight into the distinct roles played by key sectors such as households, healthcare facilities, and agricultural operations in generating and managing plastic waste (Sagapolutele, 2017; SPREP, 2024a). This absence of targeted, sector-level data constrains the government's ability to design and implement effective, evidence-based interventions tailored to local conditions.

In addition to the lack of data, Tuvalu's plastic waste response suffers from fragmentation. Various sectors operate in silos, with little coordination or communication across institutions. Households, healthcare services, and local government agencies often address waste independently, unaware of each other's practices, challenges, or capacities. This disjointed approach hinders the development of integrated waste strategies and results in inefficiencies, duplication of effort, or complete inaction.

Tuvalu's situation reflects the broader vulnerabilities of SIDs (Horvath *et al*., 2018; Pacific Trade Invest New Zealand, 2024), yet it also presents an opportunity for innovation. The country's small scale and relatively centralized structure provide a manageable context for piloting coordinated community-informed plastic waste solutions that could be adapted across similar island contexts. However, such efforts require a clear understanding of the behavioural, infrastructural, and governance-related factors that currently influence waste management.

This study responds to these gaps by examining plastic waste management across key sectors in Tuvalu: households, healthcare, and businesses. It explores how behavioural factors, infrastructural limitations, and institutional arrangements influence plastic waste generation and disposal practices within these domains. In addition, the study considers the role of selected regional and international frameworks, specifically the Secretariat of the Pacific Regional Environment Programme (SPREP), the Basel Convention, and the United Nations Global Plastic Treaty under negotiation (INC), in supporting national efforts to improve plastic waste governance. By generating locally grounded, sector-specific insights, the study aims to contribute to the development of practical and collaborative approaches to sustainable plastic waste management in Tuvalu.

1.3 Research Objectives

This study aims to assess plastic waste management practices in Tuvalu, identify sector-specific challenges, and explore integrative strategies for sustainable plastic waste reduction through collaborative efforts.

Key objectives include:

1. Identify key challenges in waste management, including behavioural, infrastructural, and governance-related factors.
2. Evaluate sector-specific practices in households, healthcare, and agriculture, and explore opportunities for plastic waste reduction.
3. Examine the role of selected regional and international frameworks, specifically SPREP, the Basel Convention, and the UN Global Plastics Treaty under negotiation, in supporting sustainable plastic waste management.
4. Propose integrated waste management solutions that involve households, local governments, and regional partnerships to mitigate plastic pollution.

This study also draws on the Theory of Planned Behaviour (TPB) (Ajzen, 1991) to support the analysis of household-level plastic waste practices. TPB provides a useful lens for examining how attitudes, perceived social norms, and a sense of control influence individual disposal behaviours and participation in waste reduction initiatives. While not applied as a formal overarching framework, TPB is used to interpret behavioural findings and inform practical strategies for promoting more sustainable practices at the community level.

1.4 Research Questions

The research is guided by the following questions:

1. What are the types and sources of plastic waste in Funafuti, Tuvalu?
2. What approaches can the households, the Tuvalu government, *kaupule* (local councils), businesses, and the public adopt to reduce plastic waste, particularly single-use plastics?
3. How can regional organizations and international treaties assist Tuvalu in addressing plastic waste challenges?
4. What integrative strategies can improve plastic waste management in Tuvalu?

1.5 Expected Outcomes of the Study

This research aims to generate context-specific insights to inform sustainable and collaborative plastic waste management strategies for Tuvalu. The expected outcomes include:

1. Evidence-based recommendations for improving plastic waste management infrastructure, policy, and behavioural change in Tuvalu.
2. Sector-specific findings that highlight current waste practices and challenges in households, and healthcare.

3. Practical strategies to enhance coordination and reduce fragmentation across sectors involved in plastic waste management.
4. Policy-relevant insights into how regional and international frameworks particularly SPREP, the Basel Convention, and the ongoing Global Plastic Treaty can support national plastic waste governance.
5. A contribution to the academic literature on integrated plastic waste management in Small Island Developing States (SIDS), particularly within a Pacific Island context.

1.6 Thesis Structure

The thesis is organized into the following chapters:

1. ***Chapter 1: Introduction*** - Introduces the background, context, and rationale of the study. It outlines the research problem, objectives, questions, and scope of the investigation into plastic waste management in Funafuti.
2. ***Chapter 2: Literature Review*** - Explores the growing challenge of plastic waste at the global, regional and national level, and highlight the Theory of Planned Behaviour.
3. ***Chapter 3: Research Methodology*** - Details the research design, data collection methods, and analytical techniques used in the study.
4. ***Chapter 4: Findings*** - Present the results of household surveys, interviews, and observation study conducted in Tuvalu.
5. ***Chapter 5: Interpreting Plastic Waste Management Challenges and Opportunities***- Critically examines and interprets the findings, analyse policy frameworks, offering suggestions to strengthen plastic waste management in Tuvalu.
6. ***Chapter 6: Synthesis and Strategic Pathways*** - Synthesises key findings in relation to the research objectives and propose practical, multi-level strategies for improving plastic waste management in Funafuti. It also outlines study limitations and identifies areas for future research.

Chapter 2: Literature Review

2.1 Global Overview of Plastic Waste-Scope and Impacts

The word “plastics” originates from the Greek word “plastikos” meaning “fit for molding” (Akash and Vasudevan, 2021, Huang *et al*., 2022, Mazhandu *et al.,* 2020) or “easily shaped” (Evode *et al*., 2021, Nato, T.G., 2020). Originally developed in the early 20th century, plastics quickly gained prominence as industrial and consumer materials due to their versatility, durability, and low production cost. From packaging and textiles to electronics and medicine, plastic materials have transformed modern life. However, the very properties that make them indispensable have also led to a global environmental crisis.

Global plastic production has increased at an unprecedented rate, rising from approximately 2 million tonnes in 1950 to an estimated 460 million tonnes in 2019 (OECD, 2022). Plastics have become indispensable in modern economies due to their durability, affordability, and versatility, with widespread applications in packaging, healthcare, agriculture, construction, and consumer goods (Rodrigues *et al*., 2019).

However, these same qualities have contributed to plastics becoming one of the most challenging waste streams to manage. An estimated 91% of all plastic produced globally has never been recycled, with much of it ending up in landfills, waterways, or the ocean (Evode *et al.*, 2021; Horvath *et al.*, 2018). The mismanagement of plastic waste is a global issue (OECD, 2022), particularly in countries with inadequate collection infrastructure and limited regulatory enforcement. Over time, plastics degrade into microplastics, infiltrating marine and terrestrial ecosystems, food chains, and even human bodies (Rodrigues *et al.*, 2019a). Microplastics and associated additives such as phthalates and bisphenol A (BPA) have been linked to endocrine disruption, reproductive toxicity, and developmental disorders (Cook and Halden, 2020; Halden *et al.*, 2010; Li *et al.*, 2021).

Plastics are also deeply connected to climate change. Over 99% of plastics are derived from fossil fuels such as crude oil and natural gas (Villarrubia-Gómez *et al.*, 2024). The plastic industry consumes around 4% of the world’s fossil fuel supply for raw material extraction, with another 3–4% used for energy during refining and manufacturing (Ilyas *et al.*, 2018; Mazhandu *et al.*, 2020). Processes like steam cracking, used to produce ethylene and other monomers, are especially energy-intensive and emit large quantities of CO_2 (Shen *et al.*, 2020). Transport and distribution of plastic products, which rely heavily on fossil fuel logistics, further compound the sector’s emissions. As a result, plastics are among the most carbon-intensive materials globally (Stegmann *et al.*, 2022).

According to the Center for International Environmental Law (CIEL), under current projection trends, plastic production and incineration could emit up to 56 billion tonnes of CO_2-equivalent emissions by 2050, potentially consuming as much as 13% of the world’s remaining carbon budget, which refers to the total volume of CO2 that can still be emitted globally while limiting warming to 1.5°C (Hamilton *et al.*, 2019). These figures highlight the urgent need to recognize plastic waste not only as a pollution issue but also as a growing contributor to the global climate crisis. Moreover, open

burning of plastic waste, common in lower-income regions, releases harmful pollutants such as dioxins, furans, and particulate matter, compounding local health risks (Filho *et al.*, 2019a; Verma *et al.*, 2016; Bolan *et al.*, 2020).

Despite growing global recognition of the plastic crisis, policy responses remain fragmented and reactive. Most initiatives have centred on downstream solutions such as recycling and clean-ups, while upstream drivers like overproduction, trade systems, and weak international accountability remain underregulated (Barrowclough and Eugui, 2021; Farrelly *et al.*, 2021). These limitations have serious implications for Small Island Developing States (SIDS), which contribute minimally to global plastic production but face disproportionate impacts due to their geographic isolation, import dependency, and vulnerability to transboundary plastic flows. The next section explores how mismanaged plastic enters marine ecosystems, with a particular focus on the implications for island and coastal nations.

2.2 Plastic Leakage and Marine Pollution

Plastic leakage, defined as the release of plastic waste from formal or informal waste management systems into the natural environment, is one of the principal mechanisms by which plastics enter marine ecosystems (IUCN, 2020). This leakage occurs via multiple routes, including open dumping, poorly contained landfills, stormwater runoff, coastal erosion, and river discharge (Lebreton and Andrady, 2019; Guggisberg, 2024; Mazhandu *et al*., 2020). Once released, plastics can travel long distances, accumulating in rivers, estuaries, and oceans (Gwada *et al*., 2019; Barnes *et al*., 2009).

Globally, plastic leakage into marine environments is widely recognised as an escalating environmental challenge. While estimates of leakage volumes vary, there is broad consensus that without systemic changes in plastic production, consumption, and waste management, plastic emissions to the ocean will continue to increase- posing severe long-term risks to biodiversity, public health, and coastal economies (Jambeck *et al.,* 2015; Richie and Roser, 2023).These emissions arise from both direct and indirect pathways, including land and ocean based sources (Godfrey, 2019)

In the marine environment, larger plastics degrade over time through sunlight, mechanical abrasion, and wave action into microplastic particles smaller than 5 millimetres in diameter. These are readily ingested by marine organisms, from zooplankton to fish, seabirds, and mammals, causing physical harm and allowing toxic chemicals to bioaccumulate up the food chain (Halden *et al.*, 2010; Cook and Halden, 2020; Li *et al.*, 2021). This contamination presents growing risks for coastal and island communities that depend heavily on seafood for food security and livelihoods (Barnes *et al.*, 2009; The Lancet Regional Health – Western Pacific, 2024).

Although land-based sources are responsible for the majority of marine plastic waste (Filho *et al.*, 2019a), ocean-based contributions such as discarded fishing gear (Guinto and Makoto, 2017), shipping waste (SPREP, 2018), and cruise tourism is also significant. Abandoned, lost, or discarded fishing gear (ALDFG), often referred to as "ghost gear," is a particular concern in the Pacific(Gilman *et al.*, 2016; Gilman *et al.*, 2021). Durable and resistant to degradation, these materials entangle marine

mammals, seabirds, and turtles, often resulting in injury or death (Filho *et al.*, 2019b; Barnes *et al.*, 2009).

Tuvalu, like other Pacific SIDS, faces a combination of local and transboundary plastic pollution sources. The country's reliance on imported, plastic-packaged goods combined with inadequate landfill containment, weak enforcement mechanisms, and limited recycling capacity means that much of its unmanaged waste is vulnerable to leakage, especially during storms, flooding, and high tides. Coastal dumping and open burning exacerbate the risk of plastic entering the ocean, threatening fragile reef systems and lagoon ecosystems.

In the context of Pacific SIDS such as Tuvalu, plastic leakage into marine environments is closely tied to land-based waste mismanagement, limited infrastructure, and external marine inputs beyond national control. While ocean-based litter remains a concern, this study prioritises land-based plastic flows, which are more directly shaped by national policies, household behaviours, and institutional capacities. This emphasis aligns with the research objective to assess how domestic systems and practices contribute to plastic accumulation, and what strategies might strengthen management at the community and national levels. The following section examines how plastic waste challenges are experienced across Pacific SIDS, highlighting the structural constraints and regional dynamics that frame Tuvalu's plastic waste problem.

2.3 Plastic Waste in Pacific Small Island Developing States (SIDs)

Plastic waste management in Pacific Small Island Developing States (SIDS) is shaped by structural vulnerabilities, limited infrastructure, external dependencies, and geographic isolation, that compound the impacts of rising plastic consumption. Common regional challenges include high dependency on imported, plastic-packaged goods, constrained land availability, limited access to waste management technology, and small economies of scale (Guinto and Makoto, 2017). As a result, plastic waste in many Pacific SIDS is generated at rates that exceed the capacity of local systems to manage it effectively, leading to its accumulation in dumpsites, waterways, and coastal zones (Dehm *et al*., 2020; PRIF, 2018; Rimon, 2023).

Beyond infrastructure, policy-to-practice gaps further undermine waste governance. While most Pacific SIDS have developed and implemented bans on single-use plastics or adopted action plans in collaboration with donors or regional bodies, these efforts often fall short in enforcement (Barrowclough and Eugui, 2021). In Nauru, for instance, despite enacting legislation to restrict plastic use, the country relies on a single overburdened landfill, where all waste including plastics is ultimately deposited, highlighting a lack of viable alternatives and enforcement capacity (SPREP, 2024b).

Similar governance issues have been documented in Kiribati, where the "Green Bag" system, a plastic waste initiative developed with support from the Taiwan Technical Mission (TTM) has faced both operational and public awareness challenges. While the programme aims to incentivize plastic waste collection through a "waste exchange" for fresh produce, it has also created confusion among

some community members about the appropriate use of green bags, resulting in misuse and reduced effectiveness (Niemi *et al*., 2019).

Furthermore, many policies in the Pacific fail to address the full life cycle of plastic or incorporate principles such as precaution, polluter-pays, or circularity. Several national frameworks remain under-enforced due to limited institutional capacity, budgetary shortfalls, or overlapping mandates. According to Farrelly *et al.* (2021), these fragmented institutional arrangements hinder cohesive implementation and monitoring. In some cases, policy frameworks exist only on paper and lack operational support, robust community engagement, or data systems to track impact (Farrelly and Fuller, 2023). Tuvalu and many other Pacific SIDs have limited capacity to recycle plastics due to a lack of appropriate technology. This technological gap exacerbates existing plastic management challenges and highlights the need for regionally coordinated solutions that address these structural limitations.

These region-wide governance and capacity gaps mirror the challenges observed in Tuvalu. Understanding how Tuvalu's national context fits within this broader Pacific landscape is essential for formulating realistic and context-sensitive interventions. The next section examines the country-specific dynamics of plastic waste generation and governance in Tuvalu.

2.4 Plastic Waste Generation and Disposal in Fongafale, Funafuti-Tuvalu

2.4.1 Overview of Plastic Waste Generation & Composition in Tuvalu

Tuvalu, comprising nine low-lying atolls and reef islands, has a total land area of just 26 km², making it one of the world's smallest and most geographically constrained nations (SPREP, 2024; Statistics, 2017). The capital, Funafuti, is home to more than half of Tuvalu's population (Statistics, 2017), approximately 6,000 residents, resulting in a significantly higher concentration of plastic waste compared to the other outer islands (Sagapolutele, 2017).

Consistent with broader waste management challenges faced by Pacific SIDS (Section 2.3), contributing factors include its limited land area, reliance on imported goods packaged in plastic, weak enforcement of waste-related policies, and the absence of formal waste recovery or recycling systems (Sagapolutele, 2017; Sagapolutele *et al*., 2019).

A 2017 Waste Audit report estimated that Tuvalu generates approximately 0.42kg of waste per person per day, amounting to 904 tonnes of household waste annually in Funafuti alone. Plastic waste accounts for 7% of the total national waste stream (Sagapolutele, 2017), but in Funafuti, this figure rises significantly to 19.7% by weight (Sagapolutele, 2017). This is because of the larger population that resides in Funafuti, its heavy reliance on imported goods, and lack of alternatives. In the 2017 Waste Audit, various types of plastics, single-use plastics, such as takeaway containers and beverage containers, are the most frequently discarded plastic waste items (Sagapolutele *et al.,* 2019). In

addition, nappies (diapers) represented a significant portion of Tuvalu's waste stream, contributing 22.9% of Funafuti's total household waste (Sagapolutele, 2017)

Figures 2 and 3 illustrate the contrast between Tuvalu's overall waste composition and Funafuti's more plastic-intensive waste profile in 2017 (Sagapolutele., 2017). While organic waste dominated nationwide (60%), Funafuti's waste composition showed a higher proportion of plastics, nappies, and papers, reflecting urban consumption patterns, and the limited availability of waste reduction strategies.

