Version 1 - October 2023

PLASTIC PACKAGING RECOVERY OPPORTUNITIES IN THE ANZPAC REGION

ANALYSIS OF A REGIONAL PATHWAY TO PLASTIC CIRCULARITY BY 2025

ANZPAC PLASTICS PACT | PLASTICS PACT

DISCLAIMER

ACKNOWLEDGEMENTS

We acknowledge and thank the numerous contributors around Australia, New Zealand, and Pacific Island Countries who responded to our information request for this project. The completion of this study was only possible because of your valuable and expert contributions. We thank the Institute for Sustainable Futures at the University of Technology Sydney (UTS ISF), specifically Ben Madden, Senior Research Consultant, Helen Barreto Lara, Research Assistant, and Dr Nick Florin, Research Director for their research work.

CITATION

ANZPAC, 2023. *Plastic Packaging Recovery Opportunities in the ANZPAC Region*, Report prepared by Institute for Sustainable Futures, University of Technology Sydney on behalf of the Australia, New Zealand, and Pacific Islands Plastics Pact (ANZPAC), December 2022.

CONTENTS

EXECUTIVE SUMMARY

1.1. The project

This report links the outcomes of a plastic packaging recyclability assessment for the Australia, New Zealand and Pacific Islands region with the completion of a material flow analysis (MFA) of used plastic packaging in the region for the 2019-20 financial year. Utilising data collected for the 2020 ANZPAC Baseline Recyclability Assessment, this analysis evaluated packaging flows from the point of consumption to collection, sorting and recovery for seven countries: Australia, New Zealand, Fiji, Western Samoa, Solomon Islands, Tonga and Vanuatu.

The project also aimed to evaluate recovery system performance and develop methodologies to measure progress in achieving the 2025 Australia, New Zealand and Pacific Islands Plastics Pact (ANZPAC)'s Regional Targets. These include:

- **ANZPAC Target 1:** Eliminate unnecessary and problematic plastic packaging through redesign, innovation and alternative (reuse) delivery models.
- **ANZPAC Target 2:** 100% of plastic packaging to be reusable, recyclable or compostable packaging by 2025.
- **ANZPAC Target 3:** Increase plastic packaging collected and effectively recycled by 25% for each geography within the ANZPAC region.
- **ANZPAC Target 4:** Average of 25% recycled content in plastic packaging across the region.

1.2. Packaging flows in 2019-20

Approximately 1.3 million tonnes of plastic packaging were placed on the market in 2019-20 across the ANZPAC region, including 487,000 tonnes of recyclable packaging. Of this, only 216,000 tonnes of plastic packaging were recycled—mainly in Australia and New Zealand. Figure E1 shows the main flows of plastic packaging for the ANZPAC region estimated in this analysis. Losses of packaging at the point of collection were significant.

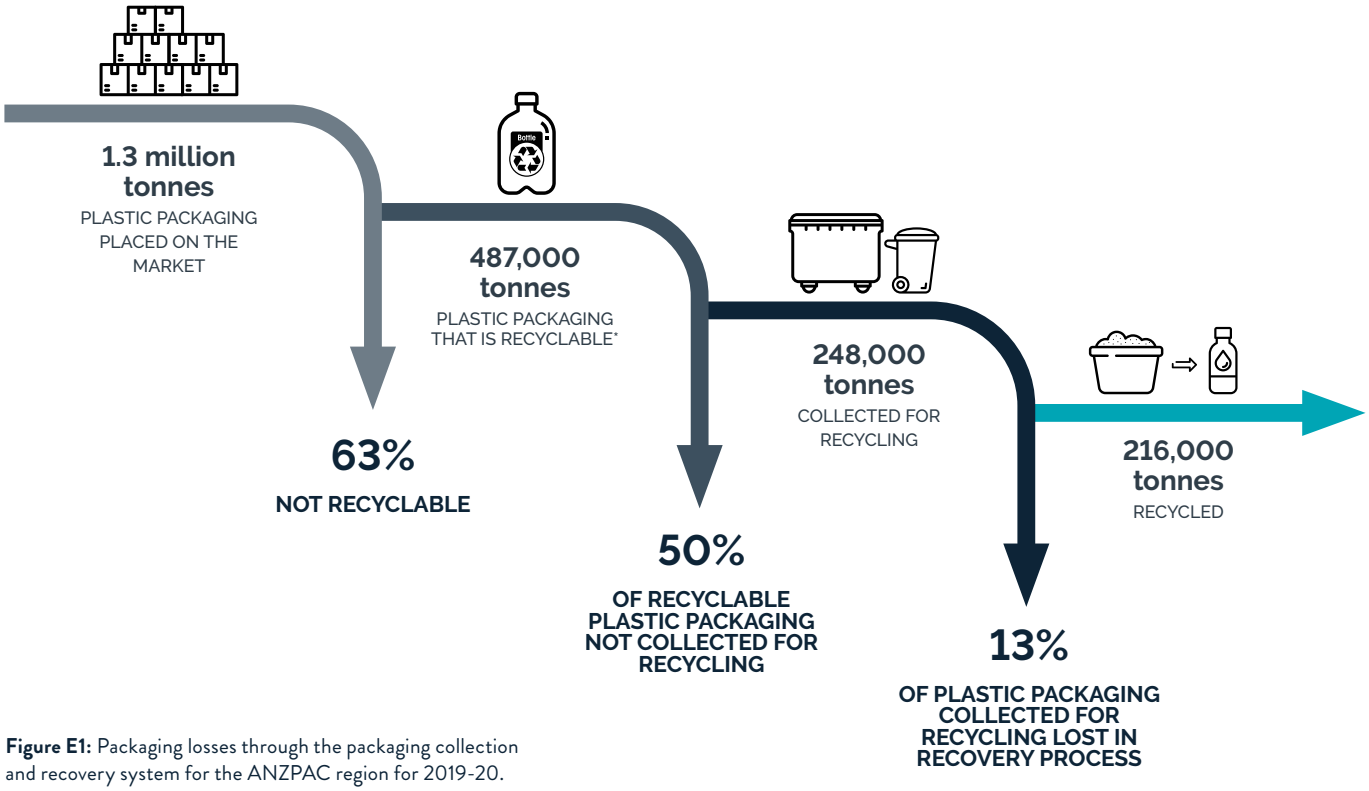


Figure E1: Packaging losses through the packaging collection and recovery system for the ANZPAC region for 2019-20.

Collection rates of used plastic packaging were quite poor across all packaging formats and regions. Most significant losses of recyclable material result from a failure to collect used packaging for recycling. This could be owing to a range of factors such as plastic packaging designs limiting collection and recovery success, littering, lack of convenient collection infrastructure overall or more specifically general collection infrastructure in remote and regional areas, poor disposal practices, or a combination of the above. In total, only approximately **17% of used plastic packaging was collected for recycling** in 2019-20 across the region, which significantly limits potential recovery of used plastic packaging. Rigid packaging generally had the highest rates of collection, with flexible packaging types having the lowest.

Table E1 – Summary of estimated collection rates by ANZPAC country and packaging format*.

Formats	Australia	New Zealand	Fiji	Western Samoa	Solomon Islands	Tonga	Vanuatu	Total
Bottles	42%	49%	<1%	1%	0	0	0	42%
Other rigid	19%	34%	0	0	0	0	0	20%
All rigid	29%	42%	<1%	<1%	0	0	0	29%
Small flexible	4%	2%	0	0	0	0	0	4%
Large flexible	11%	11%	6%	0	0	0	0	11%
All flexible	5%	4%	<1%	0	0	0	0	5%
TOTAL	**16%**	**26%**	**<1%**	**<1%**	**0**	**0**	**0**	**17%**

* Table 2 in the main body of the report describes these format definitions. Estimated collection rates have estimated uncertainty range of ±14-15% for Australia and New Zealand, and ±24% for Pacific Island Countries

1.3. Performance against 2025 ANZPAC Regional Targets

In this project, metrics were used to evaluate recovery system performance against the 2025 ANZPAC Regional Targets. Table E2 summarises estimated performance against these Targets.

Approximately 42% of plastic packaging in the ANZPAC region was considered unnecessary and/or problematic[1] (ANZPAC Target 1). This proportion was highest in the Pacific Island Countries (PICs), where flexible packaging types made up a higher proportion of plastic packaging placed on the market.

Approximately 37% of plastic packaging was considered recyclable—significantly less than the 100% target rate for 2025 (ANZPAC Target 2). This proportion again was lowest in the PICs, owing to the high proportion of flexible packaging placed on the market. New Zealand had the best performance of the ANZPAC countries, with 56% of plastic packaging placed on the market deemed recyclable.

Approximately 17% of all plastic packaging placed on the market was recycled (ANZPAC Target 3). PICs had the lowest performance, with New Zealand having the highest, with an overall plastic packaging recycling rate of 26%.

Recycled content made up approximately 4% of total plastic packaging placed on the market—significantly less than the target of 25% (ANZPAC Target 4). The distribution of recycled content across the ANZPAC region was consistent because, owing to data limitations, Australian proxy data was used to calculate this proportion.

Table E2 – Summary of ANZPAC country performance against ANZPAC Regional Target metrics by percentage (%) of material placed on the market (PoM).*

Country	Metric 1 – Unnecessary and problematic packaging	Metric 2 –Recyclable packaging [% of PoM]	Metric 3 – Recovery rate [% of PoM]	Metric 4 – Recycled content in new packaging [% of PoM]
Australia	42.6%	35.6%	15.9%	4.1%
New Zealand	35.3%	55.5%	25.8%	5.8%
Fiji	57.3%	19.4%	0.1%	4.2%
Western Samoa	50.7%	8.8%	0.3%	3.3%
Solomon Islands	52.5%	18.3%	0%	4.6%
Tonga	57.3%	19.4%	0%	4.2%
Vanuatu	37%	23.4%	0%	5.7%
ANZPAC region	42.1%	37.4%	16.6%	4.3%

*Note: Uncertainties on country level metrics are found in Appendix A7.

[1] Based on assumed problematic/unnecessary packaging formats and materials, including single-use PS/EPS/PVC, lightweight HDPE shopping bags, and oxo-degradable packaging.

1.4. Scenario analysis of system interventions

A scenario analysis was conducted to project plastic packaging flows to 2026-27 and to test the impact of several system changes on ANZPAC Regional Targets performance. Scenarios testing included material bans, CDS expansion, and advanced soft plastics recovery.

Assumed **material bans coming into effect by 2026-27,* will lead to reduction of overall packaging by approximately 8%**, and lead to a small increase in plastic packaging recovery (Table E3).

Overall, **advanced soft plastics recycling will lead to the largest increases in recovery rate** and ANZPAC Regional Targets performance, achieving over 20% recovered. However, this relies on improving collection rates for soft plastics to be in line with rigid packaging collection rates.

CDS expansion was also shown to be significant, especially in the PICs and illustrates the potential impact that convenient collection systems with financial incentives for behaviour change can have on rigid packaging recoveries, by bypassing inefficient collection systems and providing a less contaminated material stream for recyclers.

The scenarios analysed illustrate the potential for plastic packaging recovery in 2026-27 for the assessed interventions, but also shows the significant improvements that need to be made system wide to achieve higher rates of plastic packaging recovery.

Table E3 – Summary of ANZPAC region overall plastic packaging recovery rates, by scenario in 2026-27. Percentages in parentheses indicate %-change compared to baseline.

Country	Business as usual	Material ban scenario	CDS expansion scenario	Advanced soft plastics recovery scenario	Combined scenario
Australia	15.9%	16.3%	15.9%	19.8%	19.9%
New Zealand	25.8%	26.7%	29.9%	28.8%	34.2%
Fiji	0.1%	0.2%	4%	0.4%	5.3%
Western Samoa	0.3%	0.4%	2.1%	0.9%	3.1%
Solomon Islands	0.0%	0%	3.7%	0.5%	5.3%
Tonga	0.0%	0%	3.9%	0.3%	5.1%
Vanuatu	0.0%	0%	4.7%	0.3%	5.8%
ANZPAC region	**16.6%**	**17.1%**	**17.1%**	**20.3%**	**21.2%**

* refer to Table 20 – Material ban and substitution assumptions for Scenario 2

1.5. Recommendations

Circular plastic packaging design

The plastic packaging system performance against the 2025 ANZPAC Regional Targets clearly showed that innovation, redesign, and alternative use models are necessary to progress towards circularity for plastic packaging. Focus needs to be on reduction of packaging, viable reuse models and systems, and recyclability in practice and at scale.

Improving collection rates

To increase the recovery the 1.3 million tonnes of plastic packaging placed on the ANZPAC market (in 2019-20), improved collection is needed across the region:

- Separation of recyclables and non-recyclables at households and businesses.
- Extending CDS to NZ and PICs.
- Establishing more widespread collection systems in PICs for all formats.
- Expanding collection systems for flexible formats in Australia and New Zealand.
- Applying recovery models that are geographically relevant in remote and regional communities.

System interventions

To move towards the 2025 ANZPAC Regional Targets, system changes are required to close the gaps towards the Target performance. The two system interventions with the highest impact are introduction of advanced recycling technology for soft plastic recycling and CDS extension.

- Improved collection of soft plastic combined with advanced recycling technology will significantly improve the overall recovery rate across the region. Therefore, innovative advance recycling solutions should be tested to identify opportunities for long term recovery solutions.
- CDS implementation in New Zealand and PICs will significantly increase recovery rates of plastic packaging and improve source separation of rigid plastic packaging.

1. INTRODUCTION

1.6. Project background

This report describes material flow modelling undertaken to evaluate the management of used plastic packaging materials in the Australia, New Zealand and Pacific Islands Plastics Pact (ANZPAC) region, from consumption, to recovery at end-of-life. The study is part of the Phase II analysis of the *2020 ANZPAC Recyclability Assessment*. Findings from this study can inform future data collection and calculation methodologies for assessing the performance of ANZPAC plastic packaging management against the 2025 ANZPAC Regional Targets and provides new insight to inform future strategies for improving plastic packaging management performance.

In this first section of the report, we introduce the quantitative modelling approach and assumed system model representing plastic packaging management for the ANZPAC region, including data utilised and metrics used to evaluate performance. Section 2 provides the results of our modelling, tracing the flows of plastic packaging through the management system as well as an evaluation of system performance for countries within the ANZPAC region. A scenario analysis is presented in Section 3, evaluating possible system changes and their impact on achieving the 2025 ANZPAC Regional Targets. Section 4 includes considerations for the future evaluation of performance against the Targets, including addressing data limitations and calculation methodologies.

1.7. Scope of analysis

The timeframe of this analysis is the 2019-20 financial year, aligning with data in the 2020 ANZPAC Baseline Recyclability assessment.