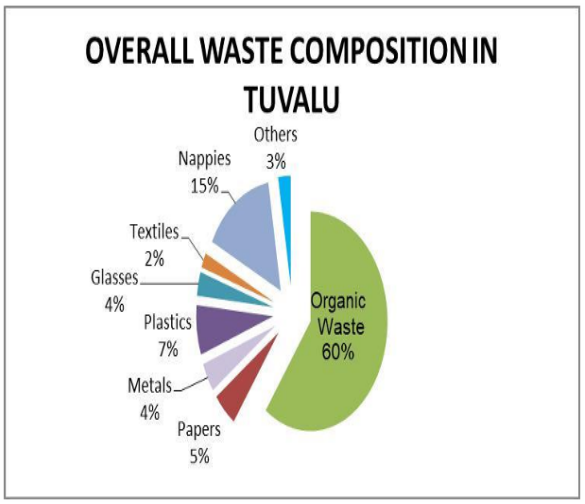

Figure 2: *Composition of waste in Tuvalu (Sagapolutele,2017)*

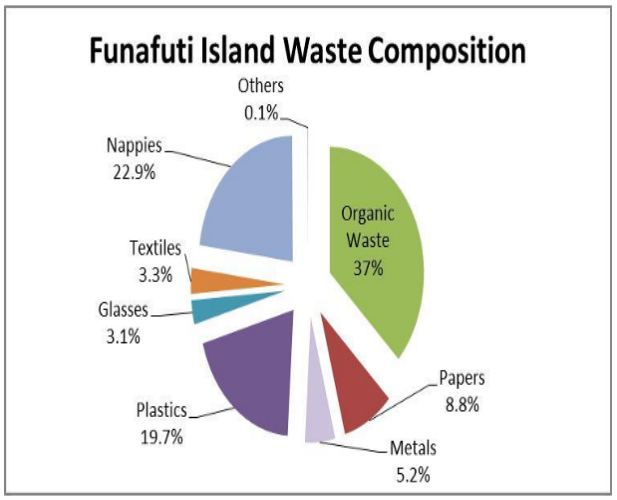

Figure 3: *Composition of waste in Funafuti (Sagapolutele,2017)*

2.4.2 Waste Collection Systems

Tuvalu is one of the few Pacific nations where waste collection services cover approximately 80% of households (PRIF, 2021). Despite this extensive coverage, collection services are frequently disrupted due to mechanical failures of waste collection trucks, leading to illegal dumping and open burning of waste (Pacific Trade Investment New Zealand, 2024).

A significant challenge in Tuvalu's waste management system is the lack of a dedicated plastic recycling facility. Currently, all plastic waste is collected as part of general household waste and transported directly to the dumpsite without any form of sorting or recycling. Notably, nappies are not included in routine waste collection; instead, large, designated bins are placed at transfer stations for public disposal. When these bins reach capacity, the Department of Waste empties and transports them to the dumpsite for disposal (Sagapolutele, 2017).

In 2017, household waste was the largest contributor to the national waste stream, accounting for 80% of total waste, followed by commercial waste (15%) and institutional waste (5%) (Sagapolutele, 2017). The high proportion of household waste containing various plastic materials raises concerns about plastic accumulation, improper disposal, and the absence of waste separation initiatives.

Funafuti, the capital of Tuvalu has an established waste collection system that is jointly managed by the *Kaupule* (local council) and the Department of Waste Management. The *Kaupule* oversees household and public waste collection, working alongside the Department of Waste Management,

which provides operational support and technical expertise. This collaboration ensures that solid waste is regularly removed from residential and communal areas while addressing logistical challenges. However, responsibility for waste collection has since shifted, with certain modifications to the system (see findings section).

To streamline collection efforts, Funafuti is divided into four collection zones, with general household waste collected on a scheduled basis using dump trucks and trailers operated by the Waste Department. The collection schedule for these zones is detailed in the following section.

Waste Collection Schedule in Funafuti

Waste Type	Waste Storage at source	Weekly collection frequency	Estimated household collection %
General mixed waste	80L/ 120L wheelie bins for households 240L/1,100L bins for institutions & businesses, sack & plastic for household without bins & extra waste	Monday & Wednesday Block 1 & 2 Tuesday & Thursday Block 3 & 4 Friday- main road covering	90-95
Nappies	Pack in plastic bags or sacks then transport by individuals to drop-off bins	Monday and Friday Or once all bins are full regardless of what day	90-95

Table 1: *Waste collection schedule in Funafuti, extracted from the Tuvalu Waste Audit Report 2019*

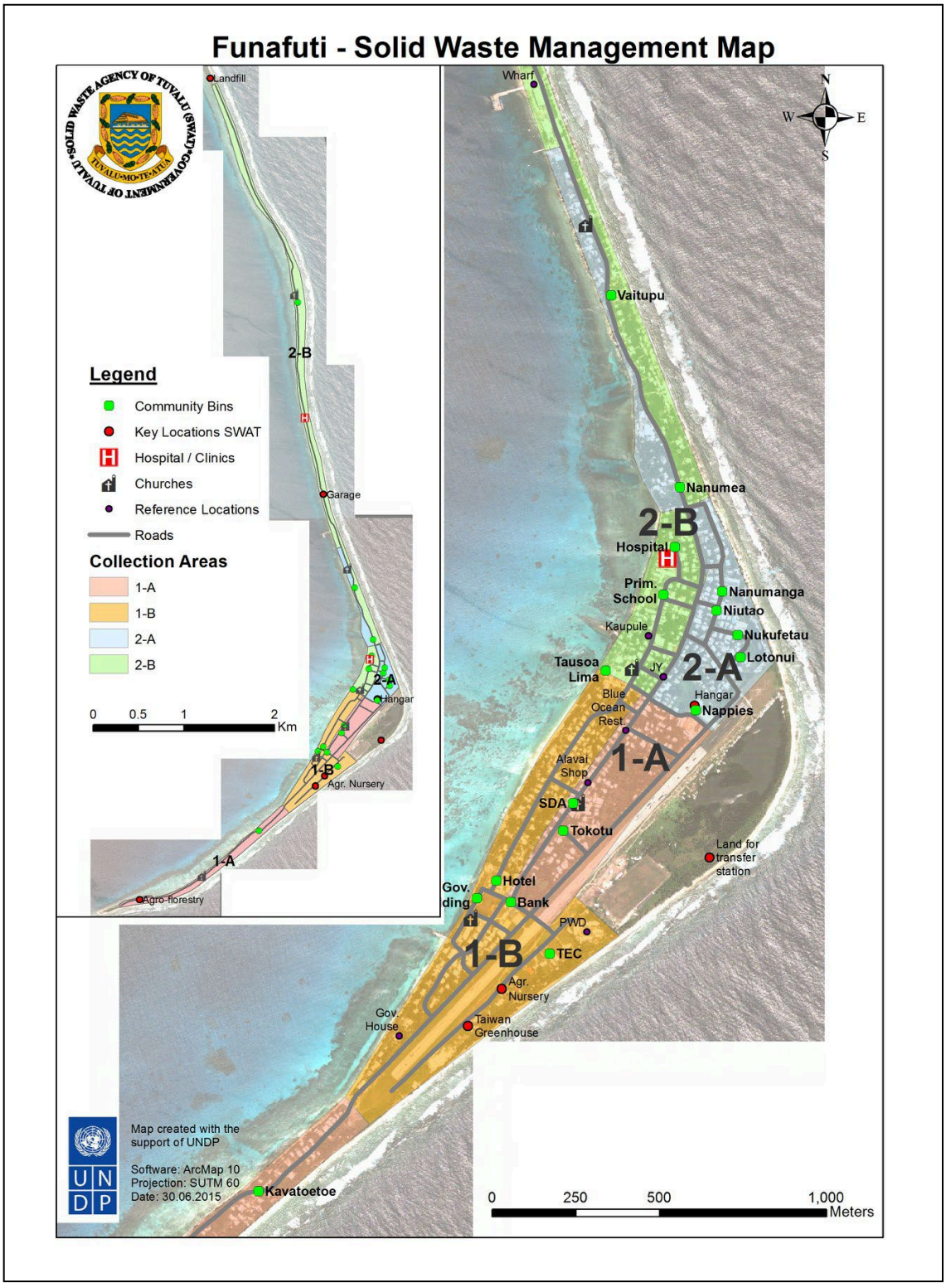

Figure 4: *Map showing the block and zones for waste collection in Fongafale, Funafuti*

2.4.3 Healthcare Waste Collection and Disposal Systems in Funafuti

The Princess Margaret Hospital (PMH), the only hospital in Funafuti, is the primary generator of healthcare waste (World Bank, 2022). Healthcare waste refers to all forms of waste generated by healthcare institutions, research facilities, and laboratories in the course of diagnosing, treating, and immunising both humans and animals (Dwivedi *et al.,* 2021; Gill *et al.,* 2022; Raj and Samuel, 2023).

It can be classified into two main classes: non-hazardous and hazardous waste (Gill *et al.,* 2022), and for the case of Tuvalu, healthcare waste collection and disposal in Tuvalu falls under the responsibility of the Ministry of Health (Sagapolutele, 2017; World Bank, 2022).

However, waste segregation is poorly managed, and as a result, waste may be stored at the designated disposal site near PMH for extended periods, ranging from days to weeks or even months, before being transported to the dumpsite. Additionally, PMH operates a wood-fired incinerator located at the dumpsite for waste disposal (ENVIRON Australia Pty Ltd, 2014).

2.4.4 Challenges of Plastic Waste Collection in Funafuti, Tuvalu

Despite having a structured waste collection system, several operational challenges continue to hinder the efficiency of plastic waste management. One of the most significant and persistent issues is frequent equipment breakdown, particularly with waste collection trucks and trailers (Sagapolutele, 2017; pers.obs.,2024). Due to Tuvalu's geographical remoteness and limited access to spare parts, mechanical failures often lead to prolonged service disruptions, delaying waste collection and increasing the risk of plastic leakage, illegal dumping, and open burning. Illegal dumping commonly occurs along roadsides, in backyards, or near coastal areas, while open burning is frequently practiced beside homes. When waste collection services are disrupted, plastic waste accumulates in residential areas for extended periods, attracting stray dogs that scatter the waste, making the environment messy and unhygienic. Additionally, strong winds can blow accumulated plastic waste into other areas, further exacerbating pollution (pers. obs, 2024).

Another major challenge is the labour-intensive nature of the waste collection, particularly for manual loading of waste into trucks (Sagapolutele, 2017; pers.obs, 2024). The use of dump trucks requires a significant number of staff, making the process inefficient and demanding (Sagapolutele, 2017; Sagapolutele *et al*., 2019). While trailers, although easier to load, fill up quickly, requiring multiple trips to the dumpsite, further reducing efficiency and increasing operational costs (Sagapolutele, 2017; Sagapolutele *et al*., 2019).

Furthermore, Tuvalu's waste collection infrastructure is insufficient to support effective plastic waste management. Many households lack standardised waste bins, leading to waste being stored in sacks or plastic bags (Sagapolutele, 2017). This often leads to waste spillage onto roads before it is properly transported to the dumpsite, further contributing to environmental pollution and inefficiencies in waste management (Sagapolutele, 2017; pers.obs, 2024).

2.5 Plastic Waste Regulations, Tuvalu

Managing plastic waste effectively requires not only adequate infrastructure but also strong legal and policy frameworks. In recent years, Tuvalu has taken steps to address the escalating challenge of plastic pollution through legislative measures. However, the extent to which these frameworks are translated into enforceable actions and behavioural change remains unclear due to a lack of documented evidence, comprehensive data and a monitoring mechanism (SPREP, 2024a)

One of Tuvalu's key policy responses is the Prohibition on the Importation of Single-Use Plastics Regulation 2019, later amended in 2022. This regulation serves as Tuvalu's first dedicated legislative instrument targeting plastic pollution, prohibiting the importation, distribution, and sale of designated single-use plastic products. The 2022 amendment expanded definitions, introduced clearer enforcement provisions, and established penalties for non-compliance. Items banned under this regulation include plastic shopping bags, plastic bottles and plastic beverages of less than 1.5L, plastic straws, plastic pouches used to produce iceblocks, single-use plastic cutlery, and plastic flags.

Complementing this is the Waste Management (Levy Deposit) Regulation 2019, which imposes an import levy on products like bottles and packaging. For instance, PET bottles, mineral waste, and cooking oil are subject to a 10-cent levy per item, while disposable nappies incur a levy of five cents per unit. This policy aims to fund waste collection, promote resource recovery, and potentially support overseas recycling efforts, recognising Tuvalu's limited domestic recycling capacity (Government of Tuvalu, 2019b).

Beyond these plastic-specific instruments, Tuvalu's waste governance is framed by broader policies including the Environment Protection Act 2008, Tuvalu Waste Management Act 2017, Falekaupule Act 2007, and the Te Kete National Strategy for Sustainable Development (2021–2030), the Tuvalu Integrated Waste Policy and Action Plan (2017-2026). While these frameworks reference pollution control and waste minimization, they rarely focus on plastics as a distinct category. In practice, the generality of these instruments and their overlap in institutional mandates contribute to implementation fatigue and diluted accountability.

Tuvalu's legislative focus on banning single-use plastics (SUPs) aligns with broader global trends, where such bans are commonly adopted as a primary response to plastic pollution, especially in contexts with limited waste management infrastructure (Knoblauch and Mederake, 2021). Global and regional studies indicate that the effectiveness of such bans typically depends on complementary measures, including robust enforcement, public education, and the availability of affordable alternatives (Knoblauch and Mederake, 2021; SPREP, 2024a). While these factors are not extensively documented for Tuvalu specifically, it can be reasonably inferred that similar challenges exist given Tuvalu's small size, limited resources, and reliance on imported goods, as observed across Pacific Island Countries (SPREP, 2024a).

Regional studies further highlight that the effectiveness of SUP bans in the South Pacific often hinges on enforcement capacity, stakeholder engagement, and policy harmonisation across governance levels (Tudor and Williams, 2021). Like many PICs, Tuvalu's regulatory approach has largely targeted the consumption phase through bans and levies, with limited integration of circular economy strategies aimed at reducing plastic waste more holistically (Tudor and Williams, 2021; Knoblauch and Mederake, 2021). In Tuvalu's specific case, the absence of domestic plastic production and complete reliance on imports for all plastic products underscores the importance of upstream interventions, such as import controls and levies, as primary tools for plastic waste reduction (SPREP, 2024).

2.6 Understanding Plastic Waste Behaviours through the Theory of Planned Behaviour (TPB).

The Theory of Planned Behaviour (TPB), developed by Ajzen (1991), offers a useful framework to examine the psychological and social factors influencing individuals behaviour (Ajzen, 1991). TPB is particularly useful for examining how people respond to plastic waste policies, systems, and interventions in both household and community settings.

According to TPB, an individual's intention to engage in a particular behaviour is shaped by three core constructs: attitudes, subjective norms, and perceived behavioural control. Attitudes refer to the individual's positive or negative evaluation of the behaviour. Subjective norms involve the perceived social pressure to perform or not perform the behaviour. Perceived behavioural control (PBC) reflects the perceived ease or difficulty of performing the behaviour, which is influenced by both personal capabilities and external constraints.(Ajzen, 1991).

In environmental contexts, this intention is often referred to as environmental intention, a person's self-reported readiness or willingness to engage in pro-environmental behaviours such as reducing plastic use, recycling, or avoiding littering (Sun *et al*., 2017; Bamberg and Möser, 2007). Environmental intention serves as a strong predictor of actual behaviour when structural and social conditions allow follow-through.

While TPB was originally developed as a general social psychological model, it has been applied in research on e-waste recycling (Aboelmaged, 2021), sustainable consumption (Truelove *et al*., 2023), and plastic bag reduction (Sun *et al*., 2017).These studies suggest that all three constructs particularly perceived behavioural control are critical predictors of whether people translate intention into action.

Recent studies have expanded TPB to include influences such as convenience, moral obligations, environmental concern, and situational constraints (Sun et al., 2017; So *et al*., 2021). These extensions are especially relevant for evaluating responses to plastic regulation in small island or low infrastructure contexts.

In Pacific Island contexts, formal use of TPB in waste management research and planning remains limited. However, its relevance has been demonstrated in related environmental fields. For example, Di Falco and Sharma-Khushal (2019) applied TPB to climate adaptation decisions in Fiji, confirming that attitudes, social norms, and perceived control shaped individuals' willingness to invest in adaptive behaviour.

These findings reinforce the model's broader utility in understanding environmental actions within low-resource island contexts. Similarly, the UNDP (2022) ethnographic report on Fiji and Vanuatu highlights plastic related behaviours such as informal dumping, habitual reuse of packaging, and reliance on burning that align closely with TPB constructs.

Although TPB has not been directly applied to plastic waste management in Tuvalu or other Pacific SIDS, this study adopts TPB not as a predictive modelling tool, but as an interpretive

framework to help explain plastic waste-related behaviours at the household and business level in Funafuti. It is used to frame the interaction between individual attitudes, social influence, and systemic barriers, and to guide the development of more contextually grounded strategies for promoting sustainable behavioural change.

Chapter 3: Methods and Methodology

3.1 Research Design

This chapter introduces the research design used to examine plastic waste generation and management in Funafuti, Tuvalu. A mixed-method approach was employed to capture both quantitative trends and qualitative data, allowing for a more comprehensive understanding of the issue (Creswell and Plano Clark, 2018).

Qualitative tools included customs import analysis, waste audits, household surveys, and drone-based GIS imaging, while qualitative methods involved literature review, semi-structured interviews, and field observations. Although data from a waste audit, custom import records, and drone imagery were collected, they are not reported here but may inform future publications.

Quantitative methods

1. Household Surveys- collect data on plastic waste generation, challenges and disposal practices.

Qualitative methods

2. Literature review- synthesizes existing research, policies, and frameworks related to plastic waste management in Funafuti, Tuvalu.
3. Semi-structured interview- gather insights from Government officials, Waste Management Authorities, *Kaupule*, businesses and local communities
4. Fieldwork observations at the Princess Margaret Hospital (PMH) – examines healthcare plastic waste disposal practices.

Each of the methodology processes are detailed below

3.1.1 Household surveys

Household surveys were conducted to gather primary data on plastic consumption patterns, disposal behaviours, and public awareness of plastic-related policies in Funafuti. Surveys are a widely adopted tool in solid waste research (Asari *et al*., 2019), as they enable the collection of structured, quantitative data from a diverse population sample.

Funafuti comprises approximately 980 households (Statistics, 2017). To ensure representative coverage, a spatially distributed sampling approach was employed. The island was visually segmented into residential clusters based on waste collection blocks and observable housing density. From these areas, 196 households were selected with the aim of covering all key zones and minimizing geographic bias. This is approximately 20% of the total households.