The geographical scope of the project is the ANZPAC region, specifically Australia, New Zealand, Fiji, Western Samoa, Solomon Islands, Tonga, and Vanuatu. Table 1 lists the countries included in the analysis, and how they are referred to in short form throughout this report.

Table 1 – ANZPAC countries in scope. *

Country short name	Country full name
AUS	Australia
NZL	New Zealand
FJI	Fiji
WSM	Western Samoa
SLB	Solomon Islands
TON	Tonga
VUT	Vanuatu

*Note: Country short names are used as labels in outputs throughout this report, based on World Bank country classifications.

Table 2 lists the plastic packaging types and materials in scope for this project. Packaging types are aggregated to higher material and format categories throughout this report.

Table 2 – Plastic packaging materials in scope*

Plastic packaging type	Material category	Format category
Polyethylene Terephthalate (PET) bottles	PET	Bottles
PET thermoforms		Other rigid
PET other rigid		
High density polyethylene (HDPE) bottles	HDPE	Bottles
HDPE other rigid		Other rigid
Polypropylene (PP) bottles	PP	Bottles
PP other rigid		Other rigid
Polyethylene (PE) tubes	HDPE	Other rigid
Polystyrene (PS)	PS	Other rigid
Expanded polystyrene (EPS) rigid	EPS	Other rigid
Polyvinyl Chloride (PVC) rigid	PVC	Other rigid
>A4 mono-material PE flexibles in a business-to-business (B2B) context	LDPE	Large flexible
>A4 mono-material PE flexibles in a business-to-consumer (B2C) context		
Other >A4 flexibles	Other	Large flexible
<A4 PE flexibles	LDPE	Small flexible
<A4 PP flexibles	PP	Small flexible
<A4 multi-material flexibles	Other	Small flexible
Other <A4 mono-material flexibles		
Other rigid		Other rigid

*Material categories and format categories are used in the aggregation of results throughout this report

1.8. Modelling approach

A material flow analysis (MFA) was performed to estimate the flows of used plastic packaging through the various ANZPAC packaging management systems for the 2019-20 financial year period. MFA is an approach used to quantitatively assess the state and change of flows and stocks of materials within a system (Brunner & Rechberger, 2017). The approach is based on the principle of the conservation of mass. By balancing material inputs and outputs, the material flows within a system can be quantified and further analysed. The remainder of Section 1.3 describes the MFA approach used for this project.

1.8.1. System specification

Figure 1 shows the system diagram representing the plastic packaging consumption and recovery system in 2019-20 used for this analysis. This system specification was consistently applied across all ANZPAC regions. Material flows are estimated based on three estimation strategies, represented by different coloured flows in Figure 1.

These are:

- Raw data input (green).
- Estimation via parameters (orange), where flows are modelled using parameters from proxy data and/or relevant literature (e.g., materials recovery facility (MRF) sorting efficiencies, local reprocessor recovery rates).
- Estimation via mass balance (pink), i.e., by back-calculation to ensure mass balance is retained.

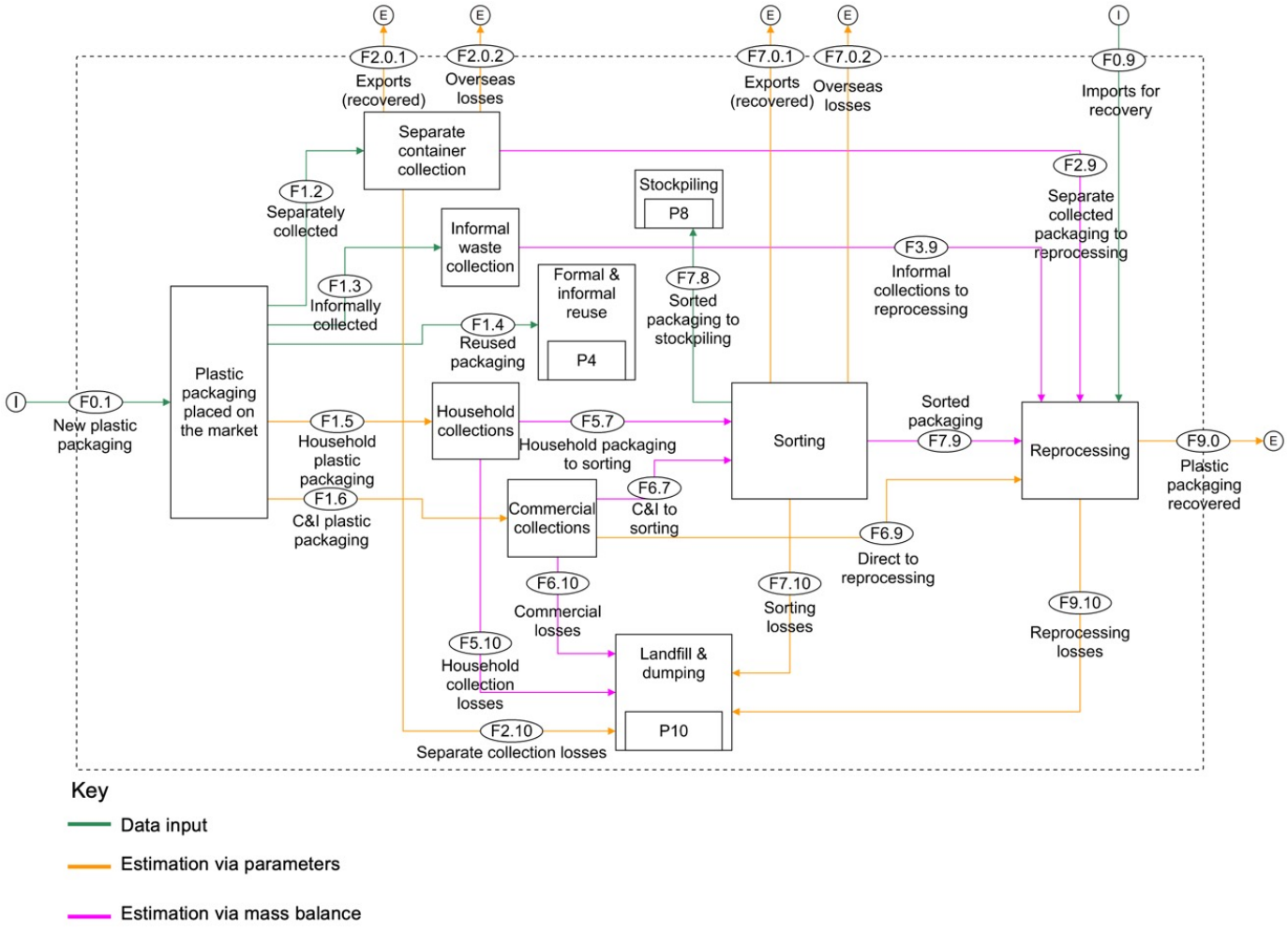


Figure 1: System diagram representing the plastic packaging management and recovery system assumed for the ANZPAC region.

Overall, there are 10 system processes in the system specification, which represent physical (e.g., sorting, collection) and 'virtual' waste transformation and aggregation (e.g., plastic packaging consumption) steps along the waste management chain. Three of these processes are assumed to accumulate over time, namely 'Formal and informal reuse', 'Stockpiling', and 'Landfill and dumping', however data for these accumulations was not available for this iteration of work (see Section 4.1 re: data limitations). There were 24 material flows estimated, representing the transfer of materials between processes, imports into the system, and exports out of the system. For this work, flows are labelled using the following convention:
F[source process].[destination process].[sub-flow]

For example, flow 'F2.10' represents a single material flow from process number 2 ('Separate container collection') to process number 10 ('Landfill and dumping'). Flow 'F7.0.1' represents export flows from process number 7 ('Sorting') that are recovered overseas, where sources/destinations outside the system are represented by process number 0. Sub-flow '1' in this example refers to quantities of material recovered, and sub-flow '2' refers to losses overseas.

Descriptions of system processes and material flows are provided in Table 3 and Table 4.

Table 3 – Description of system processes

Material process	Description
P1, Packaging placed on the market	A 'virtual' process representing all material placed on the market from local and overseas sources, as well as primary and secondary material inputs. Packaging placed on the market is considered as a proxy for packaging consumption in the timeframe of analysis.
P2, Separate container collection	This process represents container deposit schemes and other similar collection systems, that collect a 'clean' stream of packaging (typically bottles). This process is conceived as a sorting process; hence, outputs are directed to reprocessing.
P3, Informal waste collection	This process represents waste collection that is not part of formal kerbside or separate container collection systems (see Section 4 for more details on this process).
P4, Formal and informal reuse	This process represents the formal and informal reuse of packaging. Formal reuse includes dedicated reuse systems, while informal reuse refers mainly to at-home reuse.
P5, Household collections	Kerbside collections of household packaging waste.
P6, Commercial collections	Collection of packaging waste derived from the commercial and industrial sectors.
P7, Sorting	This process refers to discarded packaging that is collected and sorted, however is kept as a stock of material and not directed to reprocessing activities.
P8, Stockpiling	This process includes material recycling facility (MRF) sorting as well as other more informal sorting processes, which remove contaminants and other non-recyclable material from the waste stream before being directed to reprocessing.
P9, Reprocessing	This process refers to the recovery, reprocessing or beneficiation of packaging material into raw secondary material, to be utilised as inputs into new packaging or non-packaging applications.
P10, Landfill and dumping	The destination of all material not collected for recycling, and for material losses at sorting and reprocessing facilities.

Table 4 – Description of system material flows.*

Material flow	Description
F0.1, New packaging	New packaging placed on the market, consisting of recyclable and non-recyclable packaging, problematic packaging, and recycled content. Derived from Blue Environment (2022).
F1.2, Separately collected	Eligible packaging collected or disposed of via separate collection systems, i.e., container deposit scheme systems (dedicated drop-offs, reverse vending machines, etc.). Derived from Envisage Works (2021).
F1.3, Informally collected	Packaging collected for recycling via informal collection, e.g., 'waste pickers'.
F1.4, Reused packaging	Reusable packaging reused in the study time frame.
F1.5, Household packaging	Packaging consumed in households.
F1.6, C&I packaging	Packaging consumed at businesses (including business-to-business packaging).
F2.0.1, Exports (recovered)	Overseas exports of packaging derived from separate collections that is recovered overseas. Derived from Envisage Works (2021) and ISF (2021).
F2.0.2, Overseas losses	Recovery losses of exported CDS packaging that occur overseas. Derived from Envisage Works (2021) and ISF (2021).
F2.9, Separate collected packaging to reprocessing	Separately collected packaging directed to local reprocessing for recovery.
F2.10, Separate collection losses	Efficiency losses from separately collected material, resulting from contamination, incorrect disposal, and other losses. Derived from parameters from Pressley et al. (2015).
F3.9, Informal collections to reprocessing	Informally collected packaging directed to local reprocessing for recovery.
F5.7, Household packaging to sorting	Household packaging collected at the kerbside, destined for material sorting facilities.
F5.10, Household collection losses	Losses of household packaging at the point of collection, resulting from incorrect disposal, littering and other causes.
F6.7, C&I to sorting	Commercial and industrial (C&I) packaging collected for recycling, destined for material sorting facilities.
F6.9, Direct to reprocessing	Business-to-business packaging sent direct to reprocessing facilities from points of collection. Derived from Envisage Works (2021) and ISF (2021).
F6.10, Commercial losses	Losses of C&I packaging at the point of collection.
F7.8, Sorted packaging to stockpiling	Packaging that has been positively sorted at material recycling facilities and stored.
F7.0.1, Exports (recovered)	Overseas exports of positively sorted material from material recovery facilities that is recovered overseas, derived from Envisage Works (2021) and ISF (2021).
F7.0.2, Overseas losses	Assumed recovery losses from exported material overseas. Derived from Envisage Works (2021) and ISF (2021).
F7.9, Sorted packaging	Positively sorted packaging directed to local reprocessing facilities for recovery.
F7.10, Sorting losses	Losses of packaging at material sorting facilities, resulting from contamination and process inefficiencies. Derived from Pressley et al. (2015).
F0.9, Imports for recovery	Packaging imported overseas for local recovery.
F9.0, Packaging recovered	Packaging recovered locally. Derived from Blue Environment (2022).
F9.10, Reprocessing losses	Losses of packaging at reprocessing facilities. Derived from Envisage Works (2021).

*Data sources referenced in the table are described in Table 6.

1.8.2. System performance indicators

An aim of this project was to define calculation methodologies for measuring plastic packaging performance against the ANZPAC Regional Targets. Packaging flows quantified from the MFA were used as a basis, for estimating performance metrics that can be used for this purpose. Performance metrics to measure against the ANZPAC Regional Targets are summarised in Table 5, and were calculated for each country within the ANZPAC region, and for the ANZPAC region as a whole. The indicators in the table serve as a benchmark for evaluating future performance against a baseline, and future considerations in this regard are discussed in Section 4.2.

Table 5 – Indicators used to evaluate system performance.

ANZPAC Target	Performance indicator	Description
ANZPAC Target 1 – eliminate unnecessary and problematic plastic packaging	Problematic plastic packaging proportion [% of plastic packaging placed on the market]	Performance measured based on the input flows of new plastic packaging that are considered unnecessary and/or problematic. The proportion of new plastic packaging that is problematic is derived from data in APCO (2021) for Australia and is applied to the other ANZPAC countries assuming that packaging types placed on the market are generally consistent throughout the ANZPAC region. Problematic plastic packaging types include single-use PVC, PS/EPS and other (polymer code 7); lightweight HDPE/LDPE shopping bags, and oxo-degradable packaging. The composition of new plastic packaging and uncertainty on new plastic packaging flow estimates are discussed further in Section 2.2.
ANZPAC Target 2 – 100% of plastic packaging to be reusable, recyclable or compostable	Recyclable plastic packaging proportion [% of plastic packaging placed on the market]	Performance measured based on the input flows of new plastic packaging that are considered reusable, recyclable and/or compostable. For this, the definition of recyclable packaging from EMF (2021) and the 2020 ANZPAC Baseline Recyclability Assessment project report were applied, whereby packaging is considered recyclable when post-consumer collection, sorting and recycling is proven to work in practice and at scale (>30% post-consumer recovery). Considerations regarding the treatment of recyclable plastic packaging and reusable plastic packaging are discussed further in Section 4.2.
ANZPAC Target 3 – Increase in plastic packaging collected and effectively recycled by 25%	Recovery rate [% of plastic packaging placed on the market]	Performance is measured as the proportion of used plastic packaging that is recovered 'out-the-gate' as secondary material. Quantities of plastic packaging recovered locally and overseas are considered. This analysis establishes a baseline for 2019-20, from which performance in achieving this target may be measured.
ANZPAC Target 4 – average 25% recycled content in plastic packaging	Recycled content [% of plastic packaging placed on the market]	Performance measured based on the proportion of recycled content in new plastic packaging. Proportions of recycled material is based on available data in APCO (2021) for Australia for the considered plastic packaging material types in scope, again assuming that new plastic packaging types placed on the market are generally consistent across the ANZPAC region.