Within each cluster, household selection was intended to be random but followed an adaptive substitution method. If a selected household was unoccupied at the time of visit, surveyors proceeded to the nearest neighbouring household rather than revisiting later. This substitution approach is

frequently used in small island contexts where time, access, and population dispersal constrain formal random sampling frameworks (Muñoz-Conde *et al*., 2018)

The survey instrument covered key aspects of household plastic waste management. It included questions on plastic use behaviours (e.g., types, frequency, and purpose), disposal methods (e.g., reuse, burning, open dumping, and separation for recycling), and access to waste collection services. Respondents were also asked about their satisfaction with existing waste infrastructure, awareness of national plastic bans and levies, and perceptions of the role of respective authorities in managing plastic waste.

Responses were recorded manually on paper and later digitised for analysis. All participants were informed of the research objectives and each gave verbal consent. Verbal consent was considered appropriate due to local communication norms and the informal nature of data collection. Anonymity and confidentiality were upheld throughout the process in line with ethical research standards.

The full survey questionnaire is included in Annex 1.

3.1.2 Literature review

The literature review research was conducted using ANU Library Catalogue and Google Scholar, focusing on plastic waste management policies, governance frameworks, and regional interventions in Tuvalu and the broader Pacific region. To ensure a comprehensive and structured approach, the search terms were categorized into three thematic areas:

1. Plastic Waste and Management
    - “Plastic waste and/or plastic waste management in South Pacific”
    - “Plastic waste management challenges in Tuvalu”
    - “Case study plastic waste in South Pacific”
    - “Challenges of plastic waste management in Pacific SIDs”
2. Policy and Regional Support Mechanisms
    - “Evaluation of plastic policy effectiveness in Pacific SIDS”
    - “Regional support for plastic waste reduction in Pacific SIDs”
    - “Pacific regional plastic policies”
3. International Treaties and Negotiations
    - “Basel Convention”
    - “INC Plastic Treaty”
    - “Global negotiations on plastics”

To ensure data credibility, the search included policy reports and technical documents from reputable sources such as UNEP, SPREP, World Bank, the Pacific Regional Infrastructure Facility (PRIF), and Tuvalu reports shared through colleagues back home on waste management.

Results were screened and filtered on the relevance to Tuvalu and PICs, government reports, and institutional studies were also selected. Additionally, relevant studies were identified by reviewing the

reference lists of key papers, ensuring the inclusion of foundational research and policy reports that may not have appeared in initial search results.

The literature review directly informs the study's research design, and data collection methods. While the main literature review is presented in Chapter 2, literature specifically related to regional and international support on plastic waste management is discussed in detail in Chapter 4, as it closely aligns with the study's findings in that Chapter.

3.1.3 Semi-structured interview

Semi-structured interviews, commonly used in the social sciences (Ruslin *et al*., 2022), was conducted to gain in-depth insights into the institutional, policy, and practical challenges related to plastic waste management in Tuvalu. This method allows for flexibility while exploring specific themes with diverse stakeholders (Ruslin *et al*., 2022; UNDP, 2022).

A total of 20 key informants across government, private, local government, businesses, and community sectors were interviewed. It was to explore policy, governance, and institutional challenges. The interviewees comprised the following:

- 10 government officials (environment, waste, finance, health, customs)
- 5 small local business owners
- 1 NGO representative (Live & Learn)
- 3 PMH health care workers (cleaners and waste handlers)
- 1 representative from Fatoaga Fiafia (Taiwan funded vegetable garden)

All participants provided verbal consent prior to the interviews. Interviews were not audio-recorded; instead, detailed notes were taken during each session. Participants were informed that notes would be used for research purposes only, and anonymity was maintained throughout.

3.1.4 Fieldwork observation at the Princess Margaret Hospital (PMH)

An observational study is a research method that prioritizes collecting information on behaviours of interest with minimal intervention (Portell *et al*., 2015). In healthcare research, this method has been widely applied to study hospital waste management systems and procedures (Amariglio and Depaoli, 2021).

This method was chosen primarily due to limitations in accessing formal data sources, such as waste audits, disposal logs, and internal reports. Additionally, there is a lack of recent publicly available reports specifically addressing plastic healthcare waste management in Funafuti. These constraints made it difficult to rely on document analysis or secondary data alone. Observation provided an alternative means to gather firsthand, contextual data on actual practices in the field. It also enabled the identification of informal routines and deviations from official policy, which may not be captured through interviews or documentation, while minimizing the risk of social desirability bias.

For this study, it was conducted at Princess Margaret Hospital (PMH) to examine plastic waste disposal practices in the healthcare sector. This method captured real-time behaviours without intervention, focusing on: types of waste placed in bins, use of segregation or labelling, storage, collection, and transport processes.

Observations were carried out twice a week over a three-week period. Data were recorded in the form of detailed field notes and photographs, which served to document the physical infrastructure and routine practices. The observational findings were later compared with insights from interviews with healthcare workers and Department of Health staff, enabling an assessment of how closely actual practices align with existing waste management policies.

3.1.5 Ethical Considerations

Access to the Funafuti dumpsite was granted following formal permission from the relevant waste management authorities. Household surveys and interviews were also conducted with the prior approval of the Department of Waste Management in Funafuti. For the healthcare sector, permission to conduct research at Princess Margaret Hospital was granted by the Department of Health, along with verbal consent to observe hospital waste practices.

All participants were informed about the purpose of the study, the voluntary nature of their participation, and the ways in which their responses would be used. Although formal paper-based consent forms were provided, participants were also asked to give verbal consent before interviews or surveys were conducted. No personally identifiable information was collected, and all responses were treated with confidentiality.

Interviews were conducted respectfully without audio recording, and detailed notes were taken with participants' knowledge. Observational research at the Princess Margaret Hospital was conducted discreetly and in a non-intrusive manner, with staff awareness and verbal consent.

3.2 Data Analysis Techniques

Quantitative Data Analysis

3.2.1 Household Survey Data

Survey responses, primarily multiple-choice and categorical, were digitized and analyzed using Excel. Key analysis techniques included: pivot tables to calculate frequencies and percentages for each response option, pie charts to visually represent data such as types and frequency of plastic use, disposal practices etc.

In addition to closed-ended questions, the survey included a few open-ended short answer questions, which were analysed through basic thematic coding in excel. Responses were grouped into common themes (environment, health, income, duty of responsibility, awareness), and summarized descriptively to complement the findings.

Qualitative Data Analysis

3.2.2 Semi-structured interviews & Fieldwork observation at PMH

Data collected through semi-structured interviews and field observations were manually transcribed as detailed notes. These notes were organized and coded using Microsoft Excel, where recurring phrases, concepts, and ideas were identified and grouped into thematic categories.

A thematic analysis approach was employed to interpret the data, with themes developed inductively from participant responses. The themes are waste disposals, waste management challenges, behavioural patterns and attitudes towards plastic use, institutional capacity, infrastructure gaps, alternatives, and coping strategies.

Chapter 4: Findings

4.1 Introduction

This chapter presents the core findings of the study based on qualitative data collected through household surveys, semi-structured interviews, and field observations, as described in Chapter 3. The results highlight key patterns in plastic use, disposal behaviours, and sector-specific management practices across household, institutions, and the healthcare sector in Funafuti.

This chapter is organized into four major sections. Section 4.2 explores household plastic waste consumption patterns, including the types and sources of plastic waste used. Section 4.3 discusses disposal practices, access to collection systems, and specific challenges such as disposal nappy management. Section 4.4 presents community awareness and behaviour, including knowledge of policies, participation in waste reduction, and willingness to support recycling initiatives. Section 4.5 outlines key institutional and governance challenges, highlighting perspectives from government representatives, local businesses, and community leaders. Finally, Section 4.6 presents findings on healthcare plastic waste management based on field observation and interviews conducted at the Princess Margaret Hospital (PMH), and Section 4.7 outlines the key summary findings

	Research Questions	Research Objectives
1.	What are the types and sources of plastic waste in Funafuti, Tuvalu	Identify key challenges in waste management, including behavioural, infrastructural, and governance-related factors.
2.	What approaches can the households, the Tuvalu government, the *kaupule*, businesses, and the public adopt to reduce plastic waste, particularly single-use plastics	Evaluate sector-specific practices and explore opportunities for plastic waste reduction
3.	How can regional organizations and international treaties assist Tuvalu in addressing plastic waste challenges?	Examine the role of regional and international cooperation in supporting sustainable plastic waste management, with a focus on the INC on plastics, SPREP initiatives, and Basel Convention
4.	What integrative strategies can improve plastic waste management in Tuvalu	Propose integrated waste management solutions that involve households, local governments, and regional partnerships to mitigate plastic pollution

Table 2: *Research Questions and Corresponding Objectives*

4.2 Plastic Waste Consumption Patterns

Data was gathered from 196 household survey participants, and was based on a multiple-response question, allowing respondents to select all plastic items used within their household. In total, 196 households made 644 selections, reflecting the wide range of plastic products used in daily life.

As shown in Figure 4, food packaging (e.g. noodles, frozen food wrappers, ice cream containers, juice bottles, etc) emerged as the most commonly used plastic item, accounting for 22% of total responses. This was followed by plastic bottles (18%), shampoo bottles and cosmetic products (15%), and nappies (12%). Other frequently used plastic items included plastic bags (13%), cigarettes (7%), plastic cutlery (6%), and plastic straws (4%). A small proportion of responses (3%) were categorized as others.

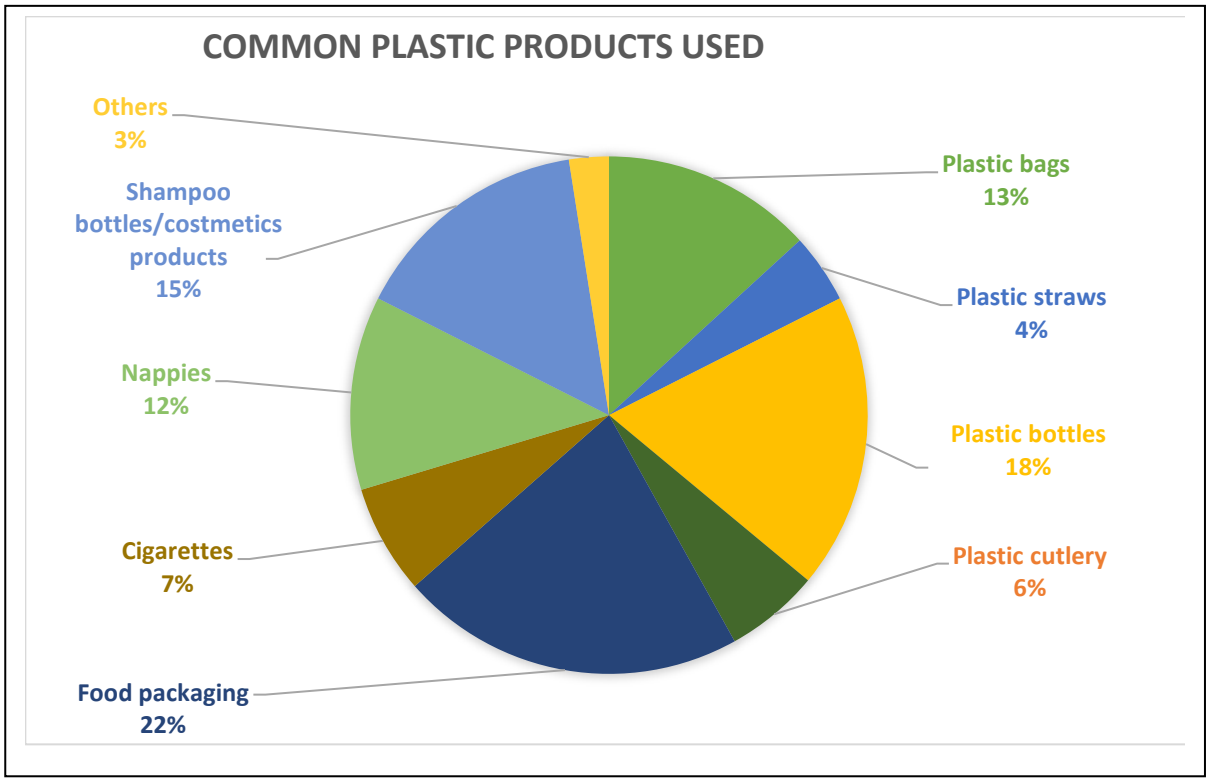

Figure 5: *Household Plastic waste consumption patterns in Fongafale, Funafuti*

In relation to the frequency of plastic usage (Table 3), the findings show that households in Funafuti use a variety of plastic products on a regular basis, with daily plastic use being the most common. These patterns provide insight into the types and extent of plastic use at the household level, forming an important basis for understanding subsequent disposal behaviours and challenges.

Often the usage of plastics	Count	household response (%)
Daily	102	58
Several times a week	41	23
Once a week	17	10
Rarely	15	8
Never	2	1

Table 3: *Frequency of household plastic use among survey participants*

The following section (4.3) builds on these findings by examining how households and businesses in Funafuti dispose of plastic waste, including the methods used, access to waste services, and practical challenges encountered in daily waste management.

4.3 Disposal Methods

Plastic waste disposal in Funafuti takes place through both formal and informal methods. The formal system includes scheduled collection services managed by the Department of Waste Management and a small-scale container refund scheme for recyclables like PET bottles.

However, gaps in service access, public awareness, and infrastructure, and behaviour of public have contributed to the rise of informal disposal methods.

Understanding both formal and informal disposal pathways is essential for evaluating the effectiveness of current waste management strategies and identifying opportunities for intervention. The following subsections examine specific aspects of disposal practices in greater detail:

4.3.1 Household Plastic Waste Disposal Practices

4.3.2 Commercial and Business Waste Disposal

4.3.3 Satisfaction with Waste Collection Services

4.3.4 Challenges in Disposable Nappy Disposal

4.3.5 Informal Disposal

4.3.1 Household Waste and Plastic Disposal Practices

Survey findings reveal that most respondents in Funafuti rely on the waste collection services provided by the Department of Waste Management. Figure 5 shows that the majority of households (55%) reported segregating their waste into different streams before disposal, indicating some level of awareness and effort to separate recyclables from non-recyclables.

In contrast, 44% of households reported disposing of all waste in a single bin without any separation, and 1% indicated they do not pay attention to how their waste is managed, suggesting a need for enhanced public education on waste practices.

"I separate my waste into different bags, but when the truck comes, they just throw it all together. I've stopped separating altogether." (R63)

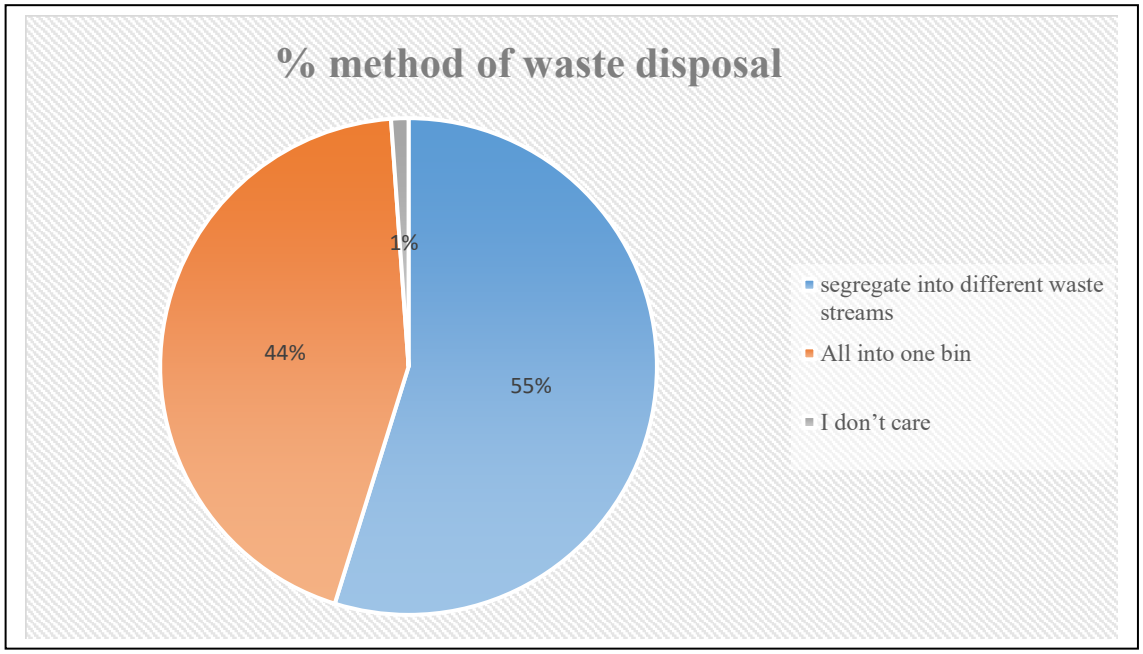

Figure 6: *Household waste disposal methods in Funafuti*

Several respondents highlight their frustrations, on their sorting efforts being disregarded by collection crews, which reduces motivation to continue separating waste. Others raised concerns about inconsistent pick-up schedules and careless bin handling by staff.

"It's frustrating, sometimes the rubbish sits for more than a week. We end up taking it to the dumpsite ourselves." (R5)

"They just throw bins after emptying them into the rubbish truck. We can't afford to buy a new bin, as this was provided years ago by the government." (R78)

When collection is delayed or bins overflow, many households transport waste directly to the Funafuti dumpsite, especially during home clean-ups or regular outings. These loads are often disposed of unsorted.

"We don't separate when we take it ourselves, everything goes in one truckload" (R44)

In terms of plastic-specific disposal, 82% of households reported discarding plastics with general waste, with only 9% participating in recycling (Figure 6). Although a small-scale refund scheme allows households to return PET bottles for $0.05 AUD per item, awareness and participation are inconsistent.

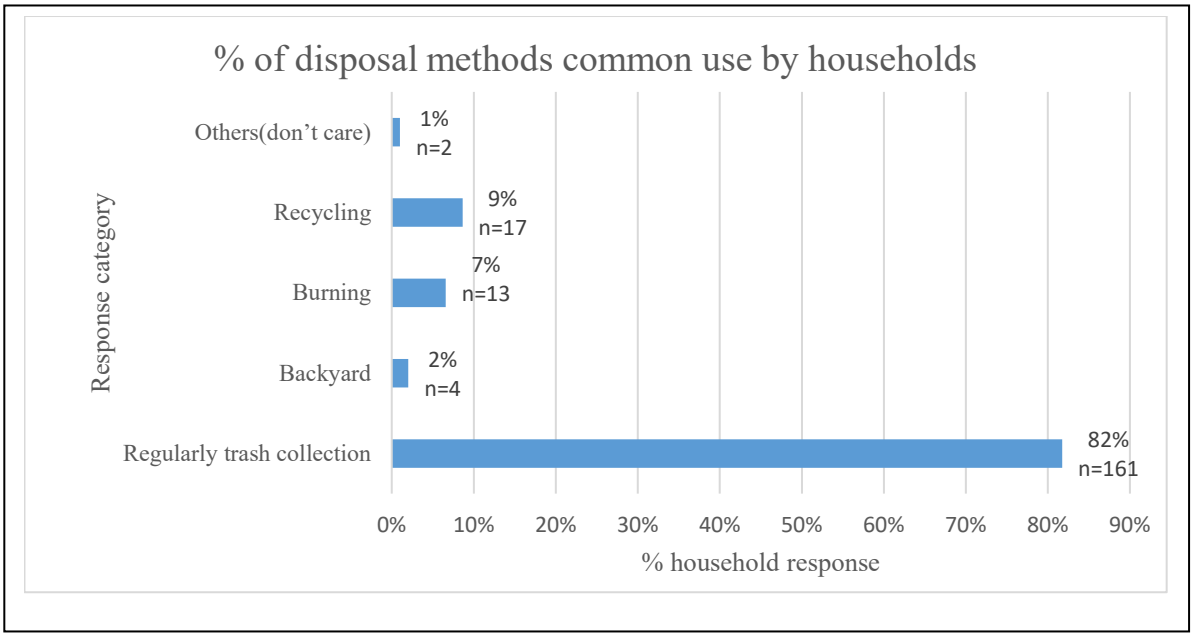

Figure 7: *Household method of plastic waste disposal*

"I collect aluminium cans and water bottles and store them in a big bag. When it's full, I take them to the station and will get roughly more than $100" (R71)

"I do not know about recycling PET bottles, but I am only aware of aluminium cans being recycled" (R77).

In addition to disposal, many households engage in informal reuse of plastic containers. PET bottles are commonly repurposed to store *kaleve* (a traditional coconut syrup) or juices for personal use or resale. Reused packaging such as the fiji biscuit buckets is used for food storage, animal feed, and water storage during droughts.

"I usually keep bottles and reuse it to pack local juice where I can take it to the market or school" (R52).

"I usually collect and store 1.5L bottles and empty Fiji biscuit containers, which are shipped to Niulakita, one of Tuvalu's outer islands, where they are filled with toddy juice. The filled containers are then brought back to Funafuti for resale, including to the Tuvaluan diaspora" (R45).

"We reuse Fiji biscuit buckets to store food at home, use it to store food waste for our pigs, also keep it to carry water in times of drought." (R14)

4.3.2 Commercial/ Business plastic waste disposal

In addition to household waste management, interviews with local shop owners and major grocery retailers provided insight into business waste disposal practices in Funafuti. Unlike households that primarily rely on the Department of Waste Management's collection services, business owners manage their waste independently. Typically, these shop owners transport their waste directly to the dumpsite once a week or whenever their bins are full, depending on the volume of plastics and other waste generated.

"We don't wait for collection- we take the waste ourselves to the dumpsite when it's full in one truck" (SBR 4)

"Normally it's only a truckload of waste, but if we got new cargo-we may have more than a truckload" (SBR 2)

At the dumpsite, there are pre-existing designated sections for the disposal of different waste categories, including scrap metal, plastics, cardboard, and disposable nappies. Businesses dispose of their waste directly into these sections, although practices vary, and some waste is deposited as mixed loads depending on convenience or time constraints.

"We try to separate plastic wrapping and cardboard, but when it's busy, everything goes together" (SBR5).

These findings suggest that while the physical layout of the dumpsite supports categorised waste disposal, commercial participation in this system remains informal and largely unregulated. The limited infrastructure and informal nature of plastic waste recovery highlight key gaps in systematic household-level plastic waste management. These infrastructure-related challenges, including broader issues of waste system capacity, are further explored in Section 4.4.

4.3.3 Access and Satisfaction with the collection system

This section presents household perceptions of the waste collection system managed by the Department of Waste Management (DWM), focusing on access, satisfaction and the infrastructural and governance-related challenges, that affect plastic waste practices.

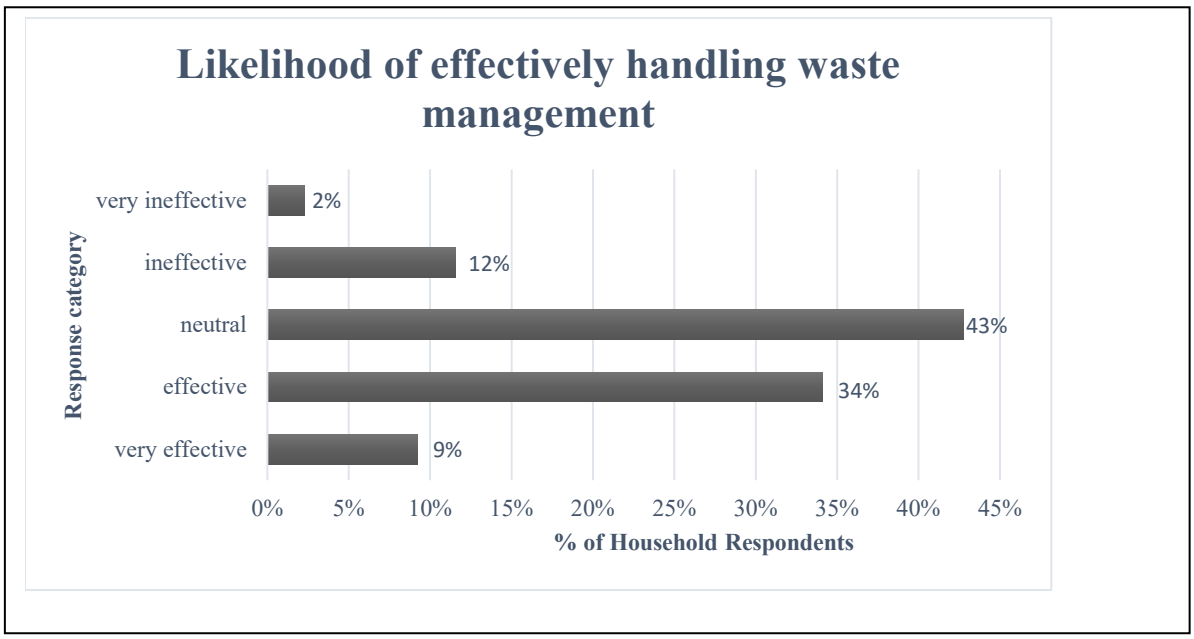

Figure 8: *Household perceptions of the effectiveness of the waste collection service*

As shown in Figure 8, perceptions were mixed. The largest proportion of participants (43%) selected a neutral stance, indicating neither satisfaction nor dissatisfaction with the service. A

combined 43% of respondents viewed the service as effective (34%) or very effective (9%), while 14% considered it ineffective (12%) or very ineffective (2%).

While neutrality was the most common response, these findings suggest a slight overall lean toward positive evaluations of DWM's performance. However, qualitative responses reveal underlying concerns.

A few participants noted low awareness, regarding the types of plastic that can be recycled. Others raised concerns about inconsistent collection schedules, noting that waste is sometimes left uncollected for several days.

"Sometimes the truck doesn't come for almost a week-waste will just sit there" (R43)

"All we know is that all plastics are the same" (R68)

These insights reflect ongoing communication and service delivery gaps that may limit household participation in structured waste reduction efforts, including plastic segregation and recycling.

4.3.4 Use of disposable nappies and associated disposal challenges

Survey responses revealed that disposable nappies are widely used in Funafuti, particularly among working mothers and larger families. Respondents cited convenience, hygiene, and time savings as the primary reasons for their preference.

Given that Tuvalu relies almost entirely on rainwater stored in household tanks and cisterns, water conservation is a major concern. This influences household decisions, making disposable nappies a more appealing option compared to cloth alternatives, which require frequent washing.

"As a working mom, using nappies every day is convenient." (R6)

"Nappies are reliable- they save time and water." (R12)

"Plastics like nappies are easier to use than washed cloth nappies- washing creates more wastewater too." (R8)

"Using nappies is easier, and it helps save water." (R25)

Despite these benefits, respondents expressed concern about disposal. Used nappies are typically discarded with general household waste and are rarely separated. When households deliver waste directly to the dumpsite, nappies are almost always included in unsorted loads.

Field observations and informal feedback also revealed secondary challenges, particularly the scattering of used nappies by stray dogs. This contributes to visible litter in residential areas and along roadsides, posing health and sanitation risks.

"stray dogs are often seen carrying nappies and leave them on the roadside" (R21)

These findings highlight the tension between practicality and environmental burden. While disposable nappies offer household-level benefits, their increasing use presents growing waste management challenges under Tuvalu's constrained infrastructure.

4.3.5 Informal Disposal

Informal disposal is widespread in Funafuti and occurs alongside formal systems. Observations and participants accounts indicate that plastic waste is frequently discarded in public and residential areas due to convenience, service delays, or lack of awareness.

Litter is often observed along roadsides, near community halls, coastal zones, and at the airstrip. The airstrip, which is a central space for recreation and daily activities, is adjacent to the ocean side, where many household pig pens are located. Both areas show visible signs of informal plastic disposal. Plastics left behind by those using the airstrip and are typically only cleaned up before scheduled flights.

"I usually walk every morning in the airstrip. I see lots of waste and plastics everyday" (R23)

The adjacent ocean-facing area, next to the airstrip, is where most household pig pens are located. In this area, discarded plastic containers, especially empty Fiji biscuit buckets, are frequently observed. While some are reused for storing pig foods and water, many are eventually visible accumulating as plastic waste in these areas.

In addition to these qualitative observations, survey data (see Figure 6 in 4.3.1) indicates that a small proportion of household engage in informal disposal practices: 7% reported burning plastic waste, 2% dispose of it in their backyards, and 1% expressed no concern about how plastics is handled.

These findings illustrate how informal disposal, driven by systemic constraints and behavioural patterns, continues to contribute to environmental degradation in Funafuti.

4.4 Awareness and Behaviour

4.4.1 Knowledge of Plastic Ban Regulation or other Waste Management Regulation/Policies

This subsection addresses household awareness of key regulatory instruments related to waste management regulations and policies in Funafuti

To assess knowledge of existing regulations, respondents were asked whether they were aware of the single-use plastic ban regulation and associated waste levies imposed by the Waste Department. The regulation defines single-use plastics as specific plastic items intended for one time use, including shopping bags, plastic bottles under 1.5L, straws, plastic cutlery, polystyrene plates and containers, cling film, plastic sheets, and plastic flags.

As shown (Table 4) below, large majority of respondents (87%) reported awareness of the plastic ban regulation, while only 13% indicated they were unaware.

Respondent	Number of household participants	% of response
Yes	152	87%
No	23	13%

Table 4: *Household awareness of existing waste management policies*

When asked whether they support the regulation, 53% of respondents expressed a positive stance, 27% indicated support, and 26% strongly support the regulation (Figure 8). Meanwhile, 36% of respondents chose a neutral position, and a combined 10% expressed opposition (7% opposed, 3% strongly opposed).

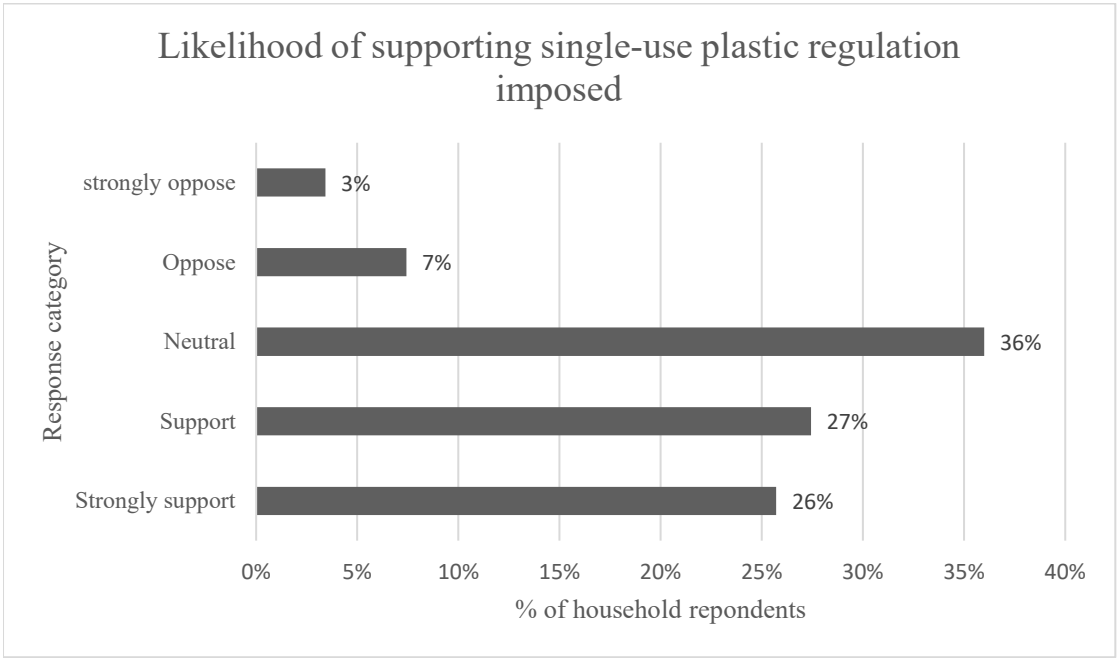

Figure 9: *Household support for waste regulations and policies*

Awareness of international agreements related to plastic waste was notably low. When asked about the International Negotiating Committee (INC) on Plastics and the Basel Convention, only 13% of respondents reported any familiarity with these agreements (Table 5).

Respondent	Number of household participants	% of response
Yes	23	13%
No	150	87%

Table 5: *Household awareness of international waste-related treaties.*

While the survey data suggests a high level of general awareness of the plastic ban regulation, qualitative interviews revealed gaps in understanding. Several respondents expressed uncertainty about the purpose of the ban and its rationale:

"I thought plastics are useful, not sure why they are banned" (R16)

Others highlighted the need for improved communication and more accessible public information:

"more awareness through local media, for people to know" (R78)

"the government should do more to explain the regulation" (R48)

These findings indicate that while overall awareness of the plastic ban is high, many households lack a clear understanding of the regulation's objectives and implications. Furthermore, knowledge of broader international agreements related to plastic waste remains minimal among the surveyed households.

4.4.2 Participation in plastic reduction and recycling efforts

Data gathered from household surveys revealed strong willingness among residents of Funafuti to adopt plastic reduction behaviours and reusable alternatives. As shown in Figure 9, 41% of respondents reported being very likely to switch to reusable items, and 37% were likely to do so. Only 6% indicated they were unlikely or very unlikely to change their habits.

When asked to identify what they considered reusable, most respondents cited cloth shopping bags, refillable water bottles, and durable containers. Many also viewed reusability in terms of extending the life of existing plastic items. A subset of participants noted the importance of replacing plastics altogether with non-plastic alternatives, including items based on traditional knowledge and locally available materials. These practices are further explored in Section 4.5.3

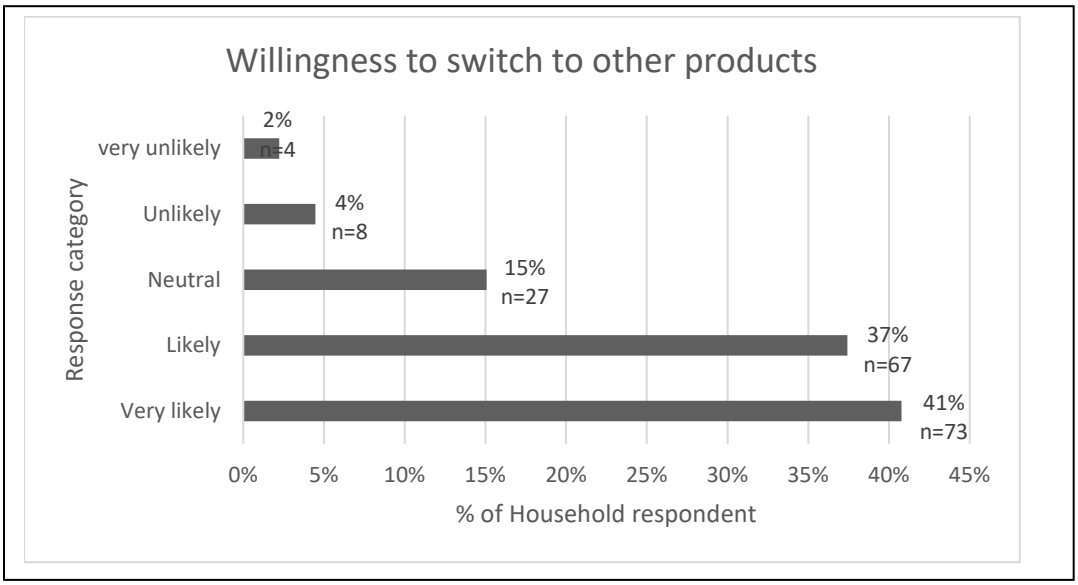

Figure 10: *Willingness of households to switch to reusable alternatives*

To understand what might encourage households to reduce single-use plastics, participants responded to a multiple-response item listing potential motivators. Across six predefined categories, a total of 511 selections were recorded. The most frequently selected motivator was education and awareness of the environmental impacts of plastics (24%), followed by government regulation and enforcement (22%) and availability of affordable alternatives (19%). Other common motivators included community initiatives (18%) and discounts for using reusable items (17%). Only 1% of responses fell into the "Other" category (Table 6).