1.8.3. Data utilised

The primary data set utilised was the Blue Environment (2022) data set, which was compiled for the *2020 ANZPAC Baseline Recyclability Assessment* for the 2019-20 financial year. Several other data sets were also utilised for the MFA modelling to fill data gaps identified early in the project, such as non-Australian plastic packaging flows. These data sets are described in Table 6.

Table 6 – Data sets utilised in the MFA modelling.

Reference	Data title	Description
Blue Environment (2022)	ANZPAC recyclability assessment 2020 – ANZPAC reporting tool	Data describing total quantities of plastic packaging placed on the market and recovered for countries in the ANZPAC region. This is the primary data source for this analysis.
Envisage Works (2021)	Packaging consumption and recycling data 2019-20 – Packaging data tool	Data describing quantities of plastic packaging placed on the market and recovered for Australia at a higher resolution than Blue Environment (2022). This data is a key source of proxy data applied across the region.
ISF (2021)	Material flow analysis of Australian packaging, 2019-20	Material flow analysis performed for Australia based on Envisage Works (2021) data. This data provides additional detail not in Envisage Works (2021) used as proxy, including exports and CDS flows.
OPMCA (2019)	Rethinking Plastics	Report compiled by New Zealand's Office of the Prime Minister on waste plastic flows. Data in the report is used in the calibration of the MFA for New Zealand.
Infometrics (2015)	Review of packaging mass balance measurements for Packaging Council of New Zealand	Data source that underpins OPMCSA (2019), which evaluates some key packaging flows including exports and household vs. C&I collections in New Zealand.
APWC (2021a)	Plastic Waste National Level Quantification and Sectorial Material Flow Analysis – Fiji	Report compiled by Asia Pacific Waste Consultants that underpins data in Blue Environment (2022). Includes further detail on household vs. C&I flows for Fiji.
APWC (2021b)	Plastic Waste National Level Quantification and Sectorial Material Flow Analysis – Samoa	Report compiled by Asia Pacific Waste Consultants that underpins data in Blue Environment (2022). Includes further detail on household vs. C&I flows for Samoa.
APWC (2021c)	Plastic Waste National Level Quantification and Sectorial Material Flow Analysis – Vanuatu	Report compiled by Asia Pacific Waste Consultants that underpins data in Blue Environment (2022). Includes further detail on household vs. C&I flows for Vanuatu.
SPREP (2020)	Moana Taka Partnership – A Guide for Pacific Island Countries & Territories	Report detailing some key export flows from PICs. To be used in scenario analysis.
Pressley et al. (2015)	Analysis of material recovery facilities for use in life-cycle assessment	Analysis of material recycling facilities in the US, used for proxy data on sorting efficiencies of plastic packaging types.

1.8.4. Uncertainty analysis

Uncertainty on estimated material flows resulting from variability in data was evaluated using a method published by Laner et al. (2015). This approach combines a qualitative assessment of data quality used in the MFA to generate a quantitative measure of data variability. This scoring system is described generally in Table 7. This approach is applied to all underlying data inputs and parameters. The software STAN *(subSTance-ANalysis)* was used for estimating material flows.

The software takes input values of known material flows, as well as estimated uncertainty, which is derived from the approach described above. The STAN software considers the propagation of uncertainty throughout the modelled system. This is the interaction between uncertainties across flows in the system and the analysis gives quantitative uncertainty ranges for all estimated material flows. Data and modelling uncertainty is discussed in further detail in Appendix A1.

Table 7 – Summary of the data uncertainty evaluation method from Laner et al. (2015).

Indicator	Definition	Score
Reliability	Focus is on the source of the data, including documentation, generation methodology and verification methods.	1: Methodology is well documented and consistent, peer-reviewed data. 2: Methodology of data generation is described, but not fully transparent. 3: Methodology not comprehensively described, but principle of data generation is clear. 4: Methodology of data generation unknown.
Completeness	Data includes all relevant material flows.	1: Value indicates all relevant processes/flows in question. 2: Value includes quantitative main processes/flows in question. 3: Value includes partial important process/flows, certainty of data gaps. 4: Only fragmented data available; important processes/flows are missing.
Temporal correlation	Congruence of the available data and the ideal data with respect to time reference.	1: Value relates to the right time period. 2: Deviation of value 1 to 5 years. 3: Deviation of value 5 to 10 years. 4: Deviation more than 10 years.
Geographical correlation	Congruence of the available data and the ideal data with respect to geographical reference.	1: Value relates to the studied region. 2: Value relates to similar socioeconomical region (GDP, consumption pattern). 3: Socioeconomically slightly different region. 4: Socioeconomically very different region.
Other correlation	Congruence of the available data and the ideal data with respect to technology, product, etc.	1: Value relates to the same product, the same technology, etc. 2: Values relate to similar technology, product, etc. 3: Values deviate from technology/product of interest, but rough correlations can be established based on experience or data. 4: Values deviate strongly from technology/product of interest with correlations being vague and speculative.

2. RESULTS FOR 2019-20

This section contains results from the MFA performed for each ANZPAC region for the 2019-20 financial year. An evaluation of modelling uncertainty and data gaps is included in Appendix A1. Generally, uncertainty on modelled material flow estimates was low. Uncertainty was highest for material flow estimates for the PICs—due to a lack of country-specific data, and a reliance on proxy data.

2.1. ANZPAC plastic packaging placed on the market

Table 8 summarises plastic packaging placed on the market in 2019-20 by packaging material type and region. Approximately 1.3 million tonnes of plastic packaging were placed on the market, with approximately 86% of this quantity placed on the Australian market. On a per-capita basis, Australia and New Zealand had the highest rates of plastic packaging consumption, at approximately 44 kg/person and 29 kg/person respectively. Solomon Islands and Vanuatu had the lowest per-capita consumption, at approximately 10 kg/person.

Table 8 – Summary of total tonnes of plastic packaging placed on the market (PoM) by material type across the ANZPAC region.*

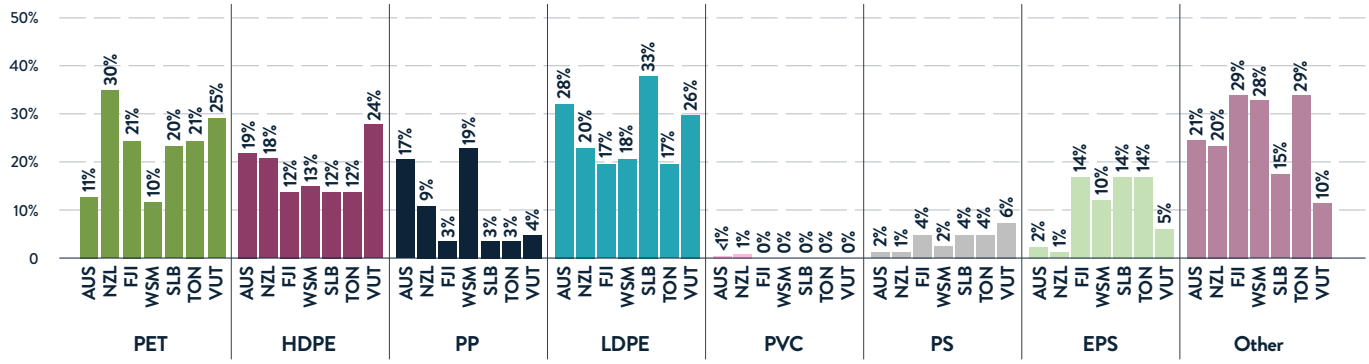
Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total tonnes by material
PET	128,600	43,400	4,100	300	1,300	400	800	179,000
HDPE	208,000	26,900	2,300	500	800	200	700	239,500
PP	186,100	13,500	600	700	200	100	100	201,200
LDPE	318,300	28,700	3,300	600	2,200	400	800	354,300
PVC	4,400	800	0	0	0	0	0	5,200
PS	17,100	1,500	700	100	200	100	200	19,900
EPS	22,700	2,000	2,700	300	900	300	100	29,200
Other	238,600	29,300	5,600	1,000	1,000	600	300	276,500
Total tonnes by region	**1,123,800**	**146,200**	**19,400**	**3,500**	**6,700**	**2,100**	**3,100**	**1,304,800**

* Note that quantities have been rounded to 2 significant figures. Uncertainty on PoM quantities are consistent across material types and the region (4.4%).

Figure 2 shows the distribution of plastic packaging material types and formats across the ANZPAC region. LDPE was the most widespread plastic packaging material, contributing approximately 27% to the overall used plastic packaging supply. The proportion of LDPE to total plastic packaging PoM was highest in the Solomon Islands (33%), and Australia (28%). The proportion of PET to total plastic packaging PoM varies across the region between 10% (Western Samoa) and 30% (New Zealand). PP also was highly varied, between 3% (Fiji, Solomon Islands and Tonga), and 20% (Western Samoa). Polystyrene packaging consumption is also varied: the proportion of EPS PoM ranged from around 1-2% in Australia and New Zealand, and around 14% in Fiji, Solomon Islands and Tonga. The proportion of PS packaging was less varied, ranging from 1% of plastic packaging PoM in New Zealand, to 6% in Tonga.

The distribution of plastic packaging formats is quite consistent across the different countries in the ANZPAC region. Rigid formats made up approximately 58% of the used plastic packaging supply. However, flexible packaging types had the largest contribution to overall used plastic packaging in Australia, at 43%. In the PICs, this proportion ranged between 25% (Western Samoa) to 31% (Tonga).

Distribution of packaging material types across ANZPAC region



Distribution of packaging formats across ANZPAC region

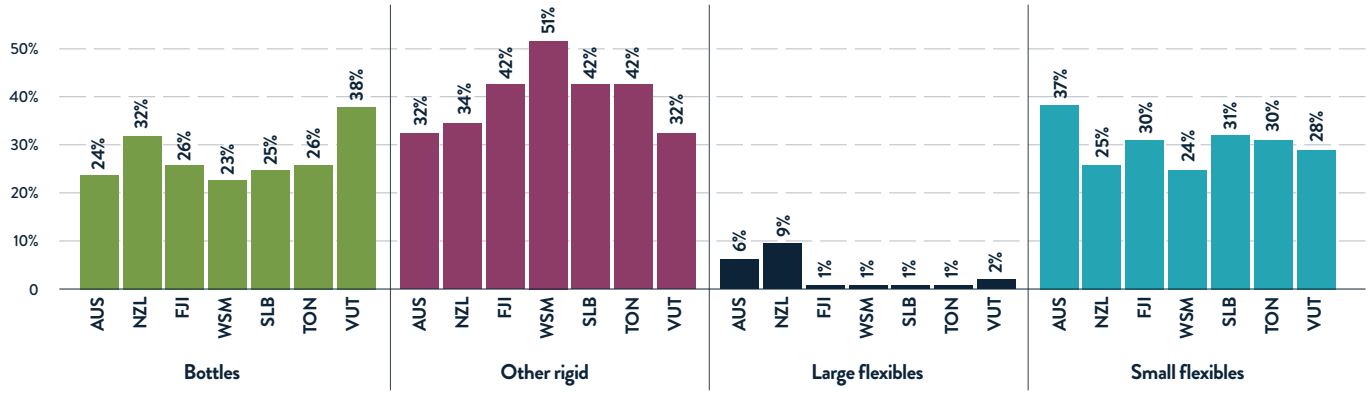
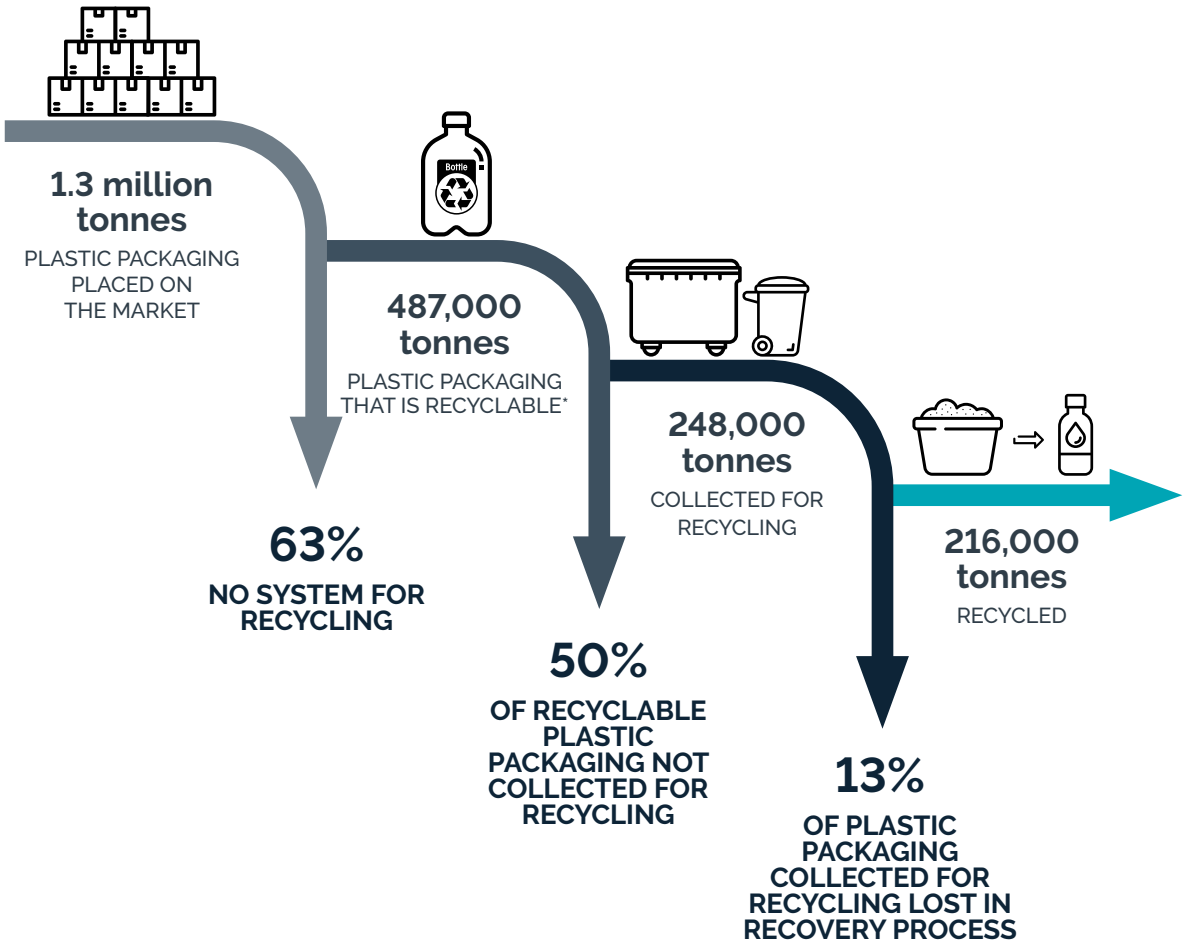


Figure 2: Distribution of plastic packaging materials and formats across the ANZPAC region

2.2. Material flows for plastic packaging in the ANZPAC region

This section describes estimated material flows for each country in the ANZPAC region by materials and formats. Packaging system performance for the ANZPAC region is also presented.