Option	Response	Count	% of total selection (511)
a	Discount for using reusable items	86	17%
b	Availability of affordable alternatives	97	19%
c	Education and awareness on environmental impacts of plastics	122	24%
d	Government regulation and enforcement	111	22%
e	Community initiatives	91	18%
f	Other (please specify)	4	1%

Table 6: *Incentives identified GORGby households to encourage reduction of single-use plastics*

Despite this willingness to change, interview data revealed gaps in infrastructure and public knowledge. Some respondents were unaware of existing recycling efforts or doubted their existence.

"We don't have a proper plastic recycling facility. I'm not even aware of any recycling happening here." (R101)

Others recommended the introduction of colour-coded bins to support sorting and promote participation at the household and community levels.

"Place colour bins near shops, schools, and other public places." (R38)

The importance of education also emerged strongly. One participant reflected on how the interview itself had increased her awareness:

"This interview helped me understand how plastics harm the environment and our health too. Now I'm aware, and I feel scared for the future of my grandchildren at the rate of us using plastics now. I want to change my attitude-more public awareness is needed." (R103)

These findings highlight a strong willingness among households to reduce plastic use, alongside frequent mentions of the need for improved guidance, infrastructure, and public education.

4.5 Institutional and Governance Challenges (Interview Findings)

This section presents key institutional and governance challenges that affect plastic waste management in Tuvalu, drawing primarily from qualitative interviews with government officials, small business owners, and community members.

4.5.1 Government representatives and Department of Waste Management (DWM)

The DWM, under the Ministry of Home Affairs, Climate Change and Environment, is the central agency responsible for managing waste in Tuvalu. This includes waste collection, transport, and limited plastic recovery. Interviews with government representatives revealed that while the department has expanded its workforce in recent years, it continues to face significant constraints in technical capacity, funding, infrastructure, and inter-agency coordination.

Between 2017-2019, DWM operated with just 13 staff members nationwide. This number increased slightly to 14 staff from 2020 to 2022. A major shift occurred in 2023, when the conclusion of the EU-funded Waste Project enabled the government to absorb many of the project's staff into the public service. As a result, staffing rose to 68, with personnel now stationed both in Funafuti and across the outer islands (GOR3).

While this expansion represents an important step toward strengthening institutional capacity, interviewees highlighted continued gaps in staff training, coordination, budget constraint, among many others.

4.5.1.1 Policy and Regulatory Challenges

Interviewees described multiple challenges in the design and implementation of the 2019 single-use plastic ban. The policy was formulated under time pressure, with minimal stakeholder consultation and no baseline data on plastic imports or consumption. As a result, the list of banned items was largely based on perception rather than data.

A six-month grace period was granted to allow businesses to phase out existing stock. However, interviewees reported that enforcement mechanisms and operational procedures for managing confiscated plastics were never clearly defined:

"There was a grace period of six months after the regulation was in place to allow businesses and the public to use up the plastics they had already imported. But after that, when plastics were confiscated, we hadn't really thought about how to dispose of them." (GOR2)

Initially, the regulation included a ban on importing PET bottles smaller than 1.5 litres. However, this restriction was lifted in 2024, allowing their reintroduction without a clear strategy for collection or disposal. The change was primarily communicated via Tuvalu.TV and has not yet been formalised through updated regulation or guidance.

4.5.1.2 Budget Allocations for Department of Waste Management (DWM) (Jan 2022- June 2025)

An analysis of the (DWM) budget allocations from January 2022 to June 2025 (Table 7) reveals significant fluctuations.in funding While staffing consistently received the largest share, allocation for goods and services and equipment maintenance declined, despite their critical role in supporting daily

operations such as waste collection, transport, and public awareness efforts. Notably, the 2024 budget covered only a six-month period due to government's transition to a new financial year structure.

While the increase in staffing reflects institutional strengthening following the integration of project staff, the simultaneous reduction in key operational categories raises concerns about DWM's functional capacity. For example, goods and services, which include essential supplies, maintenance tools, communication materials, and safety equipment fell by more than 58% between 2022 and 2023. This limits the department's ability to conduct repairs, maintain infrastructure, and run community awareness campaigns necessary for effective waste management.

Likewise, the fuel and oil budget, vital for operating waste collection trucks, machinery, and inter-island support declined from AUD 172,210 in 2022 to AUD 150,000 in 2023.These reductions directly constrain the department's ability to provide consistent waste collection services across Funafuti and the outer islands.

Despite the growth in staff numbers, field observations revealed that only one truck and one tractor were operational at the time of research. Key waste equipment, including the plastic shredder, compost machine, and aluminium can crusher, remained non-functional.

"We have machines sitting here broken for months-we're waiting for parts, everything comes from overseas, and its expensive" (GOR6)

In addition, although a waste levy fund was established with the intent of providing dedicated support for waste management operations, interviewees confirmed that these funds are absorbed into Tuvalu's general government revenue. This practice reduces the visibility and direct impact of the levy on improving waste infrastructure or services.

These findings illustrate that while budget allocations have expanded DWM's staffing capacity, corresponding investments in fuel, equipment maintenance, and operational tools have not kept pace. This gap continues to constrain service delivery, limit public engagement, and delay the effective use of waste infrastructure.

Items	2022 (AUD $)	2023 (AUD $)	2024 (AUD $)	2025 (AUD $)
Staffing	1,009,100	1,024,530	511,630	1,048,872
Maintenance	54,490	60,820	30,000	60,970
Goods and services	454,430	188,110	161,980	151,675
Fuel and Oil	172,210	150,000	75,000	150,000
Total budget	**2,283,760**	**1,467,460**	**798,560**	**1,438,617**

Table 7: *Budget support for DWM by the Government of Tuvalu (2022-2025)*

*2022-one off payment of $470,200 was given to department of waste to cater and support waste staff

*2023-$665,710 was provided for absorption of staff under EU Waste Project in govt register.

*2024- the budget was a half a year (Jan-June) due to change in financial year for Government of Tuvalu

*2024-2025-the budget was from July 2024- June 2025

4.5.1.3 Recycling and Export Barriers

Interviews with government representatives identified significant challenges in scaling up plastic recycling and exporting recovered materials from Tuvalu. While local shredding of PET bottles occurs on a limited basis, there are currently no reliable export channels for moving processed plastics out of the country. Tuvalu's geographic isolation, limited shipping options, and high transport costs make it difficult to establish consistent and cost-effective export pathways.

The primary logistical barrier is the reliance on a single shipping company, Pacific Direct Line (PDL), which services the country. According to interviewees, these limitations not only delay export processes but also restrict Tuvalu's ability to maintain a stable recycling pipeline. The country previously benefited from a partnership with a private individual who facilitated scrap metal exports. However, following his passing, no similar arrangements have been re-established.

"Plastic recycling is very expensive. Even if we shred them, we still don't have a market to send them to." (GOR8)

Although the Department of Waste Management previously undertook efforts to shred and store PET bottles for potential export, these activities have since stalled. The plastic shredder has been out of operation for several months, and no alternative mechanisms for plastic processing have been established. As a result, large volumes of plastic waste are stockpiled in anticipation of export, despite the absence of formal agreements with international buyers or transport providers. This situation raises concerns about the viability of Tuvalu's plastic recycling efforts, especially in the absence of reliable infrastructure and long-term export strategies.

Field observations confirmed that shredded plastics are currently stored in large bags at designated sites. However, many of these bags were left unsealed or partially exposed to the environment, leading to contamination from dust, moisture, and proximity to the sea. This deterioration poses a risk to the marketability of the materials if and when a buyer or shipment opportunity becomes available.

Figure 11: *Shredded PET plastics in bulk bags at DWM facility*

Figure 12: *Bagged Shredded plastics prepared for exports*

4.5.1.4 Land Access and Infrastructure Constraints

Interviewees consistently identified land access as a major constraint on the development of waste management infrastructure in Funafuti. In Tuvalu, all land is customarily or privately owned, and expansion of public infrastructure such as waste facilities requires formal negotiation with landowners and the Kaupule. This land tenure system significantly limits the government's flexibility in planning and responding to rising waste volumes especially when expanding land use for waste services.

Staff from the DWM reported that the current dumpsite is at full capacity. Efforts to negotiate the use of adjacent land parcels for expansion were unsuccessful, as the land had already been allocated for other development purposes. Without secure access to additional land, DWM cannot extend or relocate its primary waste disposal site.

The interview data suggest that a combination of limited geographic space, private land tenure systems, and competing development priorities has created a persistent barrier to waste infrastructure expansion. Respondents noted that these conditions complicate long-term planning and have prevented DWM from identifying viable sites for dumpsite extension, despite the increasing accumulation of plastic and other solid waste types.

4.5.2 Small local businesses

Interviews with small local businesses revealed complex challenges surrounding the implementation of the single-use plastic ban. While the regulation was introduced with environmental goals in mind, many micro and informal vendors felt excluded from the design and rollout of the policy. Several respondents felt that the regulation was introduced without prior consultation, particularly with micro and informal vendors who rely heavily on plastic packaging to operate.

"As a small business owner, we were not consulted before the plastic ban was imposed. No one gave us options or alternatives. Eventually, we had to close because we couldn't afford to continue under the new regulation imposed." (R25)

A recurring issue among vendors was the cost and availability of plastic alternatives. Businesses selling low-cost goods such as fried snacks, drinks, or ice-blocks, shared that the suggested substitutes, like paper bags or reusable cups, were more expensive, harder to find, or ill-suited to their operations. In particular, space constraints in freezers and storage area made some alternatives impractical.

"My small business is selling ice-blocks. Since small plastic bags were banned, they told us to use cups, but cups take up too much space in the fridge. With plastic bags, I could stack ice-blocks in buckets and still have room for other things." (R3)

For vendors relying on thin margins, the increased costs of alternatives, combined with inconsistent availability, were often unsustainable.

"The alternatives usually run out and they're more expensive than plastic. I used to pack fried breadfruit chips in plastic bags and sell them at schools for $1. Now it's hard to keep going." (R67)

Another major concern was the perceived unequal enforcement of the regulation. Some respondents felt that small local businesses were disproportionately targeted, while larger retailers continue to use banned plastic products, such as small plastic bags, to package snack items like mango skins and other sweets, sugars, flour and rice.

"Apply the single-use plastic ban regulation on everyone, not only on small local businesses." (R24)

"Eliminated small business" (R25, R56).

Findings highlight the unintended impacts of plastic regulation on small enterprises, particularly in the absence of affordable alternatives or support mechanisms, or inconsistent enforcement.

4.5.3 Local government perspectives

4.5.3.1 Kaupule's Perspectives

The *Kaupule's* role in waste management has shifted significantly over time. Previously, local councils worked closely with the Department of Waste Management, providing trucks and logistical support for waste transport. However, since the introduction of the EU-funded waste project in 2017, operational responsibility was transferred to the Department of Waste Management, resulting in a reduced direct role for the *Kaupule*.

Currently, the *Kaupule's* role is largely limited to awareness and clean-up initiatives, including beach clean-ups and annual audits in conservation zones. According to the interviewee, these clean-ups have revealed an increase in plastic pollution, particularly PET bottles, some of which are believed to originate from overseas.

"*We've seen an increase in the plastic bottles found in conservation areas during waste audits. Some of these bottles, we haven't even seen in the capital. They might be drifting in from ships or other places. This is a concern for us*." (R72)

The shift from a collaborative to a more passive role by the Kaupule highlights challenges in institutional coordination and the need for strengthened partnerships between national and local agencies.

4.5.3.2 Traditional Knowledge and Alternatives to Plastic Use

Several community participants reflected on the decline of traditional knowledge and practices that once supported low-plastic or plastic-free living. Elders recalled the widespread use of woven baskets made from coconut or pandanus leaves, coconut shells used as cups, and reused fuel drums for water storage materials that served functional purposes without generating waste.

"*We used to use coconut leaf baskets. Some of them lasted a whole year when made properly. There are different types of baskets woven for different purposes*" (R91)

However, respondents noted that these practices are rapidly declining, particularly among younger generations who are more dependent on disposable plastic products.

"*This knowledge is disappearing. Young people don't know how to weave most of the olden handicrafts. They rely on plastics; we all do*" (R44)

Despite the decline of traditional practices, several participants expressed interest in reviving cultural alternatives to plastic. Many noted that traditional materials such as coconut leaves and pandanus were once commonly used, and that these practices could still be taught and shared within the community.

4.6 Healthcare Waste Management: Princess Margaret Hospital (PMH) Observation & Interviews

This section presents findings on healthcare waste management practices at the PMH, based on field observations and interviews with hospital staff, cleaners, and support personnel. At the time of this research, either PMH did not have a formal waste management policy or institutional plan in place, or no such document was made available to the researcher despite multiple inquiries. It was noted that plastic waste is managed inconsistently across departments, with staff relying on ad hoc practices.

4.6.1 Waste Handling and Segregation practices

Interviews with hospital cleaners revealed that they are responsible for collecting garbage bags from various departments and transporting them to the designated waste storage areas as part of their daily routine. Field observations confirmed that two separate storage areas exist at PMH: one for hazardous and expired medical waste, and one for general waste.

During a three-week observation period, the hazardous waste storage area remained full most of the time, with only one partial clearance by the Department of Public Health. Waste in this area was composed primarily of expired plastic medical items, including IV tubing, packaging, and used plastic syringes and needles. The researcher noted that some of this waste was improperly stored, with loose items spilling out of unsealed bags.

"We have to move the rubbish to the storage area. Sometimes the waste isn't segregated, and there's a foul smell. (CR 1)

Although colour-coded bins are in place for example, yellow bins for sharps cleaners reported that these are not always used correctly. Mixed waste, including hazardous plastics, is often disposed of in general waste bins, leading to health and safety concerns.

"We've been pricked by used needles thrown into general bins. It's risky and shouldn't happen." (CR 2)

These practices compromise both the intended separation of hazardous and general waste and create unsafe working conditions for cleaners and support staff. The improper disposal of sharps and contaminated plastics also undermines the effectiveness of the hospital's current waste system and contributes to potential cross-contamination between waste streams.

Figure 13 – Figure 18 provides a visual example of the types of plastic waste observed in the hazardous and general waste storage area.

Figure 13: *PMH Hazadous Storage site 1*

Figure 14: *PMH General Waste Storage site 2*

Figure 15: *Used Needles Outside Hazadous storage*

Figure 16: *Unused Plastic Tubings*

Figure 17: *Inside a PMH ward*

Figure 18: *Beside Office spaces at PMH*

4.6.2 Plastic waste from covid 19 and inventory management

Staff noted that the largest volume of plastic healthcare waste was generated during the COVID-19 pandemic due to donations of personal protective equipment (PPE), gloves, masks, and tubing. However, a lack of inventory control meant that many items expired before being used.

"*We don't always see the list of donated items. Sometimes we receive way more than needed, and things expire. Gloves might be used for basic care, but we can't use expired materials in surgeries*." GOR 5

Moreover, departments within the hospital have reportedly started ordering materials independently, which complicates stock tracking and increases waste. Expired plastic items are either burned at the dumpsite or stored indefinitely in the hazardous waste area. Many of the donated items were plastic-based single-use medical products such as gloves, IV tubing, masks, and syringes. These items have expiration dates due to sterility and material safety concerns. Staff noted that when these items expire, they cannot be used for clinical procedures and are instead stored as waste or burned. The absence of inventory tracking has contributed to large volumes of expired plastic medical supplies. These practices highlight breakdowns in supply chain coordination and long-term planning for plastic medical supplies.

4.6.3 Oversight, Coordination, and Infrastructure Challenges

Staff reported that the Department of Public Health, which is responsible for monitoring waste handling within PMH, no longer maintains a physical presence on the hospital grounds. This makes it difficult for hospital staff to consult them or report urgent waste issues. Routine cleanliness checks and waste bin monitoring, which were previously conducted, have not been consistently performed.

The Infection Prevention and Control (IPC) unit, a newly established team formed during the COVID-19 pandemic, played a key role in supporting hospital waste practices. Additionally, the IPC unit developed a set of infection prevention and control guidelines aimed at minimizing the risk of cross-contamination and infection among healthcare workers (PMH and Ministry of Health, 2020). While this guideline is not specifically focused on plastic waste or hospital waste management, they represent an important step toward safer handling practices. By promoting standard precautions, the guideline indirectly supports the safe management of hazardous plastic waste such as used gloves, syringes, and other single-use medical plastics which are often linked to incidents like needle-stick injuries and other contamination risks. The unit provided training to cleaners on proper waste handling procedures and supported the distribution of bins and garbage bags to improve on-site waste management. It procured additional bins and garbage bags and provided limited training to cleaners. However, since IPC's role has reduced its function and role post-COVID, there appears to be a vacuum in oversight and accountability.

Currently, most medical waste continues to be burned in open pits at the national dumpsite, posing environmental and health risks (Figure 19 and Figure 20). Field observations confirmed that medical waste, including plastic-based items, is openly burned at the dumpsite. This method of disposal raises

serious concerns regarding air pollution and public health, particularly in densely populated areas like Funafuti.

Figure 19: *PMH Incinerator at Dumpsite*

Figure 20: *Medical Plastic at Dumpsite - pit*

4.7 Summary of Key Findings

Table 8 below provides a consolidated summary of the main findings from this Chapter 5, organized by thematic sections. It highlights the focus areas, and key insights drawn from household surveys, interviews, and field observations. The final column shows how each section aligns with the study's research objectives and research questions. This summary illustrates the multi-dimensional nature of plastic waste challenges in Tuvalu and sets the foundation for the discussion and analysis in Chapter 5

Section	Focus Area	Main Findings	Related Objectives	Related Research Questions
4.2	Plastic waste consumption patterns	high reliance on plastic packaging (bottles, nappies); limited formal recycling; some informal reuse of plastics	Obj 2	RQ1, RQ2
4.3	Households and Business disposal methods	most plastic is disposed through general waste, limited source separation; business self-transport unsorted waste; some informal reuse and refund-based recycling	Obj 1, Obj 2	RQ1, RQ2

4.4	Awareness and Behaviour	high awareness of plastic ban, but limited knowledge of broader regulation/policies and treaties; strong willingness to reduce plastic if supported by education & infrastructure	Ob 1, Obj 2. Obj 4	RQ2, RQ4
4.5	Institutional and governance challenges	DWM faces staff shortages, unclear coordination, weak enforcement of plastic bans, and no strategy for PET or plastics; land tenure and export constraints limit local plastic waste management	Obj 1, Obj 4	RQ2,RQ4
4.6	Health care waste management (PMH)	inconsistent segregation, expired plastic PPE, and cleaner safety issues. IPC efforts during covid helped, coordination gaps persist	Obj 2, Obj 4	RQ2, RQ4
4.7	Summary of findings		Obj 1, Obj 2, Obj 4	RQ1, RQ2, RQ4

Table 8: *Summary of key findings linking to objectives and research questions*

Chapter 5: Interpreting Plastic Waste Management Challenges and Opportunities in Tuvalu

5.1 Introduction

The discussion section is structured thematically to highlight key dimensions of plastic waste management identified in the study. These include patterns of plastic use and generation, household and business disposal practices, public awareness and behavioural engagement, institutional and governance issues, healthcare sector-specific challenges, and the role of regional and international support mechanisms. Each section interprets the results considering the local context, compares them with relevant studies in the Pacific and other Small Island Developing States (SIDS). Where appropriate, the chapter uses the Theory of Planned Behaviour (TPB) (Ajzen, 1991) to interpret behaviour-related findings and identify potential leverage points for change. The goal is to inform practical, integrated approaches to sustainable plastic waste management.

5.2 Patterns of Plastic Use and Waste Generation

This section explores household-level plastic consumption patterns, based on data presented in Sections 4.2 and 4.3.4. Household survey data (Section 4.2) revealed high levels of plastic use in Funafuti, with 58% of respondents using plastic daily. Food packaging (22%), plastic bottles (18%), and disposable nappies (12%) were among the most common items. These findings are consistent with consumption patterns in other Pacific SIDS (PRIF, 2018; SPREP, 2024d), where imported, single-use plastics are often essential to daily life.

These consumption patterns are shaped by practical considerations, especially among working mothers and large families. Respondents emphasized the hygiene and convenience of single-use items like disposable nappies, particularly in a context of water scarcity and time poverty:

"*As a working mom, using nappies every day is convenient."* (R6)

"*Using nappies is easier, and it helps save water*." (R25)

Using the TPB as an interpretive lens (see Section 2.6), these behaviours reflect favourable attitudes towards plastic use. Many households perceive these items as necessary and beneficial, particularly in light of the labour, time, and resource constraints they face. The decision to use plastic is not driven by disregard for environmental impacts, but by rational adaptation to local conditions.

There was little evidence of subjective norms encouraging a shift away from plastic. On the contrary, single-use items are deeply embedded in daily routines and widely accepted as normal. The lack of role models, alternatives, or visible pressure to reduce use contributes to the continuation of these behaviours.

The most critical barrier appears to be perceived behavioural control. Many households reported feeling unable to switch to reusable or alternative products due to several constraints: high cost, poor

availability, and practical inconvenience. This was especially true for reusable items like bamboo cutlery or cloth nappies, aluminium foils, which require more water, effort, and time and costly. As one respondent explained:

"*Plastics like disposable nappies are easier… washing creates more waste too."* (R8)

This illustrates a clear gap between environmental intention and actual behaviour, as described in TPB-related studies (Bamberg and Möser, 2007; Sun *et al*., 2017). Even when environmental concerns exist, people may not act on them if structural conditions make alternative choices difficult or unfeasible.

Lessons from other Pacific contexts, such as Vanuatu's Tumble Drum initiative (Engineers without Borders Australia, 2023), show that practical, low-tech solutions can mitigate these constraints. Adaptation of such innovations to Tuvalu's context could improve household capacity for sustainable choices. Ultimately, household consumption habits are deeply intertwined with structural realities. Without addressing these systemic barriers, individual motivation alone is insufficient to reduce plastic use.

In the Tuvaluan context, similar donor-supported interventions could help bridge the gap between environmental intention and sustainable action. To promote lasting behavioural change, strategies should address all three TPB dimensions:

- Attitudes: Public education campaigns can raise awareness of the long-term health and environmental costs of plastic use while promoting viable alternatives.
- Norms: Partnering with community leaders and early adopters can help model and normalize low-plastic lifestyles.
- Perceived control: Enhancing access to affordable, context-appropriate products and basic infrastructure, especially water can empower households to shift behaviour.

In sum, plastic use in Tuvalu is shaped by necessity more than choice. Without systemic improvements that reduce reliance on plastics, even well-intentioned households will struggle to change their behaviour.

5.3 Household and Business Disposal Behaviours

Building on the consumption patterns discussed in Section 5.2, this section focuses on how plastic waste is disposed of by both households and businesses in Funafuti. Drawing on findings from Sections 4.3 and 4.5.2, it examines both formal and informal disposal practices, as well as the systemic and behavioural barriers that shape these practices. The TPB, introduced in 2.6, supports the interpretation of household and business responses by explaining the disconnect between people's willingness to engage in sustainable practices and their actual behaviour.

Survey and interview data reveal that household plastic waste is disposed of through a mix of formal collection systems and informal methods, including backyard dumping, open burning, and direct, unsorted delivery to the dumpsite. Although more than half of respondents expressed a

willingness to separate plastic waste, actual sorting was inconsistent and often abandoned due to unreliable services and limited infrastructure. Respondents frequently cited the absence of sorting bins, irregular collection, and unclear recycling instructions as barriers. This reflects a limitation in PBC, a core TPB construct, where even pro-environmental intentions are not translated into action due to external constraints (So *et al*., 2021; Sun *et al*., 2017).

Household attitudes toward plastic reduction were generally positive, with many expressing concerns about visible litter and its health impacts. However, subjective norms did not strongly support sustainable disposal practices. Informal dumping and burning were normalized and largely unchallenged in the community. As Truelove *et al*. (2023) argue, structural limitations can suppress even strong intentions, reinforcing unsustainable norms in the absence of functional systems.

For small businesses, the barriers to sustainable plastic disposal were even more complex. As shown in Section 4.5.2, many vendors expressed frustration with the implementation of Tuvalu's single-use plastic ban. Several reported being excluded from consultation processes and said that alternative packaging materials were unaffordable, impractical, or poorly suited to local business operations. One vendor explained:

"*Since small plastic bags were banned, they told us to use cups, but cups take up too much space in the fridge."* (R3)

These findings underscore that PBC is shaped not only by infrastructure but also by regulatory design and market realities. The burden of compliance was seen to fall disproportionately on small and informal businesses, especially when enforcement was perceived as uneven:

"*Apply the single-use plastic ban regulation on everyone, not only on small local businesses*." (R24)

Even where attitudes toward environmental protection were positive, vendors felt disempowered by a lack of affordable alternatives, inconsistent enforcement, and inadequate policy support. In such cases, compliance felt unattainable or inequitable, reducing motivation to adopt sustainable practices.

These dynamics are not unique to Tuvalu. In Kiribati, the Green Bag initiative encountered similar confusion and uneven uptake due to weak infrastructure and limited stakeholder engagement (Niemi *et al.,* 2019). In the Marshall Islands, irregular collection undermined waste reforms (SPREP, 2021). By contrast, Palau's container deposit scheme (CDS) achieved a return rate exceeding 90%, due to the combination of financial incentives, infrastructure access, and strong community involvement (Sagapolutele *et al.,* 2019). These cases reinforce the importance of aligning behavioural expectations with enabling systems.

Overall, the findings show that while households and businesses in Funafuti express environmental concern, their ability to act sustainably is constrained by infrastructure gaps, limited economic options, and weak governance. TPB helps explain this intention action gap, where motivation alone is insufficient without supportive conditions. Addressing these behavioural and

structural barriers requires co-designed, context-sensitive solutions that improve infrastructure, clarify regulations, and build community ownership of plastic waste reforms.

5.4 Policy Awareness and Behavioural Willingness

This section explores awareness of plastic regulations, willingness to reduce plastic use, and the social and institutional factors influencing compliance, based on findings from Sections 4.4, 4.5.2, and 4.5.3.

Findings showed that while general awareness of the 2019 single-use plastic ban was relatively high among both households and businesses, the depth of understanding varied significantly. Many respondents, especially in the business sector, reported not being consulted during the policy design process and expressed frustration over the lack of clear guidance or phased implementation support. Small local businesses and households, in particular, found alternative packaging unaffordable or unavailable. Likewise, many households misunderstood key aspects of the regulation, such as how to separate or dispose of waste properly, and were discouraged when separated waste was mixed during collection.

Participation in plastic reduction and reuse initiatives was limited. A small number of households reused PET bottles or engaged in informal recycling, but there were few incentives to do so. Community-based environmental activities were mentioned, such as clean-up campaigns or school-led education, but these were often irregular or not widely accessible. Many respondents expressed a willingness to support plastic reduction but noted the lack of infrastructure, leadership, or ongoing guidance as barriers to action.

These findings further illustrate how behavioural intentions, while generally positive, are undermined by weak infrastructure, limited incentives, and low community reinforcement. In particular, the disconnect between policy expectations and day-to-day realities reflect reduced perceived control and weak normative pressure, consistent with behavioural patterns discussed earlier.

These challenges exist despite national frameworks like the Waste Management Act 2017, the Integrated Waste Policy and Action Plan (2017-2026), which sets out strategic goals for public engagement, recycling promotion, and waste minimization. However, these policies have struggled to influence everyday practice due to weak communication, limited enforcement, and insufficient support mechanisms.

Similar issues have been documented across the Pacific SIDs. Recent studies highlight that inadequate policy communication and weak institutional feedback loops often lead to confusion and reduced compliance. In Tuvalu, as in other SIDs, policies are sometimes introduced rapidly, with limited community engagement or infrastructural readiness, making it difficult for the public (individuals and businesses) to take informed action.

Comparative insights from the Pacific SIDs reinforces the importance of inclusive and well supported policy design. In Fiji, for example, a plastic bag levy was introduced alongside widespread

radio campaigns and community consultations, which improved public understanding and acceptance (SPREP, 2022). In Palau, eco-pledges and a green fee initiative helped institutionalise pro-environmental behaviours by embedding clear expectations and financial support into local system (The Palau Legacy Project, 2017). In contrast, the Marshall Islands, face similar issues to Tuvalu, where waste separation policies are undermined by infrastructural gaps and inconsistent service delivery (SPREP, 2021).

5.5 Institutional and Governance Challenges

This section explores institutional and governance factors affecting plastic waste management in Funafuti, based on findings from Section 4.5. While Section 5.4 focused on public awareness and behavioural willingness, this section examines the systemic governance challenges that limit the implementation and sustainability of plastic waste initiatives in Tuvalu.

Key issues include policy enforcement gaps, limited government capacity, infrastructure deficits, and fragmented inter-agency coordination. Together, these challenges point to the need for stronger institutional leadership, clearer mandates, and sustained investment in order to build a more resilient and coordinated waste management system. The discussion is organised around three interrelated themes:

1. Governance gaps and institutional capacity constraints
2. Infrastructure and equipment constraints
3. Gaps in inter-agency coordination

5.5.1 Governance Gaps and Institutional Capacity Constraints

A major governance barrier to effective plastic waste management in Tuvalu is the limited institutional capacity of the Department of Waste Management (DWM). As the central agency responsible for solid waste management, DWM faces persistent resource constraints that hinder its operational effectiveness. From 2017 to 2019, the department operated with only 13 staff nationwide, covering the outer islands. This figure rose slightly to 14 between 2020 and 2022 and increased substantially to 68 in 2023 after the government absorbed project-based staff from the EU Waste Project. Despite this expansion, gaps in staff training, supervision, and technical expertise remains.

The enforcement of the 2019 single-use plastic ban has been particularly weak, and challenging when first implemented. Interviews revealed that the ban was developed rapidly and implemented without baseline data or detailed stakeholder consultation. During the grace period for phase-out, no plan was communicated for handling confiscated plastics, and enforcement guidelines were not formalised. The subsequent lifting of the ban on PET bottles under 1.5L added confusion and weakened policy legitimacy. Small local vendors and the public often observed inconsistent application, with some retailers continuing to use banned plastics without consequences.

Similar issues have been documented across other Pacific SIDS. Nauru's Waste Audit Report (2023) identifies that responsibilities for environmental oversight are fragmented, with no clear lead

agency enforcing existing regulations. Similarly, Samoa, despite having a comprehensive waste management Act, has faced major setbacks in enforcement due to weak institutional coordination, limited community outreach, and a lack of follow-through at the national and village levels (SPREP, 2023).

In Tonga, the 2023 waste audit highlighted poor communication between the Ministry of Environment and local town officers, resulting in weak enforcement of bans on plastic bags and delays in implementing national-level waste management strategies. The audit further noted that local governments lack the staffing and resources necessary to effectively monitor and enforce compliance, particularly in outer island communities. In addition, in Palau and Tonga, inadequate waste disposal systems are estimated to cost 1.6% of GDP and US$5.6 million annually, respectively (Agamuthu and Herat, 2014). The Marshall Islands also illustrate the risks of fragmented governance: the 2023 Waste Audit noted overlaps in responsibility between the Environmental Protection Authority and Majuro Atoll Waste Company, with institutional inefficiencies arising from unclear mandates and dependency on short-term donor projects for key operations.

5.5.2 Infrastructure and equipment constraints

Field observations and interviews with the Department of Waste Management (DWM) revealed that, during the time of data collection, only one waste collection truck and one tractor were functional for servicing the entire island of Funafuti. Several critical wastes processing machines, including the plastic shredder, and composting unit, were reported to be non-functional due to delayed repairs and the high cost of importing spare parts. These equipment failures frequently disrupted service delivery and contributed to illegal dumping and increased littering.

Although the government provides annual funding to the DWM, it is insufficient to sustain consistent maintenance of all essential equipment. As a result, the department relies heavily on external donor funding through project-based initiatives to finance and implement waste management activities. However, this reliance presents sustainability risks: once project lifecycles end, ongoing activities are often left without support, making long-term continuity difficult.

While a waste levy was established to support the DWM's operations, interview data indicated that the revenue is absorbed into the government's general fund rather than earmarked for infrastructure maintenance or other waste-related activities. This further limit the DWM's capacity to repair and replace ageing equipment, perpetuating operational instability.

These constraints mirror those observed across other Pacific Island Countries. In Samoa, inadequate landfill infrastructure and ageing collection equipment were cited as key obstacles to effective waste management, with frequent mechanical breakdowns disrupting collection schedules (SPREP, 2022). The Marshall Islands Waste Audit (SPREP, 2021) also reported serious concerns over ageing collection vehicles, limited plastic storage capacity, and the lack of recycling options, leading to accumulation and unmanaged dumping. Similarly, Tonga has experienced delays in equipment

replacement and limited technical training, exacerbating already fragile operational systems (SPREP, 2022).

In Tuvalu, land scarcity compounds infrastructure limitations. The existing dumpsite in Funafuti is nearing full capacity, and efforts to expand have been hindered by land ownership disputes and competing development priorities. Similar trends are seen in Nauru and Kiribati, where limited land availability restricts landfill expansion and forces reliance on inefficient disposal practices (PRIF, 2018; Pacific Trade Invest New Zealand, 2024). Comparable challenges have also been identified in Bali and Palau, where inadequate landfill space and tourism-related waste pressure have exposed vulnerabilities in island waste systems (Farlynda, 2024).

Furthermore, Tuvalu's proximity to the ocean accelerates the degradation of infrastructure. Sea spray and salt-laden winds contribute to the rapid corrosion of vehicles, machinery, and storage facilities. This issue has also been documented in other low-lying atolls such as Kiribati and the Marshall Islands, where maintaining equipment durability under harsh environmental conditions remains a major operational challenge (SPREP, 2022).

Addressing these infrastructure challenges will require strategic and sustained investment. This includes procuring durable waste collection vehicles, ensuring regular maintenance cycles, developing regional partnerships, and exploring options such as regional plastic hubs or waste-to-energy technologies suitable for small island contexts.

5.5.3 Gaps in inter-agency coordination

Effective plastic waste management depends on strong coordination among government departments, local authorities, businesses, private sector and communities. However, findings from Section 4.5 ongoing coordination challenges continue to undermine the successful implementation of waste management policies and initiatives.

Field observations and interviews revealed fragmented responsibilities across agencies. The Department of Waste Management (DWM) leads operational waste services, but collaboration with the Kaupule, the Public Health Department, and private sector remains inconsistent. Although the Kaupule is legally mandated under the Kapule Act to support DWM in delivering household waste services and maintaining clean public spaces, its involvement has declined since 2019. Some interviewees viewed this reduction as a way to lessen administrative burdens, but it has instead created a governance gap, weakening the integration of local support. Businesses also reported confusion over regulatory expectations, noting minimal engagement from authorities and a lack of structured communication channels for feedback or clarification.