Figure 3 gives an overall summary of plastic packaging system performance for the combined ANZPAC region in 2019-20. Of the approximately 1.3 million tonnes of plastic packaging placed on the market across ANZPAC countries, 63% is not recyclable, i.e. there is no system in place for recycling or recycling rates are below the threshold for recyclability. Note that the definition for recyclable packaging used in this analysis is consistent with that in EMF (2021), which states: "that packaging or packaging component is recyclable if its successful post-consumer collection, sorting, and recycling is proven to work in practice and at scale." The quantities of recyclable plastic packaging for this project were derived from Blue Environment (2022), thereby ensuring consistency between this analysis, and the analysis in the 2020 ANZPAC Baseline Recyclability Assessment (Blue Environment, 2022). Of the approximately 487,000 tonnes of recyclable plastic packaging placed in the market, only 248,000, or approximately 50%, was collected for recycling. Ultimately 13% of plastic packaging collected for recycling was lost via sorting and recovery processes, with approximately 216,000 tonnes of used plastic packaging recovered across the entire ANZPAC region for 2019-20.



* Recyclable packaging is classified as according to the EMF (2021) definition

Figure 3: Plastic packaging losses through the packaging collection and recovery system for the entire ANZPAC region for 2019-20.

Figure 4 shows a Sankey-style material flow diagram, which represents simplified material flows of total plastic packaging aggregated for the entire ANZPAC region. The diagram shows material flows of plastic packaging collected for recycling, losses at various points in the system, and recovery. Approximately 220,000 tonnes of used plastic packaging were collected for recycling via Municipal Solid Waste (MSW) and C&I kerbside collections across the ANZPAC region, in addition to 24,200 tonnes collected via CDS schemes in Australia. Losses from the point of collection (i.e., not collected for recycling) was significant across all regions, with approximately 1,057,000 tonnes of used plastic packaging lost to landfill. Collection losses occur when material is not collected for recycling. Assumed reasons for these losses include non-recyclable plastic packaging placed on the market, incorrect disposal practices (i.e., recyclable packaging disposed to non-recycling collection pathways), and littering/dumping. Actual data on rates of collection and reasons for losses however is unavailable for the study area.

Material flows for all plastic packaging in the ANZPAC region, 2019-20

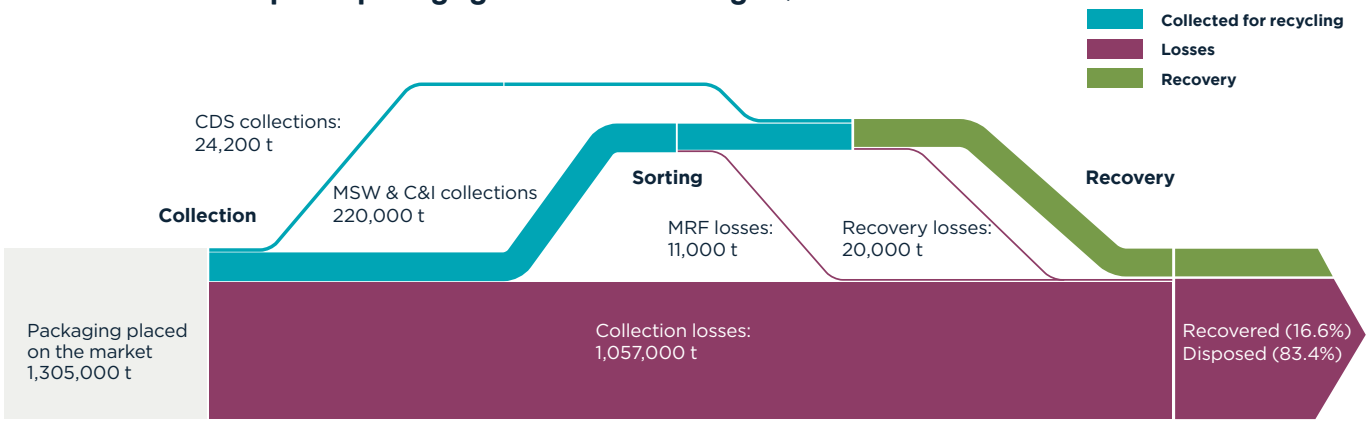


Figure 4: Simplified material flows for the whole ANZPAC region.

Table 9 and Table 10 summarise collection rates for each country in the ANZPAC region, and by materials and formats. Approximately 19% of plastic packaging placed on the market was collected for recycling across the entire ANZPAC region. Collection rates were highest in New Zealand (29%) and Australia (18%). Collection rates were poor in Fiji and Western Samoa, at less than 1% of overall used plastic packaging generated. Only PET, HDPE and LDPE were collected in Fiji, and only used PET packaging in Western Samoa. No plastic packaging was collected for recycling in the Solomon Islands, Tonga or Vanuatu.

Overall, rigid packaging types had the highest rates of collection, at 29% of all rigid plastic packaging consumed across the ANZPAC region. This is compared to an overall collection rate for flexibles of 5%. Collection rates for rigid packaging was higher in New Zealand compared to Australia, at 42% compared to 29%. Flexible collection rates were similar in both countries, at approximately 5%. Of the PICs, flexible packaging was collected only in Fiji, with a collection rate <1%.

Table 9 – Estimated collection rates for plastic packaging materials by ANZPAC country.

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total (material)
PET	47%	51%	<1%	4%	0	0	0	46%
HDPE	30%	50%	<1%	0	0	0	0	32%
PP	14%	1%	0	0	0	0	0	13%
LDPE	39%	33%	0	0	0	0	0	36%
PVC	22%	18%	0	0	0	0	0	18%
PS	49%	12%	0	0	0	0	0	43%
EPS	5%	7%	<1%	0	0	0	0	5%
Other	11%	11%	0	0	0	0	0	11%
Total (region)	**18%**	**29%**	**<1%**	**<1%**	**0**	**0**	**0**	**19%**

Table 10 – Estimated collection for plastic packaging formats by ANZPAC country.

	Percentage (%) collected by country							
Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total (material)
Bottles	42%	49%	<1%	1%	0	0	0	42%
Other rigid	19%	34%	0	0	0	0	0	20%
All rigid	29%	42%	<1%	<1%	0	0	0	29%
Small flexible	4%	2%	0	0	0	0	0	4%
Large flexible	11%	11%	6%	0	0	0	0	11%
All flexible	5%	4%	<1%	0	0	0	0	5%

Rates of collection for recycling by stream (i.e., household vs C&I) varied by material, and is summarised in Table 11. Overall, 18% of household stream collections were destined for recycling, compared to 16% of C&I collections. Approximately 43% of PET collected via household collection was destined for recycling, compared to 23% for the C&I stream. Rates of collection for HDPE were more consistent across the streams, at 31% for household collections, and 33% for C&I. Table 12 also summarises collection for recycling rates by packaging format.

For bottles, 38% of household collections were destined for recycling, compared to 30% for C&I. Flexible packaging types had relatively low rates of collection for recycling, at 3% for the household stream. C&I collections of flexibles had a higher rate of collection for recycling at 6% for C&I, which includes some large flexible packaging types that are B2B formats (e.g., pallet wrap). Computed collection rates by material and format, with calculated uncertainties are shown in Appendix A2.

Table 11 – Summary of collection for recycling rate by collection stream and plastic packaging material across ANZPAC region.

Material	Household waste collected for recycling rate [% of household derived waste]	C&I waste collected for recycling rate [% of C&I derived waste]
PET	43%	23%
HDPE	31%	33%
PP	11%	17%
PS	75%	8%
EPS	2%	42%
PVC	61%	0%
LDPE	3%	8%
Other	7%	26%
Total (region)	18%	17%

Table 12 – Summary of collection for recycling rate by collection stream and plastic packaging format across ANZPAC region.

Material	Household waste collected for recycling rate [% of household derived waste]	C&I waste collected for recycling rate [% of C&I derived waste]
Bottles	38%	30%
Other rigid	17%	28%
All rigid	26%	29%
Small flexible	3%	6%
Large flexible	3%	11%
All flexible	3%	8%

2.2.1. Plastic packaging recovery

Table 13 and Table 14 summarise plastic packaging recovery rates by packaging material and format by ANZPAC country for 2019-20. Approximately 216,000 tonnes of used plastic packaging was recovered in 2019-20, at an overall recovery rate of approximately 17%. New Zealand had the highest recovery rate at 26% of all plastic packaging placed on the market, although this estimate is subject to reasonably high uncertainty (15%). Australia had a plastic packaging recovery rate of 16%.

PET packaging saw the highest recovery rates across the region, at 42% of all PET packaging placed on the market. Recovery rates for used PET packaging were not significantly different between Australia and New Zealand, at 43% and 47% respectively. HDPE recovery rates however were significantly higher in New Zealand compared to Australia, at 46% and 27% respectively. This is an interesting finding, considering that both Australia and New Zealand had similar proportions of HDPE packaging placed on the market, and that Australia has an active container deposit scheme that accepts a proportion of HDPE beverage containers.

Overall rigid packaging recovery was approximately 26% compared to 4% for flexibles across the ANZPAC region. This indicates that rigid packaging recovery contributed approximately 90% to overall plastic packaging recovery in 2019-20. Flexible packaging recovery rates in Australia and New Zealand were not significantly different, at approximately 4% of flexible packaging placed on the market. Interestingly, Fiji had relatively high rates of recovery for large flexible packaging (i.e., >A4 size). Notable quantities of large flexible packaging recovered in Fiji were in the business-to-business (B2B) context, indicating that Fiji has a relatively robust B2B flexible packaging recovery system when compared to recovery rates in Australia and New Zealand.

Table 13 – Summary of plastic packaging recovery rates by material type and ANZPAC country for 2019-20.

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
PET	43%	47%	<1%	3%	0	0	0	42%
HDPE	27%	46%	<1%	0	0	0	0	29%
PP	11%	1%	0	0	0	0	0	10%
PS	25%	21%	0	0	0	0	0	23%
EPS	19%	16%	0	0	0	0	0	16%
PVC	42%	11%	NA	NA	NA	NA	NA	37%
LDPE	4%	6%	<1%	0	0	0	0	4%
Other	9%	9%	0	0	0	0	0	9%
Total	**16%**	**26%**	**<1%**	**<1%**	**0**	**0**	**0**	**17%**

Table 14 – Summary of plastic packaging recovery rates by packaging format and ANZPAC country for 2019-20.

Recovery rate (%) per country by packaging format								
Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Bottles	38%	45%	<1%	1%	0	0	0	38%
Other rigid	15%	30%	0	0	0	0	0	16%
All rigid	25%	37%	<1%	<1%	0	0	0	26%
Small flexible	3%	2%	0	0	0	0	0	3%
Large flexible	9%	9%	5%	0	0	0	0	9%
All flexible	4%	4%	<1%	0	0	0	0	4%

Table 15 summarises quantities of plastic packaging recovered in Australia and New Zealand for 2019-20 by overseas and local recovery pathways. Approximately 92,000 tonnes were exported for overseas recovery from Australia and New Zealand in 2019-20 and represents a large quantity of plastic packaging that may be stranded due to waste export bans coming into effect in Australia and New Zealand. In the case of Australia, data in ISF (2021) indicates that there is sufficient recovery capacity locally to accept material that would normally be exported for recovery, however recovery capacities are unknown in New Zealand. Quantities of used plastic packaging exported are however significantly lower than quantities exported from Australia, with New Zealand based exports contributing approximately 17% to overall used plastic packaging exports.

Table 15 – Plastic packaging format recovery volumes (for Australia and New Zealand only) by recovery pathway for 2019-20.

Formats	Recovery via overseas reprocessing [tonnes]	Recovery via local reprocessing [tonnes]
Bottles	65,940	58,630
Other rigid	18,840	51,190
All rigid	84,780	109,820
Small flexible	4,230	9,650
Large flexible	2,960	4,880
All flexible	7,190	14,520

2.3. Performance against ANZPAC Targets

Table 16 summarises performance metrics against the ANZPAC Targets for each country in the region. Figure 5 also summarises performance metrics across material types for the whole ANZPAC region, and Figure 6 summarises these metrics by packaging format. Further discussion on performance for each metric is provided below.

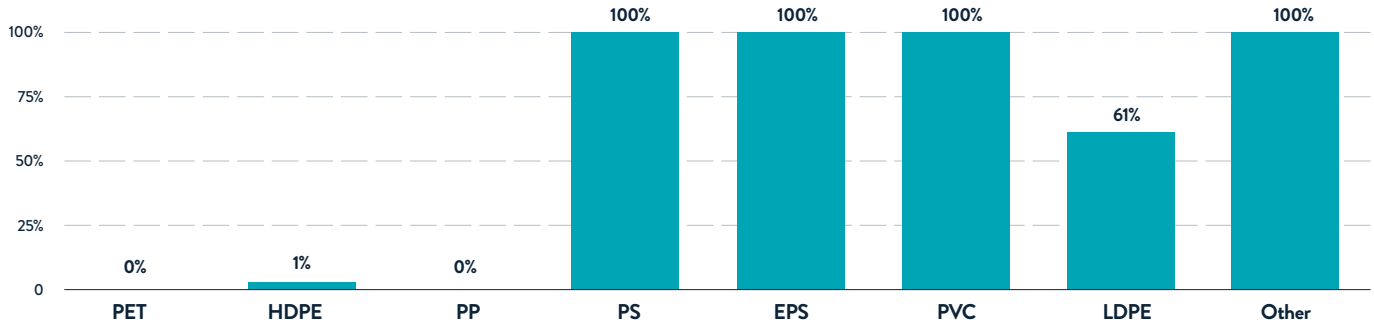
Table 16 – Summary of ANZPAC Target performance metrics.*

ANZPAC country	Metric 1 – Unnecessary and problematic plastic packaging [% of PoM]		Metric 2 –Recyclable plastic packaging [% of PoM]		Metric 3 – Recovery rate [% of PoM]		Metric 4 – Recycled content in new plastic packaging [% of PoM]	
AUS	42.6%	±15%	35.6%	±15%	15.9%	±8%	4.1%	±15%
NZL	35.3%	±15%	55.5%	±15%	28.5%	±15%	5.8%	±15%
FJI	57.3%	±20%	19.4%	±20%	0.1%	±4%	4.2%	±20%
WSM	50.7%	±20%	8.8%	±20%	0.3%	±4%	3.3%	±20%
SLB	52.5%	±20%	18.3%	±20%	0%	0%	4.6%	±20%
TON	57.3%	±20%	19.4%	±20%	0%	0%	4.2%	±20%
VUT	37%	±20%	23.4%	±20%	0%	0%	5.7%	±20%
ANZPAC region	**42.1%**	**±15%**	**37.4%**	**±15%**	**16.6%**	**±10%**	**4.3%**	**±15%**

* Note that uncertainty in the table is the coefficient of variation—a ratio of the standard deviation of the estimates (a measure of dispersion in the data), and the average. Uncertainty characterised by coefficient of variation gives an indication of relative uncertainty across the regions.

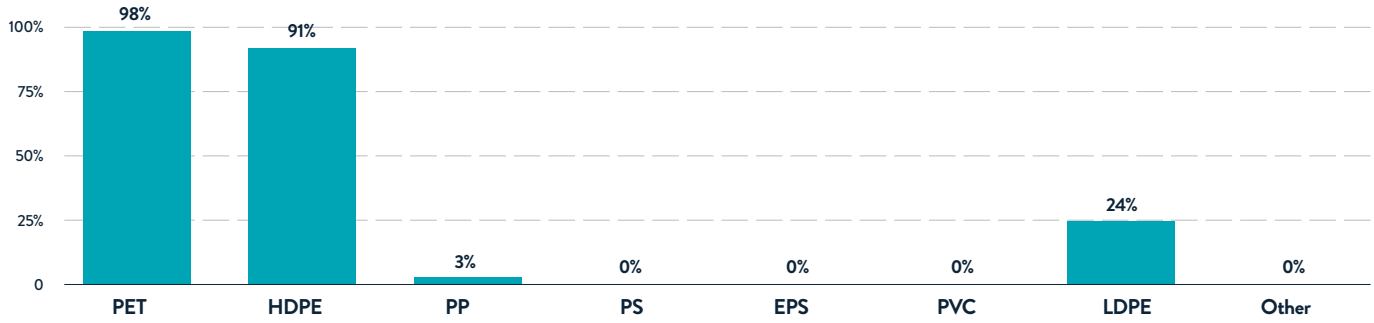
Metric 1 - PROBLEMATIC PACKAGING **BY MATERIAL**

Proportion of PoM 2019-20, all ANZPAC



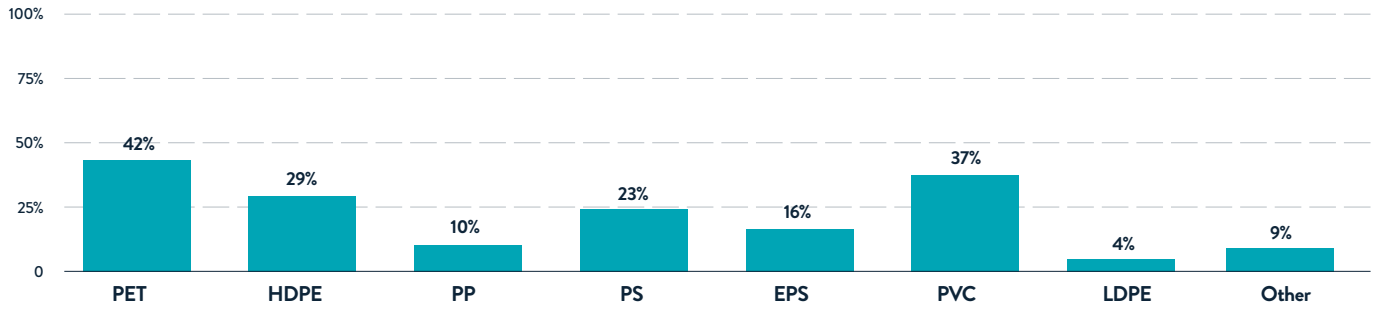
Metric 2 - RECYCLABLE PACKAGING **BY MATERIAL**

Proportion of PoM 2019-20, all ANZPAC



Metric 3 - PACKAGING RECOVERED **BY MATERIAL**

Proportion of PoM 2019-20, all ANZPAC



Metric 4 - RECYCLED CONTENT **BY MATERIAL**

Proportion of PoM 2019-20, all ANZPAC

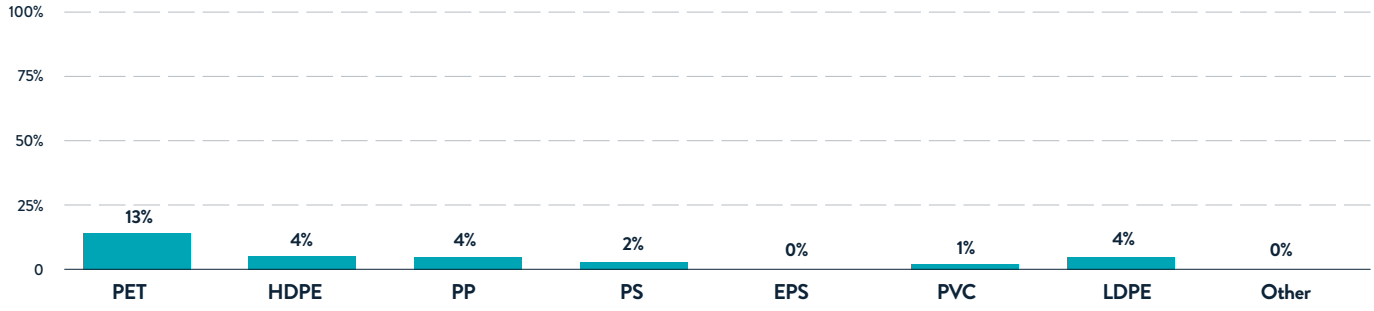
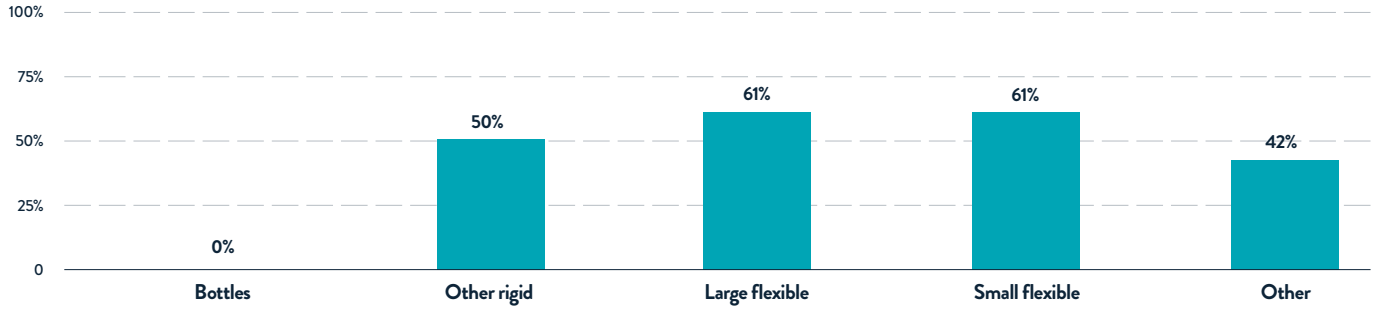


Figure 5: Summary of ANZPAC Target performance metrics by plastic packaging material type

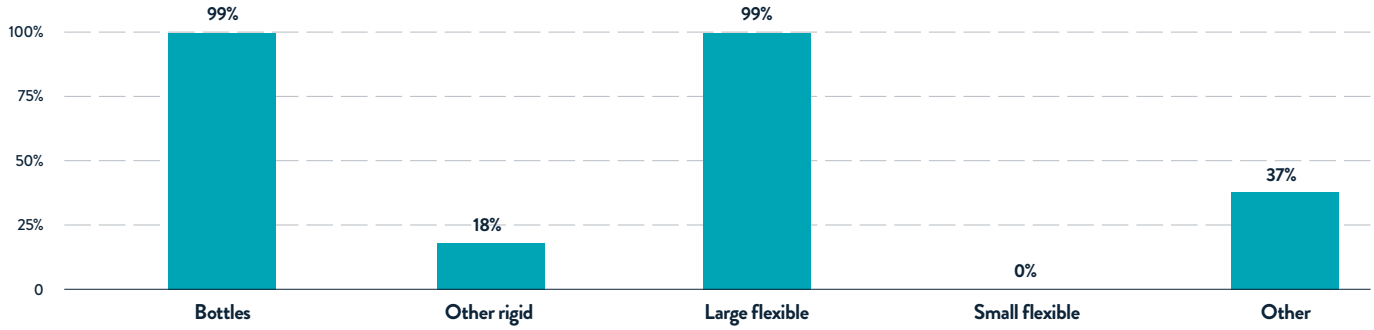
Metric 1 - PROBLEMATIC PACKAGING **BY FORMAT**

Proportion of PoM 2019-20, all ANZPAC



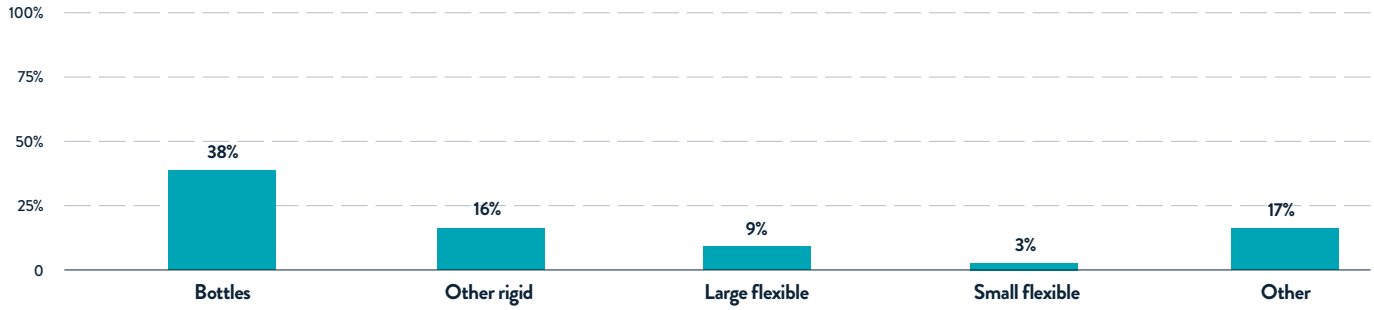
Metric 2 - RECYCLABLE PACKAGING **BY FORMAT**

Proportion of PoM 2019-20, all ANZPAC



Metric 3 - PACKAGING RECOVERED **BY FORMAT**

Proportion of PoM 2019-20, all ANZPAC



Metric 4 - RECYCLED CONTENT **BY FORMAT**

Proportion of PoM 2019-20, all ANZPAC

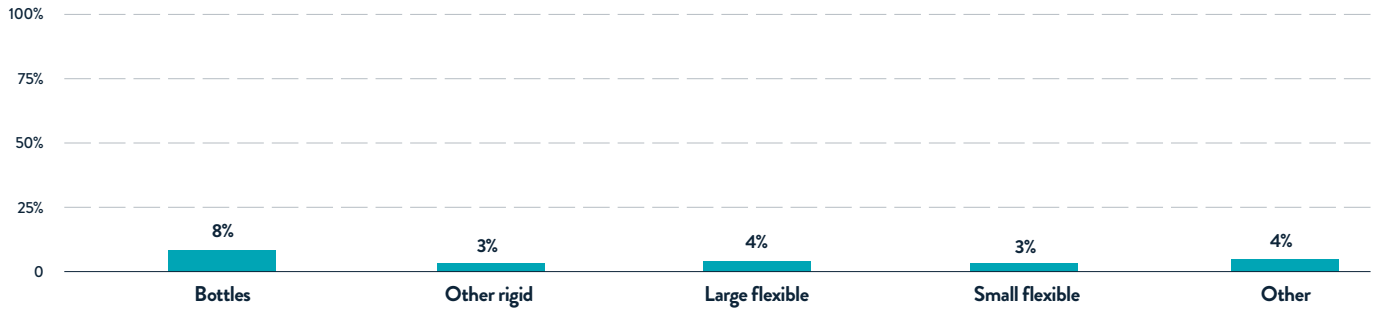


Figure 6: Summary of ANZPAC Target performance metrics by plastic packaging format

Metric 1 – Unnecessary and problematic plastic packaging

It was estimated that approximately 42% of plastic packaging placed on the market was unnecessary and/or problematic plastic packaging. For this, problematic plastic packaging types in ISF (2021) and the Envisage Works (2021) data sets were used. Plastic packaging considered unnecessary and problematic included: single-use PVC, PS and EPS polymers; light weight LDPE/HDPE shopping bags, and oxo-degradable plastic packaging. The proportion of plastic packaging placed on the market that was unnecessary and problematic was highest generally for the PICs, with the exception of Vanuatu. Uncertainty on this estimate is quite large, owing to the use of these data sets which relate to only high-level material categories and not the material categories listed in scope in Table 2. Uncertainty was higher in the PICs that were assigned a higher uncertainty score for geographical correlation with proxy data as indicated in Table 7 and in Laner et al (2015). From a materials perspective, 100% of PS, EPS, PVC and Other (Plastic Identification Code 7) packaging types were considered problematic in this study. 1% of HDPE and 61% of LDPE was considered problematic, corresponding to single-use/light-weight shopping bags and oxo-degradable packaging types made of these polymers. From a format perspective, 61% of flexible packaging, and 50% of other rigid formats were problematic. With respect to achieving ANZPAC Target 1, the proportion of new plastic packaging placed on the market that is unnecessary and problematic would need to equal 0% for geographies within the ANZPAC region. Future considerations in measuring performance against this Target are further discussed in Section 4.2.