This issue reflects a broader pattern of fragmented coordination across sectors in Tuvalu. For example, in the education sector, national policies promoting environmental stewardship often lack consistent implementation due to poor inter-ministerial alignment (Tinilau *et al*., 2025). Similar challenges have been observed in other Pacific Small Island Developing States (PSIDS). In the Marshall Islands, the 2021 Waste Audit (SPREP, 2021) found that responsibility for waste

management was spread across multiple agencies, leading to fragmented recycling and separation efforts. In Kiribati, the co-leadership of the Green Bag initiative by two departments has suffered from poor coordination, resulting in unclear guidance and ineffective progress (Niemi *et al*., 2019).

Poor coordination undermines policy enforcement, creates service gaps, duplicates effort, and erodes public trust in waste systems. Without consistent messaging and shared institutional accountability, households and businesses receive mixed signals about their responsibilities, lowering motivation for behavioural change.

5.6 Sector-Specific Issue: Health Care Waste

This section explores healthcare waste management factors in Funafuti, based on findings from Section 4.6. It focuses on how plastic healthcare waste is generated, handled, and disposed of within the Princess Margaret Hospital (PMH) and the broader public health system.

The findings revealed that at the time of research, PMH lacked a formal healthcare waste management policy or standard operating procedures (SOPs). Although two designated waste storage areas existed for hazardous and general waste, segregation was inconsistently practiced. Interviews with cleaners and health staff indicated that used plastics, including syringes, tubing, and PPE, were often disposed of improperly, with hazardous items ending up in general waste bins. This significantly elevated health risks, particularly for cleaners who reported incidents of needle-stick injuries during waste handling.

These practices mirror broader challenges across the Pacific SIDs. For instance, the Marshall's Waste audit report found that hazardous medical waste was often mixed with general waste due to poor segregation as hospitals (SPREP, 2021). In Kiribati, healthcare waste was frequently dumped without proper treatment because of infrastructural and procedural gaps (PRIF, 2021). Studies outside the Pacific, such as Amariglio and Depaoli (2021), further underscore that even in higher-resourced contexts like Italy, lack of segregation during the pre-operative phase led to 71% of recyclable healthcare plastics being unnecessarily incinerated or landfilled.

Past assessments have confirmed similar healthcare waste challenges in Tuvalu. The PacWaste Healthcare Baseline Study (ENVIRON Australia Pty Ltd, 2014) identified significant gaps in waste segregation, widespread improper storage of healthcare plastics, and reliance on open burning at the PMH. The study reported that plastics, including contaminated PPE, tubing, and syringes, were frequently mixed with general waste and that incineration infrastructure was inadequate, leading to unsafe disposal practices. These earlier findings highlight that systemic weaknesses in healthcare waste management have been longstanding, with little structural improvement over the past decade.

Infrastructure constraints further exacerbated the situation in Funafuti. Expired medical plastics, sharps, and contaminated healthcare plastic waste were largely disposed of through open burning at the Funafuti dumpsite. Although a new incinerator was being installed placed in the dumpsite area, it had not yet been operationalized. Open burning without emission controls is likely to release toxic pollutants such as dioxins, furans, hydrochloric acids, and other harmful pollutants (Gill *et al.,* 2022;

Lee *et al*., 2002). SPREP (2023) also highlighted open burning as a key contributor to marine pollution and air contamination in Pacific SIDs where proper incineration facilities are absent or non-functional.

The covid-19 pandemic further intensified healthcare plastic waste generation at PMH, with increased use of PPE, disposals medical items, and emergency procurement stocks. Field observations and interviews indicated that expired plastics and unused medical supplies accumulated in storage areas due to poor inventory management and lack of systematic disposal planning, further burdening the already fragile waste management system.

Given Tuvalu's vulnerability to environmental degradation and public health risks, urgent improvements are needed. Developing and enforcing a formal healthcare waste management SOP, introducing regular training programs for hospital staff and cleaners on safe waste handling, and strengthening inventory management systems are critical steps. These gaps mirror broader patterns observed in Tuvalu's environmental governance. Tinilau *et al* (2025) highlighted that while sustainability principles are embedded rhetorically in national policies, operational translation into sector-specific practices like healthcare waste management, remains weak due to fragmented coordination and policy misalignment. Additionally, operationalising the new incinerator with appropriate maintenance protocols would significantly reduce environmental and health hazards linked to current open-burning practices.

International evidence and examples suggest that healthcare plastic waste could be more sustainably managed by prioritising non-infectious waste segregation at source (Gill *et al*., 2022; Lee *et al*., 2002). Studies have shown that administrative plastics in hospitals could be effectively recycled when contamination risks are minimised through clear procedures (Lee *et al*., 2002). In Pakistan, clear classification systems separating infectious from non-infectious hospital plastics were recommended, particularly in response to COVID-19-related plastic surges (Gill *et al*., 2022)

In Tuvalu's context, applying similar principles, such as immediate source segregation, safe recycling of non-infectious plastics, and restricting incineration only to true infectious waste-could both minimize environmental risks and reduce operational costs.

Waste management practices at the hospital were largely informal, resulting in inconsistent waste segregation, unsafe storage conditions, and reliance on open burning at the dumpsite. Oversight by the Public Health Department, which is responsible for hospital waste management, was found to be limited, leading to gaps in safe handling, monitoring, and final disposal of healthcare plastics.

Strengthening inter-agency coordination between the DWM and Public Health Department (PHD) could offer immediate opportunities to reduce plastic waste from the healthcare. By integrating non-infectious healthcare plastics into national recycling systems, Tuvalu could significantly divert plastic materials away from open burning and landfill disposal. This approach would require developing formal protocols for the classification, collection, and transfer of recyclable healthcare plastics, supported by training and clear accountability mechanisms. Linking healthcare waste management more systematically with national plastic recycling efforts would not only address

operational gaps identified in Section 5.5.3 but also enhance Tuvalu's capacity to meet broader sustainability and public health goals.

5.7 Regional Support for Plastic Waste Management.

Plastic waste management challenges in Tuvalu cannot be addressed solely through national initiatives. This section examines how regional organizations, and international frameworks contribute to Tuvalu's effort to improve plastic waste management. "Regional organization" refers to an entity addressing issues within a specific geographic area, whereas "international organization" refers to a body established by treaties or agreements among sovereign states to promote cooperation on shared outcomes

Unlike previous section that draws primarily on field observation and interviews, this analysis is based on a review of secondary sources, including regional policy documents, strategic action plans, donor supported programmes, international environmental agreements and funding mechanisms relevant to plastic waste management in Tuvalu.

This discussion organised into two subsections (listed below), which critically evaluates how external frameworks align or could be aligned with Tuvalu's national efforts, highlighting both opportunities and systemic limitations.

5.7.1 Regional support for plastic waste management, and

5.7.2 International treaties and global support mechanisms.

5.7.1 Regional Support for Plastic Waste Management

Secretariat of the Pacific Regional Environment Programme (SPREP)

SPREP serves as the primary regional body coordinating environmental efforts across the Pacific, including waste and pollution management. Its frameworks particularly the Cleaner Pacific 2025 Strategy (SPREP, 2016) and the Pacific Regional Action Plan on Marine Litter 2018–2025 (SPREP, 2018), provides a strategic foundation for guiding national waste management policies in Pacific PICs.

The Cleaner Pacific 2025 Strategy promotes integrated waste management through institutional strengthening, development of policy and regulation, implementation of best practices, and public-private partnerships. It also encourages sustainable financing mechanisms such as Extended Producer Responsibility (EPR) and user-pays systems (SPREP, 2016; SPREP, 2022). The Marine Litter Action Plan complements this by encouraging legislative action, education, and regional cooperation to prevent plastic pollution (SPREP, 2018)

Tuvalu's Integrated Waste Policy and Action Plan 2017–2026 (TIWPAP) explicitly references its alignment with the Cleaner Pacific 2025 Strategy (Government of Tuvalu, 2016). Both emphasize institutional coordination, public education, and stakeholder engagement. TIWPAP operationalises these through the establishment of the Solid Waste Agency of Tuvalu (SWAT), now known as the Department of Waste Management, and a mandate for multi-stakeholder collaboration. However, implementation remains limited, particularly around financing and private sector engagement.

EPR remains more aspirational than operational in Tuvalu. The country has no domestic plastic producers or packaging manufacturers, with all plastic products are imported. This makes it legally and operationally difficult to apply the EPR principle of holding producers accountable for post-consumer waste. Without a regional or international enforcement mechanism, Tuvalu has no authority to impose obligations on foreign exporters. Consequently, while EPR is a key feature of regional waste strategies, it currently lacks applicability within Tuvalu's institutional and economic structure.

Tuvalu does operate a basic use-pay system model through the Kaupule, which charge annual fees to households for waste collection services, including bin provision. However, as discussed in Section 5.5.3, coordination between the Kaupule and DWM has weakened, reducing institutional coherence and undermining long-term planning. In practice, enforcement of these fees is limited, and there is no national integration of fee revenue into strategic waste infrastructure development.

Field data suggest that some households expressed a willingness to pay for improved waste services, particularly where service reliability and transparency are evident. This indicates that the principle of a user-pays model is not necessarily rejected by the public but instead undermine by inconsistent implementation and weak governance links. The disconnect between local fee collection and national planning raises broader concerns about how sustainable financing models promoted at the regional level can be effectively adapted in Tuvalu's specific context.

While public-private partnerships are promoted under both TIWPAP and SPREP strategies, Tuvalu currently faces significant challenges in engaging the private sector. In recent years, efforts to recruit and retain recyclers or private waste actors have largely stalled, leaving a gap in service delivery and limiting innovation in plastic recovery and reuse.

The Moana Taka Partnership, a regional initiative between SPREP and Swire Shipping, facilitates the free transport of recyclable waste from Pacific Island Countries (PICs) to overseas recycling facilities (SPREP, 2024c; SPREP, 2020). However, Tuvalu faces barriers in accessing this initiative, as Swire Shipping does not operate in the country only Pacific Direct Line is present (discussed in 4.5.1.3). In contrast, countries like Samoa and Kiribati have successfully utilised the partnership. Kiribati, for example, has shipped multiple containers through the programme and attributes its success to strong engagement with the commercial sector, including effective coordination between brokers, vendors, and recipients (SPREP, 2024c).

SPREP has also supported Tuvalu through regional programmes such as PacWaste (2013–2017), PacWastePlus (2019–2026), and the Pacific Ocean Litter Project (POLP) among others. These initiatives have delivered tangible outcomes including waste audits, feasibility studies, and beach monitoring. However, these successes are often project-based and donor-funded, raising concerns about long-term sustainability and institutional ownership.

A mid-term review of TIWPAP and the Cleaner Pacific Strategy (SPREP, 2022; Government of Tuvalu, 2019a) confirms that while there is policy alignment, practical implementation is hindered by limited technical capacity, fragile finances, and weak enforcement mechanisms. Introducing durable

financing tools such as waste levies, deposit-return schemes, or pay-as-you-throw models could help move Tuvalu beyond the project cycle and toward more resilient governance structures.

5.7.2 International Treaties and Global Support Mechanisms.

Plastic pollution is an escalating global concern, driven by transboundary movements through ocean currents, trade, and atmospheric pathways. For Pacific Small Island Developing States (SIDS) like Tuvalu, the challenge is especially acute; despite contributing minimally to global plastic production, they often find themselves at the receiving end of imported plastics, marine debris, which strain limited waste systems, impacting their marine ecosystems.

Several international agreements address plastic pollution either directly or indirectly. Of these, MARPOL Annex V, is relevant to Tuvalu. It prohibits the discharge of plastics and other garbage into the sea from ships (International Maritime Organization, 2022)

International treaties and multilateral mechanisms offer critical legal, technical, and financial frameworks to address these inequities. While there are several international agreements that touch on plastic-related issues, such as the MARPOL Annex V, Stockholm, this subsection explores the Basel Convention and the ongoing plastic treaty negotiations, assessing their relevance, and potential benefits for Tuvalu's efforts to strengthen plastic waste management.

Notably, Tuvalu is a party to both international frameworks discussed here. However, translating these international commitments into meaningful nation actions requires coordinated efforts across government ministries, regional support agencies, private sector, civil society, and local communities.

5.7.2.1 Basel Convention and Plastic Waste Control

Tuvalu's accession to the Basel Convention provides it with legal authority to regulate transboundary movements of hazardous and other waste, including plastic (Basel Covention Secretariat). Notably, Tuvalu does not import plastic waste, which is a positive safeguard given its limited landmass and absence of a centralised waste treatment facility. However, should Tuvalu begin exploring the export of its domestic plastic waste, it must comply with the Convention's provisions particularly those introduced under the 2019 Plastic Waste Amendments (Basel Covention Secretariat, 2023)

These amendments do not prohibit plastic waste trade outright but introduce differentiated controls. Under Article 6, clean, well-sorted plastic waste intended for environmentally sound recycling can still be traded with minimal restrictions. However, mixed, contaminated, or hard-to-recycle plastics now require the Prior Informed Consent (PIC) procedure, meaning that exporting countries must notify, obtain consent from, and ensure sound management in the importing country (Basel Covention Secretariat; UNEP, 2021)

For Tuvalu, this presents both opportunities and challenges. While the Convention offers legal protections and a potential avenue for waste export, institutional capacity is a limiting factor. The

country currently lacks the customs infrastructure, laboratory capacity, and technical expertise to accurately classify waste or fulfill the reporting obligations outlined in Article 13.

Although SPREP and the Basel Secretariat provide some technical support and regional training, there is no dedicated financial mechanism under the Convention to sustain national implementation. Therefore, any move toward plastic waste export will require not only compliance with international regulations but also targeted investments in enforcement capacity and logistical infrastructure.

5.7.2.2 The Global Plastic Treaty: A transformative Opportunity or Unrealised Potential?

The ongoing negotiation of a legally binding global instrument on plastic pollution under the United Nations Environment Programme (UNEP) marks a critical moment in international environmental governance. Initiated by UNEA Resolution 5/14 (United Nations Environment Assembly, 2022), the treaty aims to address the entire life cycle of plastics, from production to end-of-life moving beyond the waste-centric focus of instruments like the Basel Convention (United Nations Environment Assembly, 2022).

For Pacific SIDS like Tuvalu, the treaty presents both an opportunity and a challenge. On one hand, it provides a unique platform to influence upstream measures such as product design, reduction targets, and bans on problematic plastics, measure that could drastically reduce the volume of plastic waste reaching their shores. On the other hand, the complexity of negotiations, competing geopolitical interests, and ambiguity around financial support threaten to marginalize smaller, low-capacity states.

Tuvalu, which contributes minimally to global plastic production but faces disproportionately high exposure to marine debris, could benefit substantially if the treaty enshrines principles such as Extended Producer Responsibility (EPR), differentiated obligations for SIDS, and binding reduction targets. However, realising these benefits will depend on the treaty's ability to address the persistent equity gap in multilateral environmental agreements and offers accessible, predictable finance and technical support.

Several Pacific SIDs have taken positions in the INC process. Countries like Samoa, Cook Islands, and Palau have advocated for binding obligations and upstream controls, aligning with the High Ambition Coalition to End Plastic Pollution and endorsing the Bridge to Busan Declaration (SPREP, 2024c). These efforts reflect a regional push for enforceability and equity, rooted in shared vulnerabilities despite minimal contributions to global plastic production.

One promising proposal is the establishment of a dedicated global plastics fund, with earmarked support for SIDS and Least Developed Countries (LDCs), potentially funded by mandatory contributions from high-income, high-production states. This would be a significant improvement over the Basel Convention, which lacks such financial mechanisms and leaves implementation costs largely unfunded for vulnerable countries. Yet, Tuvalu's past experiences with the Global Environment Facility (GEF) and Green Climate Fund (GCF) suggest that complex application procedures and

limited in-country technical capacity could render even well-intentioned mechanisms ineffective without significant reform (pers.obs).

Tuvalu's participation in the INC process, while supported through SPREP and AOSIS coordination, remains constrained by limited human and institutional capacity. In this context, regional diplomacy becomes not just strategic, but essential. Collective Pacific submissions have elevated issues like differentiated responsibilities, access to implementation support, and the importance of recognizing structural vulnerability.

Ultimately, while the Global Plastic Treaty is framed as a legal instrument, its real value for small countries like Tuvalu lies in the operational pathways it could unlock. If designed with equity and enforceability at its core, the treaty could provide Tuvalu with access to predictable funding, technical assistance, technology that have long been out of reach. The treaty represents not just a legal milestone but a chance to enable tangible progress in addressing plastic pollution.

5.8 Summary

In summary, the discussion has highlighted the multi-dimensional challenges facing plastic waste management in Tuvalu, revealing critical patterns in household and business behaviours, infrastructural and institutional limitations, public awareness gaps, and governance coordination failures. Household dependence on single-use plastics, limited recycling practices, and informal disposal methods reflect broader behavioural and systemic barriers also documented across other Pacific SIDS. Despite positive attitudes towards waste reduction, weak service delivery and lack of affordable alternatives constrain sustainable practices. Institutional analysis shows that while frameworks such as the TIWPAP and national regulations exist, enforcement gaps, staffing shortages, budget constraints, and land tenure complexities undermine effective implementation. Moreover, healthcare-specific challenges point to serious waste management risks within critical public services. Regional cooperation, particularly through SPREP-led initiatives, provides essential technical and political support, yet remains heavily project-dependent. International frameworks like the Basel Convention offer legal tools but lack predictable financing, while the ongoing Global Plastics Treaty negotiations offer a transformative opportunity if they deliver enforceable, equity-based outcomes. Overall, the findings demonstrate that without integrated national, regional, and international efforts backed by sustainable financing and community engagement. Tuvalu's plastic waste management challenges will persist. These insights set the foundation for the final chapter, where practical, context-sensitive recommendations are proposed to strengthen Tuvalu's path toward sustainable plastic waste management.