Metric 2 – Recyclable plastic packaging

Approximately 37% of plastic packaging placed on the market was considered recyclable. The proportion of plastic packaging considered reusable or compostable was not estimated due to insufficient data, consistent with Blue Environment (2022). New Zealand had the highest proportion of recyclable plastic packaging placed on the market at approximately 56%. Australia had a considerably lower proportion of recyclable plastic packaging at approximately 36% of plastic packaging placed on the market. The proportion of recyclable plastic packaging varied among the PICs, with Western Samoa having the smallest proportion at approximately 9%, and Vanuatu the highest at 23%. For the PICs, the lower proportions of recyclable plastic packaging compared to New Zealand and Australia can mostly be attributed to a general lack of recovery system in place in these countries, which is the key determinant of recyclability as according to EMF (2021) and Blue Environment (2022). 24% of LDPE packaging and 3% of PP packaging were considered recyclable, however only in Australia and New Zealand. From a format perspective, 99% of bottles placed on the market were considered recyclable, compared to 18% of other rigid packaging types. Large flexibles, dominated by B2B packaging types, had a recyclability rate also of 99%, compared to 0% for smaller flexible packaging types.

Metric 3 – Recovery rate

Metric 3 is the recovery rate corresponding to the proportion of plastic packaging placed on the market that is recovered. The overall recovery rate for the ANZPAC region was approximately 17%. Table 17 shows the baseline recovery rate by region (corresponding to values in Table 13), the minimum recovery rate to achieve ANZPAC Target 3 (an increase in 25% above baseline), and the shortfall in recovered quantities between baseline and the target. Importantly, the recovery rate indicator cannot be directly used to measure performance against ANZPAC Target 3, as the target specifies a 25% increase in recovery for each geography in the ANZPAC region. This implies a baseline measurement is necessary to measure progress against this Target. This also makes determining performance against Target 3 for regions where no recovery takes place (i.e., Solomon Islands, Tonga, and Vanuatu) impractical, as the target defines a percentage increase over a baseline recovery rate of 0%.

Table 17 – Comparison of baseline recovery rate and the minimum recovery rate required to achieve ANZPAC Target 3. The shortfall in recovered quantities is based on 2019-20 PoM.

	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Baseline recovery rate	15.9%	25.8%	0.1%	0.3%	0%	0%	0%	16.6%
25% increase (Target 3)	19.9%	32.2%	0.2%	0.4%	0%	0%	0%	20.7%
Shortfall in recovered quantities	44,700	9,400	<10	<10	-	-	-	54,000

Metric 4 – Recycled content in new plastic packaging

Metric 4 is the proportion of recycled content in new plastic packaging placed on the market. For this metric, data on primary and secondary material in new packaging from Envisage Works (2021) was utilised, therefore uncertainty on Metric 4 is higher for countries other than Australia. On average, there was approximately 4% recycled content in new plastic packaging placed on the market in 2019-20. New Zealand had the highest proportion of recycled content at approximately 6%. While Vanuatu also had a high rate of recycled content at 5.7% - care should be taken with this estimate owing to high levels of uncertainty. From a materials perspective, PET packaging had the highest proportion of recycled content at 13% of new packaging placed on the market. HDPE, PP and LDPE packaging all had approximately 4% recycled content. From a format perspective, bottles had the highest rate of recycled content, at approximately 8% for packaging placed on the market.

Metric 4 can be directly used in assessing performance of ANZPAC plastic packaging systems against ANZPAC Target 4. As such, all plastic packaging systems and ANZPAC Targets are significantly underperforming against the targeted 25% recycled content. Improving the recycled content in new plastic packaging requires coordination between packaging manufacturers, secondary material reprocessors, and advocates for sustainable packaging systems. There is also a question of where recycled content may be sourced, i.e., via locally produced plastic packaging or from overseas imports of new plastic packaging. As indicated above, PET recycled content performance is high when compared to the other polymers. There is an established industry for recycled PET and recycled HDPE in Australia at low volumes, however expansion of recycled plastic production is set to increase in the coming years (Envisage Works, 2021), meaning local packaging manufacturing may play an important role in meeting ANZPAC Target 4 in Australia. It remains unclear however to what extent the local packaging manufacturing industry may be able to utilise recycled content for new plastic packaging in New Zealand and the PICs.

3. SCENARIO ANALYSIS

Projected ANZPAC plastic packaging flows in 2026-27 were estimated and used to evaluate the potential impact of a range of plastic packaging system interventions on future performance.

This section describes the scenario analysis approach, including key assumptions, and a summary of findings comparing scenarios. Five separate scenarios were evaluated. More detailed results from each scenario are presented and discussed separately in the Appendix.

3.1. Scenario analysis approach and assumptions

SCENARIO 1: BUSINESS-AS-USUAL, 2026-27

This scenario models ANZPAC packaging material flows for the 2026-27 financial year. For this, per-capita rates of plastic packaging placed on the market by material type were first computed for each country in the ANZPAC region based on 2019-20 packaging placed on the market data in Blue Environment (2022), and population data for ANZPAC countries (World Bank, 2021). These are summarised on a kilogram (kg) per person basis for material categories and formats in Table 18 and Table 19. This approach assumes no difference in packaging composition placed on the market compared to baseline 2019-20 packaging.

Table 18 – Per-capita plastic packaging consumption rates (kg placed on the market per person) by ANZPAC country and packaging material for 2019-20, and assumed for 2026-27.

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
PET	5.06	8.9	4.3	1.68	1.94	4.08	2.58	5.5
HDPE	8.19	5.51	2.4	2.34	1.13	2.28	2.43	7.36
PP	7.33	2.77	0.59	3.36	0.28	0.57	0.37	6.18
PS	0.67	0.31	0.75	0.28	0.35	0.71	0.65	0.61
EPS	0.89	0.41	2.86	1.73	1.36	2.72	0.48	0.9
PVC	0.18	0.16	0	0	0	0	0	0.16
LDPE	12.54	5.89	3.47	3.2	3.15	3.3	2.68	10.89
Other	9.4	6.02	5.87	4.9	1.44	5.58	1	8.5
Total	44.26	29.97	20.24	17.5	9.66	19.24	10.18	40.11

Table 19 – Per-capita plastic packaging consumption rates (kg placed on the market per person) by ANZPAC country and plastic packaging format for 2019-20, and assumed for 2026-27.

Formats	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Bottles	10.71	9.54	5.36	4.11	2.45	5.1	3.86	10.08
Other rigid	14.38	10.09	8.58	9	4.06	8.16	3.27	13.19
All rigid	25.09	19.62	13.94	13.11	6.51	13.26	7.13	23.27
Small flexible	16.31	7.53	6.04	4.17	3.03	5.74	2.89	14.17
Large flexible	2.86	2.82	0.26	0.22	0.12	0.25	0.16	2.67
All flexible	19.17	10.34	6.3	4.39	3.15	5.99	3.05	16.84

Population projections were estimated for each ANZPAC country and were then combined with per-capita generation (placed on the market) rates to estimate 2026-27 packaging consumption. Figure 7 shows the estimated population growth from 2020 to 2027, normalised on the 2020 population.

Population growth was highest for Solomon Islands and Vanuatu. Total population is projected to reach 36,100,000 in 2026-27— an increase of approximately 10% on total population in 2019-20. Australia's share of total population is approximately 78%.

ANZPAC population growth over time

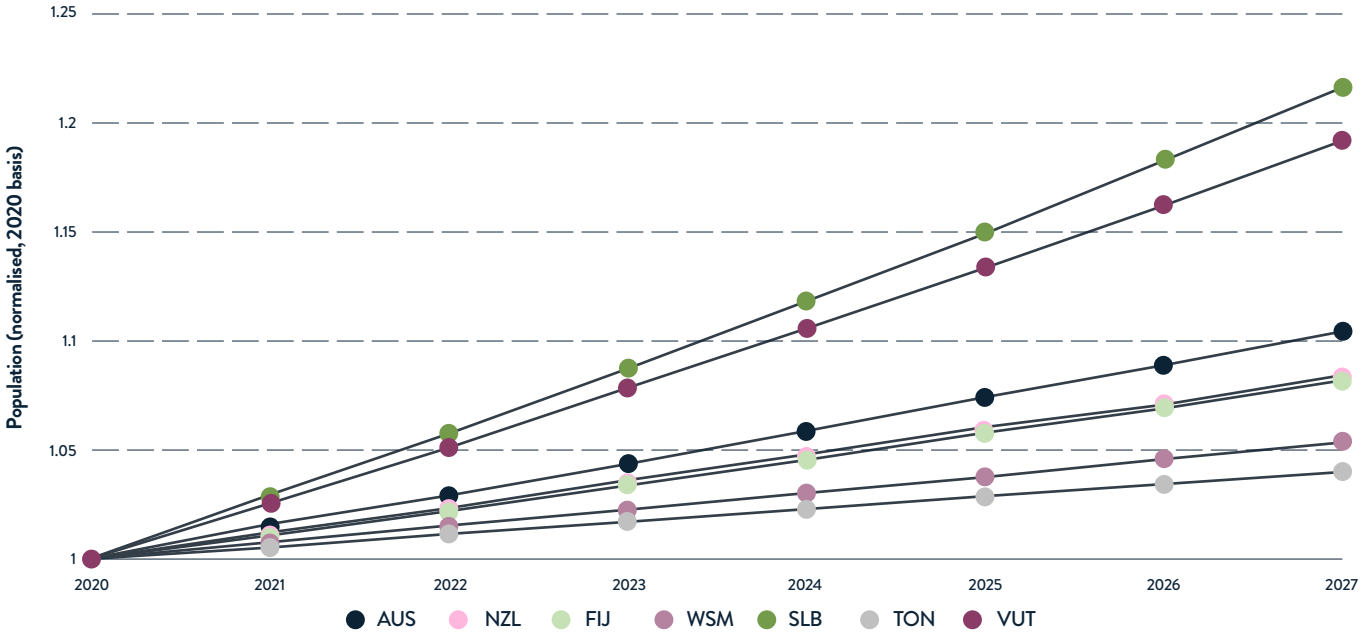


Figure 7: Modelled population growth rate over time (normalised, i.e., 1 = 2020)

System assumptions for this scenario are consistent with assumptions in the 2019-20 MFA model. Scenario 1 therefore forms a baseline for comparison with other scenarios modelled in this analysis.

SCENARIO 2: STANDARDISED REGIONAL MATERIAL BANS, 2026-27

Scenario 2 evaluates the impact of plastic packaging material bans across the entire ANZPAC region. Table 20 includes the plastic packaging materials subject to bans based on insights from the *Reduction & Recovery Options for Plastic Packaging Formats – Preliminary Conclusions* workshop material provided by APCO[2]. Both material bans and substitutions were modelled, with assumptions described in Table 20. Some material bans have a significant impact on quantities of plastic packaging placed on the market, whereas other bans impact on the overall packaging stream composition. For example, where a plastic packaging type is replaced by paper, quantities of this are not included in the placed on the market estimates, as paper is not within the scope of the analysis. Replacement of a material from one plastic type to another (e.g., replacing rigid PVC bottles with HDPE bottles) however does impact on the composition of the stream.

Table 20 – Material ban and substitution assumptions for Scenario 2.

Material subject to ban	Assumptions and scenario bases
Lightweight shopping bags (LDPE)	• Proportion of flexible packaging across ANZPAC that is shopping bags to be based on Australian data from the Envisage Works (2021) dataset. • Replacement of light/heavy bags by mix of paper bags and reusable woven bags (PP); proportions were derived from Envisage Works (2021) data for Australia • Proportion of bags replaced by paper to be removed from PoM for Scenario 2
Heavyweight shopping bags (HDPE)	
EPS food service packaging	• Proportion of EPS packaging for food service based on Australian data (Envisage Works, 2021) • Replacement of EPS food packaging with paper, therefore quantities of EPS food packaging to be removed from projected PoM for Scenario 2
EPS loose fill	• Proportion of EPS packaging for loose fill based on Australian data (Envisage Works, 2021) • Replacement of EPS loose fill assumed to be paper, therefore quantities of EPS loose fill to be removed from projected PoM for Scenario 2
Moulded EPS	• Proportion of moulded EPS (i.e., void fill) based on Australian data (Envisage Works, 2021), and data from the NPT review[3] • Replacement of moulded EPS assumed to be moulded fibreboard, therefore quantities of moulded EPS to be removed from projected PoM for Scenario 2
Rigid PVC	• Quantities of rigid PVC packaging assumed to be replaced by HDPE and PET packaging
Rigid PS	• Quantities of PS packaging assumed to be replaced by PET/HDPE (for tubs, trays), and paper for tableware • Proportion of PVC bottles derived from Envisage Works (2021) data, as the Blue Environment data for ANZPAC does not have resolution on PS and PVC formats. Non-bottle formats to also replaced by PET/HDPE (other rigids format) • Replacement of PVC bottles to occur at the same ratio as HDPE to PET packaging (e.g., if 20% of PET+HDPE packaging is PET, then 20% of PVS/PS to be replaced by PET, 80% by HDPE) • Note that PET/HDPE other rigid formats have poorer recycling rates compared to rigid PVC generally • Proportion of PS tableware derived from Envisage Works (2021) data. This quantity is replaced by paper types, and therefore removed from PoM for Scenario 2. All other PS rigid packaging to be replaced by PET/HDPE (other rigids format)
Oxo-degradable packaging	• Proportion of packaging (flexible HDPE/LDPE) that is oxo-degradable based on data in Envisage Works (2021) data, replaced with non-oxo degradable flexible HDPE/LDPE

[2] Reduction & recovery options for plastic packaging formats workshop, part of a project that looks at the 19 most common plastic packaging formats in the ANZPAC region – and their reduction and recovery options, September 2022

[3] National Packaging Target review (2022) conducted by ISF on behalf of APCO, looked at estimating format specific collection and recovery rates for Australian packaging

SCENARIO 3: CDS IMPLEMENTATION IN ANZPAC REGION

Scenario 3 models the potential impact of CDS expansion across all jurisdictions in ANZPAC. The expansion of CDS is expected to increase collection rates by providing convenient collection points as well as financial incentives encouraging higher rates of user engagement. Note that at time of writing the report CDS roll out is being explored for Vanuatu and New Zealand. CDS data from Australia (Envisage Works, 2021[4]), excluding jurisdictions without an active CDS in place, was used to estimate the proportion of eligible container types relative to total PoM and redemption rates. For this scenario, it was assumed that HDPE and PET beverage bottles will be eligible for CDS collection across the ANZPAC region. Data is unfortunately limited on non-beverage container types, for example, for oils, chemicals (e.g., cleaning detergents) and pharmaceutical products. Average redemption rates of eligible containers were derived from the Envisage Works data set for Australia and applied to the other ANZPAC regions. Eligibility and redemption rates from this data are shown in Table 21. Note that redemption rates are different across jurisdictions in Australia, and a weighted average redemption rate, based on total quantity of CDS-eligible material redeemed was used. For Australia and New Zealand, local mechanical recycling is the assumed recovery pathway for CDS collected material.

Table 21 – Australian CDS eligibility (as a proportion of PoM), and redemption rates (as a proportion of eligible packaging)

Packaging	% of PoM eligible for CDS	% of eligible packaging redeemed
PET bottles	45%	48%
HDPE bottles	3%	34%

Table 22 summarises projected CDS eligible packaging redemption by country and packaging type, used for Scenario 3. Listed in the table is also projected quantities of CDS-eligible packaging recovered. For this scenario, it was assumed that CDS-redeemed packaging is recovered locally in Australia and New Zealand. For the PICs, it was assumed that CDS collected material will be exported to Australia for further processing . Quantities of projected CDS packaging recovered in Table 22 for the PICs are therefore anticipated quantities of packaging recovered in Australia, from PIC source.

Table 22 – Estimated CDS eligibility and redemption for ANZPAC region for 2026-27.*

Country	Packaging	CDS eligible packaging [tonnes]	Eligible packaging redeemed [tonnes]	Eligible packaging recovered [tonnes]
AUS	PET bottles	51,730	24,910	22,860
	HDPE bottles	5,280	1,810	1,660
NZL	PET bottles	14,210	6,840	6,280
	HDPE bottles	530	180	170
FJI	PET bottles	1,810	870	800
	HDPE bottles	<1	<1	<1
WSM	PET bottles	150	70	60
	HDPE bottles	<1	<1	<1
SLB	PET bottles	660	320	290
	HDPE bottles	<1	<1	<1
TON	PET bottles	190	90	80
	HDPE bottles	<1	<1	<1
VUT	PET bottles	380	180	170
	HDPE bottles	<1	<1	<1
ANZPAC	PET bottles	69,130	33,290	30,550
	HDPE bottles	5,900	2,020	1,860

*Note: Values are rounded to the nearest significant figure

[4] Envisage Works (2021). Packaging consumption and recycling data 2019-20 – Packaging data tool. Data source prepared on behalf of APCO

[5] SPREP (2020). Moana Taka Partnership – A guide for Pacific Island countries and territories. Secretariat of the Pacific Regional Environment Programme

SCENARIO 4: ADVANCED RECYCLING FOR SOFT PLASTICS

Scenario 4 models the potential impact of advanced recycling for soft plastics. Advanced recycling could include a number of different recovery pathways, including for example pyrolysis. As such, assumptions must be made around technology selection, and the potential recovery rates for selected recovery processes. For this, literature data was used to estimate soft plastics recovery rates for a generic pyrolysis recovery process. It is assumed that pyrolysis will occur at advanced facilities in Australia and New Zealand, and in modular pyrolysis units in PICs, following insights from the Reduction & Recovery Options for Plastic Packaging Formats – Preliminary Conclusions workshop material. Table 23 includes assumed pyrolysis recovery rates for soft plastics derived from the literature, in comparison to mechanical recovery rates derived from the Envisage Works (2021) data set. Collection rates of soft plastics in this scenario were assumed to equal the average material collection rates where there is an active collection system based on the Blue Environment data. Where collection systems do not exist in the 2019-20 data (i.e., Fiji, Solomon Islands and Tonga), the average collection rates of Western Samoa and Vanuatu were used. These collection rates are summarised by jurisdiction in Table 24.

Table 23 – Comparison of soft plastic mechanical and pyrolysis recovery rates

Soft plastic type	Mechanical recovery rate (Envisage Works, 2021)	Avg. pyrolysis recovery rate (Sogancioglu et al., 2007[6])
HDPE	15.2%	87.6%
LDPE	26.7%	69.2%
PP	15.2%	78.6%

Table 24 – Average collection rates used for soft plastics collection rates across the ANZPAC region for Scenario 4

	Average soft plastic collection rate (% of PoM)
AUS	15.7%
NZL	14.4%
FJI	1.3%
WSM	2.8%
SLB	2.0%
TON	1.1%
VUT	1.1%

SCENARIO 5: COMBINED SCENARIO

Scenario 5 combines assumptions from the above scenarios to evaluate the overall potential impact on ANZPAC plastic packaging recovery, assuming all interventions are implemented.

[6] Sogancioglu, M.; Ahmetli, G.; Yel, E. (2017). A comparative study on waste plastics pyrolysis – liquid products quantity and energy recovery potential, Energy Procedia 118, 221-226

3.2. Summary of scenario analysis results

This section presents a summary of scenario results, comparing estimated 2026-27 packaging formats for each scenario against business-as-usual performance. Performance against ANZPAC Targets 1 to 3 is compared and discussed in this section. Performance against ANZPAC Target 4 (recycled content) however was not evaluated, as the evaluated interventions do not impact on proportions of recycled content in plastic packaging placed on the market.

A more detailed summary of results for each individual scenario is presented in the Appendix.

3.2.1. Plastic packaging placed on the market in 2026-27

Plastic packaging PoM projections for business-as-usual 2026-27 are shown by material category and format category for each ANZPAC country in Table 25 and Table 26. These estimates are used for Scenarios 1 (BAU), 3, and 4, which are not subject to material ban assumptions that influence PoM. Approximately 1,437,900 tonnes of plastic packaging is projected to be PoM in 2026-27 under BAU conditions. This is an increase of approximately 10% compared to 2019-20, consistent with the projected increase in total population in the region. The increase in packaging PoM was highest for the Solomon Islands and Vanuatu, at approximately 22% and 19% respectively, based on higher rates of projected population growth. Increases in PoM projections were lowest for Tonga and Western Samoa, at 4% and 5% respectively and aligned with lower projected population growth. Format composition of plastic packaging PoM is consistent with plastic packaging composition in 2019-20.

Table 25 – Estimated plastic packaging placed on the market in 2026-27 by ANZPAC region and material type (Scenario 1).*

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
PET	142,000	47,000	4,500	400	1,600	500	900	196,800
HDPE	229,700	29,100	2,500	500	1,000	300	900	263,900
PP	205,500	14,600	600	700	200	100	100	221,900
PS	18,900	1,600	800	100	300	100	200	21,900
EPS	25,100	2,200	3,000	400	1,100	300	200	32,200
PVC	4,900	900	0	0	0	0	0	5,800
LDPE	351,400	31,100	3,600	700	2,600	400	1,000	390,800
Other	263,500	31,800	6,100	1,000	1,200	600	400	304,600
Total	**1,241,000**	**158,300**	**21,100**	**3,800**	**8,000**	**2,300**	**3,700**	**1,437,900**

*Note: Values in the table have been rounded to the nearest 2 significant figures

Table 26 – Estimated plastic packaging placed on the market in 2026-27 by ANZPAC region and packaging format (Scenario 1).*

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Bottles	300,200	50,400	5,600	900	2,100	600	1,400	361,100
Other rigid	403,200	53,300	8,900	1,900	3,400	900	1,200	472,800
All rigid	703,400	103,700	14,500	2,800	5,500	1,500	2,600	833,900
Small flexible	457,200	39,800	6,300	900	2,500	600	1,000	508,400
Large flexible	80,200	14,900	300	0	100	0	100	95,600
All flexible	537,400	54,700	6,600	900	2,600	600	1,100	604,000

*Note: Values in the table have been rounded to the nearest 2 significant figures

For Scenario 2, where material bans come into effect, there was a projected 1,323,500 tonnes of total plastic packaging PoM across the entire ANZPAC region. This is a reduction compared to BAU of approximately 8%.

Figure 8 and Figure 9 highlight the differences in plastic packaging PoM by materials and formats in Scenario 2 compared to BAU. On a material basis, PS and PVC see the largest reductions in PoM quantities, given the assumed total ban of rigid packaging for these material types. EPS packaging also has a significant reduction of 91% compared to the baseline. Remaining EPS formats PoM include carton and boxes, which were not considered in scope of material bans (Table 20). LDPE packaging also has a significant reduction in PoM quantities compared to BAU of approximately 14%, owing to bans of lightweight shopping bags. The largest increase in material type placed on the market was for PP, due to the assumed substitution of heavyweight flexible HDPE shopping bags with woven PP alternatives. PET and HDPE packaging PoM also increased by approximately 2% each, due to substitution of rigid PS and rigid PVC packaging types.

On a format basis, small flexible packaging types saw the largest reduction compared to BAU, of approximately 13%, due to bans of lightweight and heavyweight shopping bags, with proportion substituted by paper bag types. No large flexible packaging formats were subject to material bans or substitutions in this scenario. Other rigid packaging types saw a reduction of approximately 11% compared to BAU, on account of PS and PVC bans. Bottles saw an increase in packaging PoM of approximately 1%, however this is due to lack of resolution of PVC packaging types in the Blue Environment data (with all PVC packaging labelled as rigid only)

ANZPAC packaging PoM by material, Scenario 2 vs. BAU

Percentage change compared to BAU (Scenario 1)

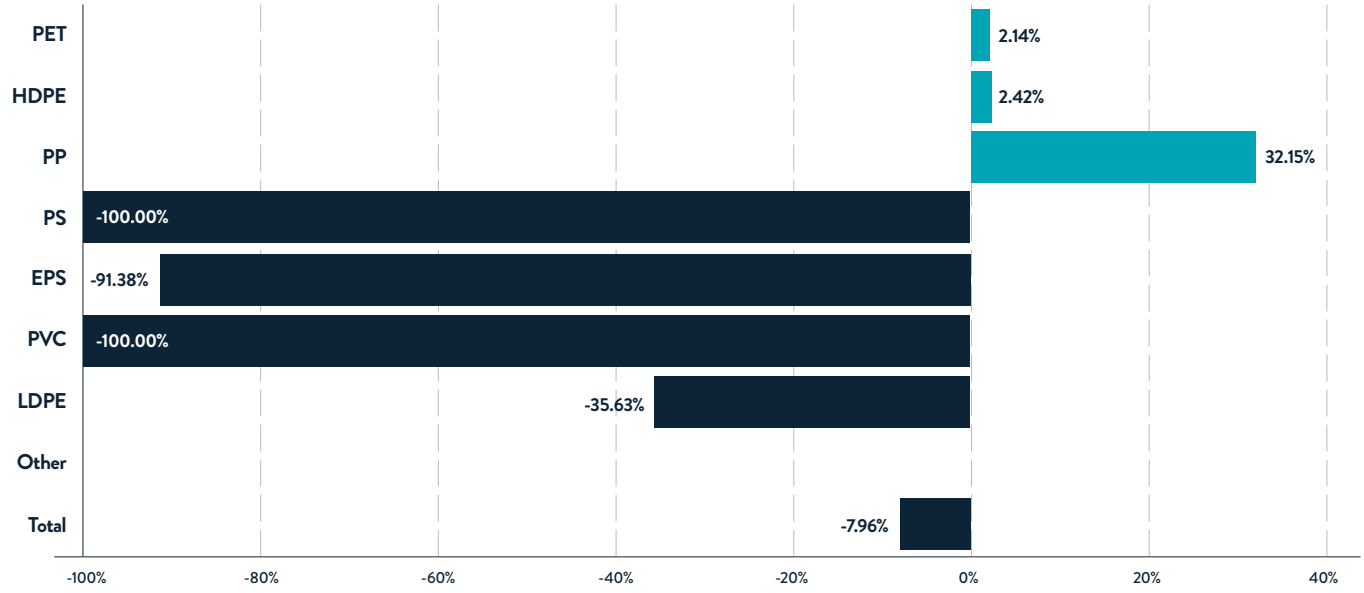


Figure 8: Comparison of overall ANZPAC plastic packaging material placed on the market in Scenario 2 compared to BAU (Scenario 1)

ANZPAC packaging PoM by format, Scenario 2 vs. BAU

Percentage change compared to BAU (Scenario 1)

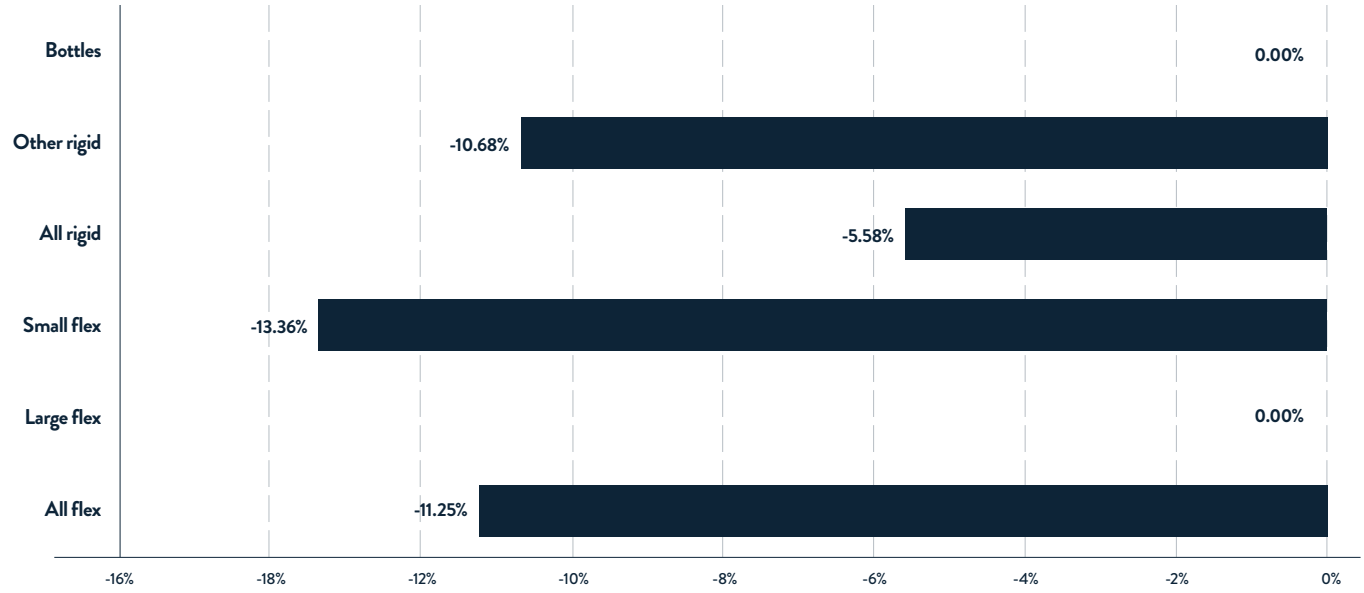


Figure 9: Comparison of overall ANZPAC plastic packaging formats placed on the market in Scenario 2 compared to BAU (Scenario 1)

3.2.2. ANZPAC Targets 1 and 2 performances

Material bans and substitutions have an impact on the proportion of overall PoM that is problematic/unnecessary, and recyclable; and thus, impacting performance against ANZPAC Targets 1 and 2. Table 27 shows the comparison in the proportion of problematic plastic packaging placed on the market between Scenarios 2 with BAU. Note that Scenario 2 and the combined scenario are the only ones that show a difference to BAU for problematic plastic packaging, due to material bans assumed. The proportion of material and format type that is problematic/unnecessary is based on the approach described in Table 5.