Chapter 6: Synthesis and Strategic Pathways for Funafuti, Tuvalu

6.1 Introduction

This chapter synthesises the key findings of the study and proposes strategic actions to strengthen sustainable plastic waste management in Tuvalu. Building on the analysis in previous chapters, it reflects critically on the extent to which the research objectives and questions have been addressed, and draws out their broader implications for policy, practice, and regional cooperation. Recognising the complexity of plastic waste issues in small island developing states (SIDS), particularly in Funafuti, Tuvalu the chapter integrates the research findings into a set of strategic priorities tailored to Tuvalu's national context while also aligning with regional and international dynamics.

6.1.1 Synthesis of Key Findings and Strategic Implications

Objective 1: Identify key challenges in plastic waste management, including behavioural, infrastructural, and governance-related factors

The research confirmed a high dependence on single-use plastics in households and businesses, particularly in Funafuti. Daily use of food packaging, PET bottles, and disposable nappies was widespread, driven by convenience, affordability, time constraints, and water scarcity. While some households informally reused plastic containers and bottles, formal reuse and recycling systems were underutilised or poorly trusted.

Using the TPB as an interpretive lens, the research showed that although attitudes towards plastic reduction were generally positive subjective norms were weak and PBC was low. Systemic barriers such as unreliable collection services, limited availability of alternatives, and poor communication prevented many from acting on pro-environmental intentions. These behavioural gaps were reinforced by infrastructure failures, and lack of incentives to separate waste.

Sustainable behaviour change cannot be achieved through awareness alone. It must be matched with consistent service delivery, visible system improvements, economic incentives, and access to affordable alternatives. Building public trust and demonstrating institutional accountability are central to enabling household action.

Objective 2: Evaluate sector-specific practices and institutional capacity for plastic waste reduction.

The study found that despite Tuvalu's Integrated Waste Policy and Action Plan (TIWPAP 2017–2026), implementation remains limited due to institutional constraints. The Department of Waste Management (DWM) faces ongoing challenges including insufficient technical expertise, unreliable equipment, declining operational budgets, and weak coordination with the Kaupule. Although staffing expanded through project absorption, key machinery remained non-functional, and essential services were under-resourced. Waste levies were also absorbed into general government revenue, reducing transparency and effectiveness.

Sector-specific analysis revealed further challenges. In the healthcare sector, the Princess Margaret Hospital lacked a formal waste management plan. Plastic-based medical waste including syringes, PPE, and expired supplies was often misclassified, stored unsafely, or burned in open pits. Gaps in inventory control and the absence of oversight by the Public Health Department worsened these risks.

Among small businesses, many vendors struggled to comply with the single-use plastic ban, citing poor consultation, high costs of alternatives, and inconsistent enforcement. Some informal businesses were disproportionately affected, with limited access to viable packaging substitutes or regulatory guidance.

Strengthening plastic waste management in Tuvalu requires improved institutional coordination, targeted budget allocations, and practical support for key sectors. Healthcare systems urgently need waste protocols and safer handling practices, while local businesses require more inclusive and better-enforced regulatory approaches.

Objective 3: Assess the role of regional and international cooperation frameworks.

The study found that regional initiatives, particularly those led by SPREP, such as PacWastePlus and the Pacific Ocean Litter Project (POLP) have contributed valuable technical support, awareness campaigns, and policy guidance to Tuvalu. However, these efforts remain largely project-based, with limited continuity or institutional ownership at the national level.

At the international level, Tuvalu's engagement in the Global Plastics Treaty negotiations offers a major opportunity to influence upstream action such as product design changes, reduction targets, funding mechanisms, and restrictions on problematic plastics that could significantly reduce the volume of plastic entering its borders and marine space.

However, for Tuvalu and other SIDS, the success of the treaty will depend on whether it creates a standalone, dedicated global fund for plastic pollution, separate from broader climate and environment mechanisms like the GEF, Green Climate Fund (GCF), or Adaptation Fund (AF). These existing funds are often pooled, have competing priorities, and are notoriously difficult to access for small, low-capacity countries like Tuvalu. A plastics-specific fund with predictable, earmarked resources, simplified procedures, and SIDS appropriate access modalities is essential for operationalising treaty commitments on the ground.

Tuvalu's advocacy within the treaty process must centre on operational equity not just ambition. Securing a plastic-specific fund, with streamlined procedures for SIDS, will be critical to converting global commitments into local impact.

Objective 4: Propose integrated solutions tailored to Tuvalu's plastic waste management context.

The findings underscore that plastic waste solutions must be cross-sectoral. This includes regulatory reform, household engagement, infrastructure investment, and regional and international diplomacy. The revival of traditional knowledge such as using woven baskets and coconut leaves can complement modern strategies if formally supported.

Financial sustainability is a recurring challenge. While mechanisms like user-pays models exist (e.g. via Kaupule), they are poorly enforced and lack transparency. Public willingness to pay for better services exists, but trust, transparency, and accountability need to be rebuilt.

Integrated planning must be anchored in financial realism and institutional coordination. Mechanisms like user-pays models, deposit-return schemes, and targeted subsidies can work if aligned with community needs and institutional capacity. Tuvalu must also position itself to leverage regional platforms and international diplomacy to amplify its needs and secure support.

6.2 Recommendations

Sustainable plastic waste management in Tuvalu requires an integrated, cross-sectoral approach that combines national policy reform, community-driven engagement, regional collaboration, and global advocacy. To support this, the following strategic action are recommended:

1. **Governance and Institutional Reform**

- Re-design the national waste levy funding mechanism to ensure funds are used exclusively for waste services, with transparent public reporting to prevent misuse.
- Strengthen coordination across DWM, Kaupule, Public Health through formal protocols
- Hold regular consultations with vendors and households before introducing regulations on plastics
- Aligning priorities and improving communication between national agencies and partners.

2. **Community Engagement and Behaviour Change**

- Develop communication plan for plastic disposal and recycling.
- Develop informational pamphlets on various types of plastics, translate them into local language, and distribute them within the community
- Clearly communicate waste collection schedules using radio broadcasts, social media, community leaders, and local churches
- Ensure consistent and reliable household waste collection services.
- Promote youth-led reuse initiatives in schools and communities
- Support community champions and revival of traditional practices (e.g., basket weaving)

3. **Sector-Specific Support**

- Develop national protocols for healthcare plastic waste including safe segregation, storage and disposal.
- Provide training support to healthcare workers on healthcare waste management protocols.
- Incorporate successful models from other neighbouring Pacific (Eg, Tumble Drum initiative).

4. **Regional and International Collaboration**

- Explore and establish formal agreements with SPREP or other partners on initiatives like the Moana Partnership for long-term technical support.
- Explore opportunities and coordinate with Pacific SIDs on the potential establishment of a regional plastic hub (including cost benefit analysis).
- Advocate for a dedicated/ standalone fund, for global plastic pollution with appropriate access modalities for SIDs and communities

5. Research, Innovation, and Monitoring

- Explore new technologies cautiously (e.g., the advanced recycling, pyrolysis), to ensure they are environmentally and economically viable, and appropriately adapted to the national context, including integration with community practices and local knowledge.
- Encourage research on water quality near dumpsite on presence of microplastics.
- Further research needed to strengthen data collection on plastic inflows and outflows, supporting more accurate and evidence-based making.
- Encourage research and development on the use of Geographic Information System (GIS) tools to assess plastic volumes at dumpsites and improve waste management strategies
- Support further research on the use of biodegradable products and alternatives for plastics to ensure they do not create new environmental challenges.

6.3 Conclusion

This study has assessed plastic waste management practices in Tuvalu through a multi-dimensional lens, revealing that plastic pollution is not only a technical and environmental challenge but also a governance, behavioural, and policy issue. By applying the Theory of Planned Behaviour to household practices, the research highlighted the gap between positive attitudes and actual behaviours driven by systemic barriers like unreliable services, lack of alternatives, and weak institutional trust.

The findings show that plastic waste in Tuvalu is not simply a byproduct of consumption, but reflection of deeper socio-economic realities, governance gaps, and external dependencies. From households navigating daily constraints to national institutions struggling with limited resources, the challenges are systemic but not impossible.

This research does more than diagnose problems; it contributed to the evolving discourse on integrated, equitable waste governance in SIDs. It offers a framework for rethinking plastic waste not just an environmental hazard, but as a development issue requiring systemic reform,, sustained political will, and inclusive planning.

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Annexes

Annex 1: Survey Questionnaire for Households

Towards a Sustainable Plastic Waste Management in Tuvalu.

Conducted by Tilia Tima. Master's Student: ANU Fenner School of Environment & Society

Talofa, ea koe ite aso nei? (Greetings How are you)?

I'm doing a research on plastic waste in Funafuti and was wondering if you could assist me by answering a short survey.

It will begin with some basic questions about your household, followed by few questions on plastic use and waste disposal. It should take about 20 minutes.

This will be very informal, and your participation will be anonymous. Do you have time to participate?

QUESTIONNAIRES FOR HOUSEHOLDs

Name:
Age:
Island group:
No of family members:
Income (fortnightly):
No of people working:
Adults:
Children:
Babies (0-2yrs):

1) **What is your primary role in the community?**
   a) Resident
   b) Kaupule representative
   c) Government
   d) Business owner
2) **How often do you use plastic items (plastic bags, straws, bottles, nappies, cigarettes)?**
   a) Daily
   b) Several times a week
   c) Once a week
   d) Rarely
   e) Never
3) **What types of plastic items do you frequently use? (Select all that apply)**
   a) Plastic bags
   b) Plastic straws
   c) Plastic bottles
   d) Plastic cuttery
   e) Food packaging (noodles,frozen foods, ice cream containers,juice bottles etc?
   f) Cigarettes
   g) Nappies
   h) Shampoo bottles
   i) Other (please specify)
4) **Why do you prefer using plastics (select all that applies)**
   a) Convenient
   b) it is necessary
   c) Cheaper & affordable
   d) Lack of alternatives

e) No choice

f) Other (please specify)

5) Are you aware of the single-use plastic ban regulation and waste levy imposed by the waste department?

a) No

b) Yes

6) Do you support the regulation imposed

a) Strongly support

b) Support

c) Neutral

d) Oppose

e) Strongly oppose

7) Why do you support or oppose the regulation? (open-ended question)

8) Are you aware of any other regulation, or policy impose by Kaupule, Waste Department, Environment Department, Health etc?

a) Yes

b) No

9) How do you dispose of your waste?

a) Segregate into different waste streams

b) All into one bin

c) I don't care

10) Where do you get your disposal bins from?

a) Buy it yourself

b) Kaupule

c) Waste Management Department

11) Are you willing to purchase bins for waste disposal?

a) Yes

b) No

If no ask why?

12) How likely are you to switch to reusable alternatives if they are available?

a) Very likely

b) Likely

c) Neutral

d) Unlikely

e) Very unlikely

13) How aware are you of the environmental impacts of plastic waste?

a) Very aware

b) Somewhat aware

c) Not aware at all

14) Are you aware of the health impacts of using plastics?

a) No

b) Yes

15) If you know how plastics affect the environment and your health, would you be willing to change how you *use* them and your disposal behaviors?

a) Yes

b) No

c) Explain!

16) What incentives would encourage you to reduce your use of plastics? (select all that applies?)

a) Discount for using reusable items

b) Availability of affordable alternatives

c) Education and awareness on environmental impacts of plastics

d) Government regulation and enforcement

e) Community initiatives

f) Other (please specify)

17) Are you aware of the local recycling facility on plastic in Tuvalu?

a) Yes

b) No

18) How likely are you to recycle plastics if there is a plastic recycling facility

a) Very likely

b) Likely

c) Neutral

d) Unlikely

e) Very unlikely

19) How do you currently dispose of your plastic waste?

a) Regular trash collection

b) Backyard

c) Burning

d) Recycling

e) Other (specify)

20) How effective do you think the current waste management department is in handling plastic waste (disposal times/awareness)

a) Very effective

b) Effective

c) Neutral

d) Ineffective

e) Very ineffective

f) Explain?

21) Have you heard about the new INC Plastic Treaty or any UN-related treaty on plastic (Basel Convention) that Tuvalu is a party to?

a) Yes

b) No

22) Can you explain what it means to you?

<u>Open-ended questions</u>

- **What challenges do you face in reducing the use of plastics?**
- **What suggestions do you have for improving plastic waste management in Funafuti?**
- **Do you know what was use by our ancestors used when there were no plastics?**
- **Do you have anything else to share?**

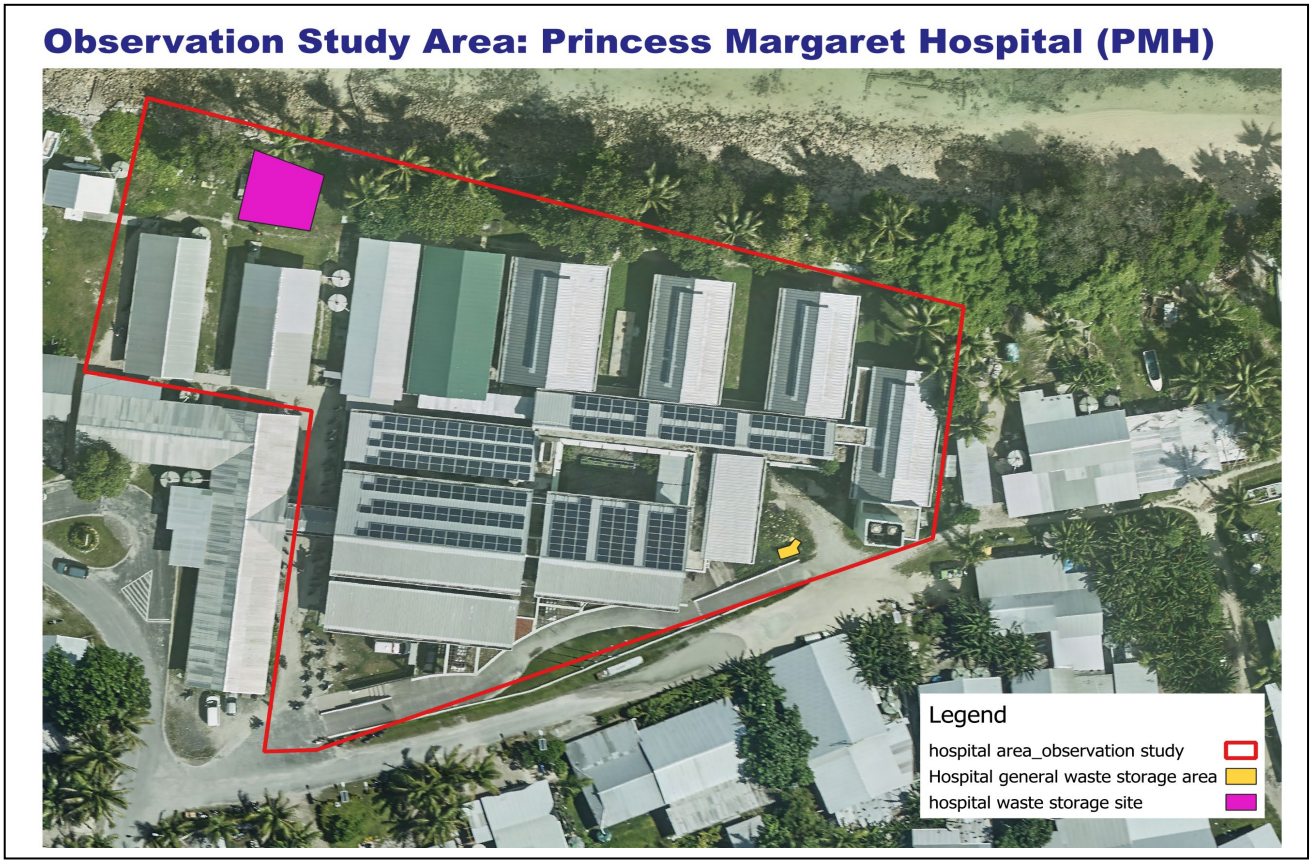
Annex 2: Guiding Questions for Semi-Structured Interviews

Key Stakeholders- DWM, Environment, Health & Health workers, Kaupule

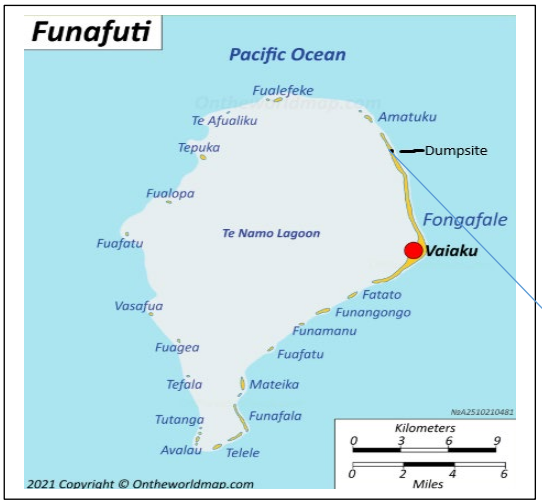
1. What is your role in waste management particularly plastic waste in Funafuti?
2. How do you differentiate your responsibilities (community, *kaupule*, government)?
3. Do you think plastics should be regulated/ and why?
4. Are there any existing or planned activities aimed at reducing or managing plastic waste?
5. Have any awareness campaigns and education been conducted? If so, how effective were they?
6. Is there a system in place to monitor plastic imports, usage, and disposal?
7. Are there any support (technical, financial, policy) you receive from other partners including national counterparts, regional and international partners?
8. What challenges or barriers you face in implementing these initiatives?
9. What are some initiatives you are anticipating doing to reduce plastic waste?
10. What does a “plastic free Tuvalu” mean to you? What would need to change to achieve this?
11. Can you explain how waste is managed and disposed of in your workplace? (specifically for health workers)
12. Do you have training to handle waste?
13. Describe some challenges you face in working in this environment?

Annex 3: Map of Observational Study Site

Observational Study Area: Princess Margaret Hospital (PMH)



Annex 4: Map of Dumpsite Area in Funafuti



Annex 5: Household Distribution - Study Sites in Funafuti