As a result of material bans, the proportion of problematic and unnecessary plastic packaging decreases from 42% in BAU, to 35% for the ANZPAC region in Scenarios 2 and 5—a relative reduction of 17%. This reduction was greatest in the PICs compared to Australia and New Zealand, indicating that problematic/unnecessary plastic packaging make up a larger proportion of overall packaging in the PICs.

Table 27 – Comparison of problematic plastic packaging as a proportion of plastic packaging placed on the market by ANZPAC country for BAU (Scenario 1), and Scenario 2.

Country	BAU (Scenario 1)	Scenario 2	Percentage change (Scenario 1 vs 2)
AUS	42.6%	35.5%	-16.8%
NZL	35.3%	30.9%	-12.5%
FJI	57.3%	44.9%	-21.7%
WSM	50.7%	41.0%	-19.2%
SLB	52.5%	35.0%	-33.3%
TON	57.3%	44.9%	-21.7%
VUT	37.0%	22.5%	-39.0%
ANZPAC	42.1%	35.0%	-16.8%

Figure 10 summarises projected quantities of recyclable plastic packaging as a proportion of packaging PoM for all ANZPAC countries (i.e., ANZPAC Target 2). Note that recyclable plastic packaging also refers to material format types for which recovery systems exist, following the description of recyclable packaging in EMF (2021). Therefore, scenario assumptions from Scenarios 3 and 4 also have an impact on this metric.

Scenario 4 saw significant improvements in the proportions of plastic packaging that is recyclable, achieving 64% of total plastic packaging, compared to 37% in BAU. The introduction of advanced soft plastics recycling has a significant impact on the proportion of recyclable packaging for LDPE packaging, rising to 100% of plastic packaging PoM. Advanced soft plastics recycling implementation also sees a significant improvement in PP recyclable packaging PoM, increasing from 3% in BAU to 40% in Scenario 4.

The introduction of material bans, leading to substitution of some soft HDPE to soft PP alternatives (i.e., for woven type shopping bags) with higher recovery rates than HDPE bags, leads to a further increase in recyclable packaging proportion for PP in Scenario 5.

Expanding CDS to include PP bottles (e.g., medication/vitamin packaging), as well as to include other forms of containers (e.g., butter) could have a significant impact on achieving the Target, as PP makes up approximately 15% of total plastic packaging PoM. Extending material bans and planned substitution to other polymer types (i.e., Resin Identification Code 7) would also have a significant impact on achieving the Target, with other polymer types making up over 20% of total plastic packaging PoM.

Recyclable packaging by material scenario comparison

Proportion of PoM, all ANZPAC

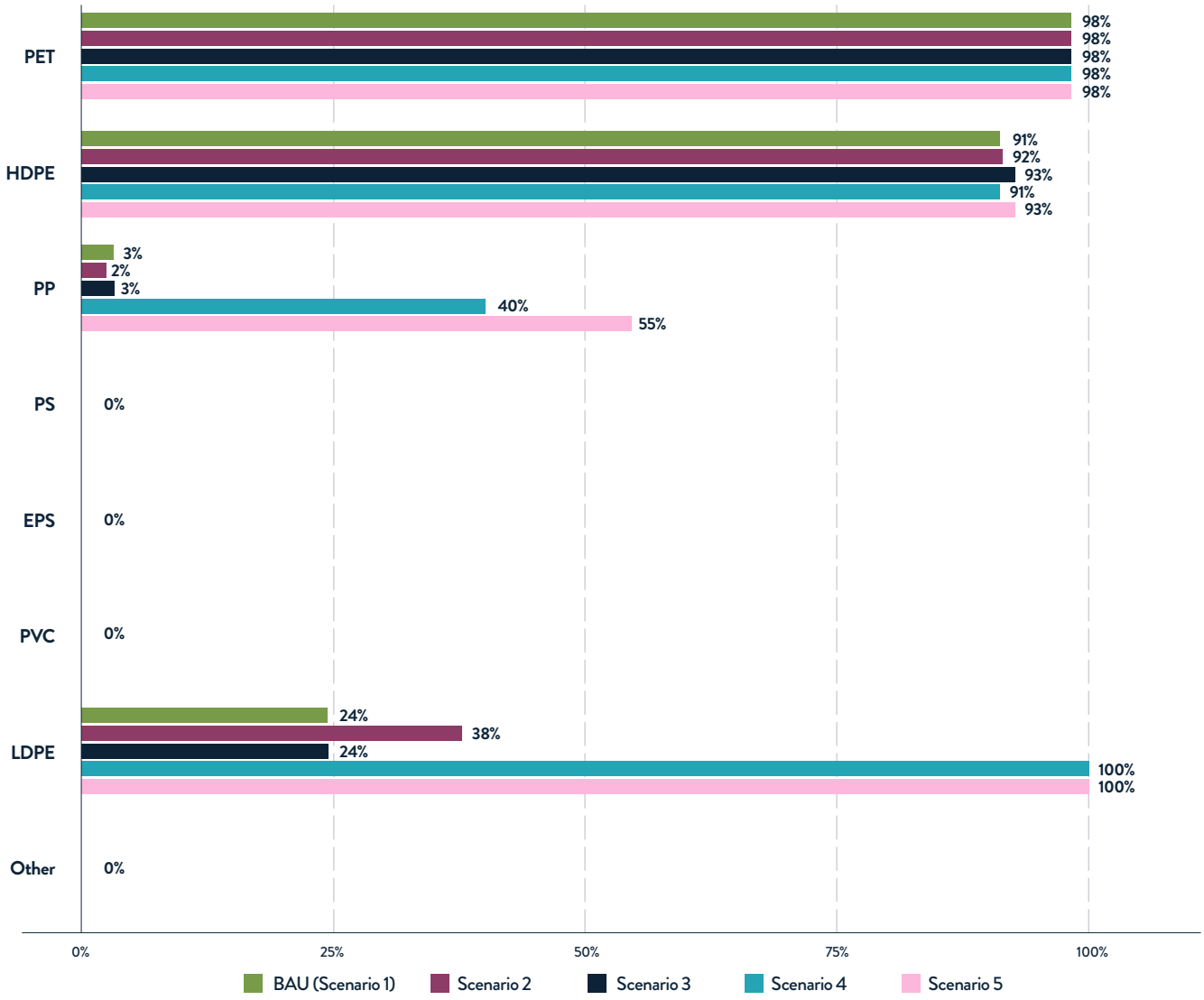


Figure 10: Comparison of recyclable plastic packaging as a proportion of PoM, by packaging material and scenario for all of the ANZPAC region

3.2.3. Plastic packaging recovery performance (ANZPAC Target 3)

Overall, a projected 238,100 tonnes of plastic packaging recovery were estimated for 2026-27 (BAU), an increase of approximately 10%, consistent with projected increases in plastic packaging placed on the market for 2026-27. Table 28 summarises estimated total recovery rates compared to BAU for each scenario by country. Percentage improvement compared to BAU is also shown for comparison against ANZPAC Target 3.

Table 28 – Summary of plastic packaging recovery performance by ANZPAC country and scenario.*

Country	BAU (Scenario 1)	Scenario 2		Scenario 3		Scenario 4		Scenario 5	
AUS	15.9%	16.3%	(+0.4%)	15.9%	(+0%)	19.8%	(+3.9%)	19.9%	(+4%)
NZL	25.8%	26.7%	(+1%)	29.9%	(+4.1%)	28.8%	(+3.1%)	34.2%	(+8.4%)
FJI	0.1%	0.2%	(+0%)	4%	(+3.9%)	0.4%	(+0.3%)	5.3%	(+5.1%)
WSM	0.3%	0.4%	(+0.1%)	2.1%	(+1.8%)	0.9%	(+0.6%)	3.1%	(+2.7%)
SLB	0.0%	0%	(+0%)	3.7%	(+3.7%)	0.5%	(+0.5%)	5.3%	(+5.3%)
TON	0.0%	0%	(+0%)	3.9%	(+3.9%)	0.3%	(+0.3%)	5.1%	(+5.1%)
VUT	0.0%	0%	(+0%)	4.7%	(+4.7%)	0.3%	(+0.3%)	5.8%	(+5.8%)
ANZPAC	**16.6%**	**17.1%**	**(+0.5%)**	**17.1%**	**(+0.5%)**	**20.3%**	**(+3.7%)**	**21.2%**	**(+4.6%)**

*Note: Percentage-point comparison against BAU (Scenario 1) is shown for Scenarios 2 to 5

Scenarios 4 and 5 had the largest total impact on the recovery rate, showing a relative improvement against BAU of over 20%. This illustrates that implementing advanced soft plastics recycling is the system intervention with the greatest potential for meeting ANZPAC Target 3. As shown through our modelling however, significant improvements in soft plastic collection would be required to achieve high recovery performance.

PICs would also see significant improvements on recovery performance from the implementation of CDS in Scenario 3, with CDS being the only recycling pathway for plastic packaging for most of these countries. New Zealand would also see significant improvements in performance from CDS implementation, as well as advanced soft plastics recycling. This can be attributed to New Zealand already having good collection and recovery system efficiency as seen in the 2019-20 results, meaning more material is collected and available for reprocessing.

Figure 11 and Figure 12 show recovery rate performance by material type and format for each scenario. Recovery rates are high for PET and HDPE across all scenarios, owing to bottles making up a significant proportion of packaging from these materials, which have high recovery rates compared to other formats. PVC (bottle) recovery is also high, however is considered a problematic packaging type and identified for material bans by APCO. The biggest improvements in performance by material were seen with PP and LDPE packaging. In the case of PP, the recovery rate falls in Scenario 2, due to substitution of lightweight HDPE bags to PP alternatives, which have lower recovery rates than rigid PP recovery rates. Flexible LDPE and PP recovery increase significantly in Scenario 4/5, where advanced soft plastics recycling is implemented. Advanced recycling assumes collection of soft plastics for recovery is at the same rate as average plastic packaging collection for materials/formats with existing collection systems. Quantities of soft plastics collected in PICs is small, at approximately 180 tonnes total in Scenario 4. However, quantities collected are much higher in Australia, at approximately 85,000 tonnes, compared to 26,000 tonnes in BAU. It is anticipated that sufficient soft plastics recovery capacity will be available in Australia by 2026-27, given anticipated capacity expansions[7].

[7] National Packaging Target review (2022) conducted by ISF on behalf of APCO, looked at estimating format specific collection and recovery rates for Australian packaging

Packaging recovery rate by material - scenario comparison

Proportion of PoM, all ANZPAC

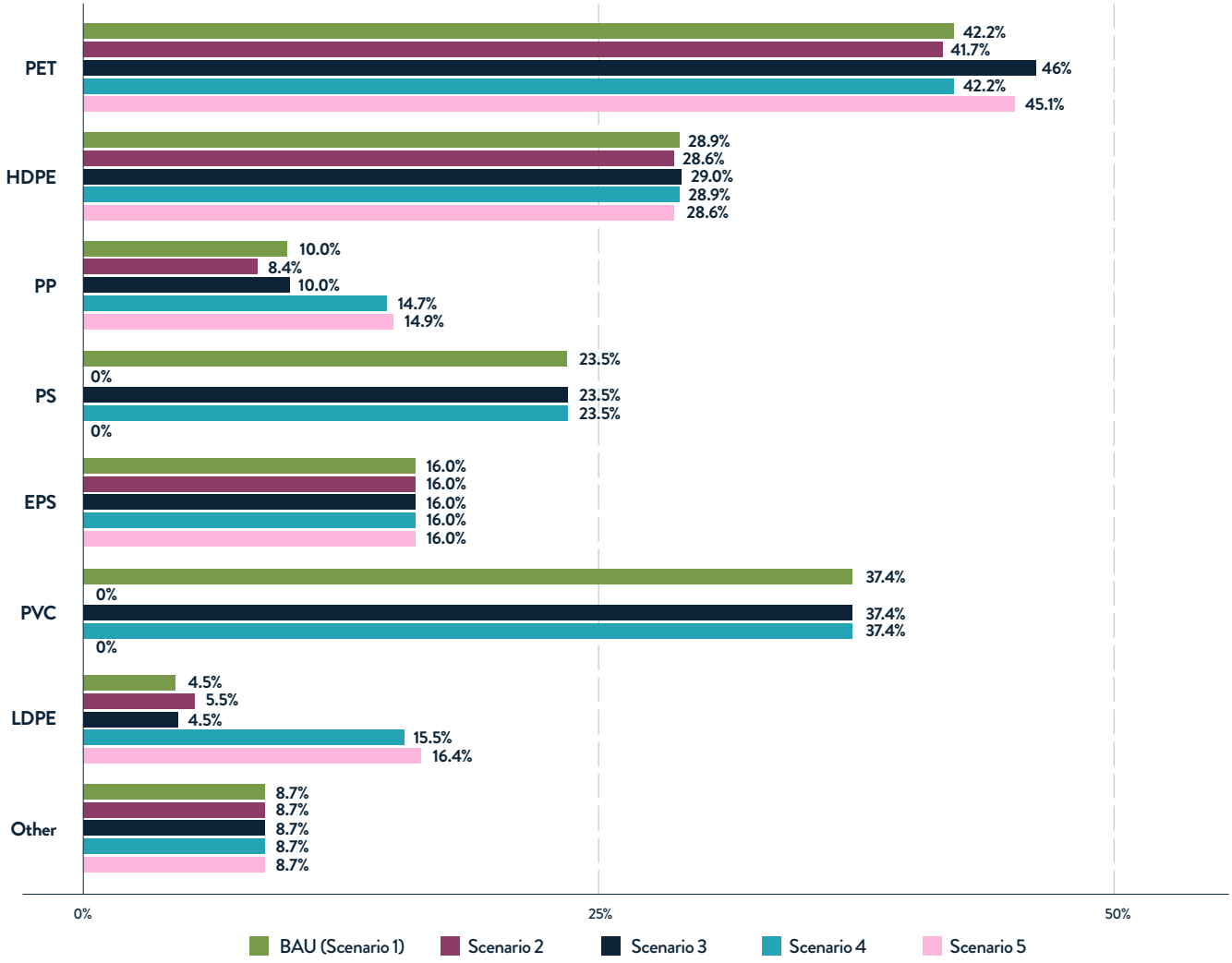


Figure 11: Comparison of plastic packaging recovery as a proportion of PoM, by packaging material and scenario for the ANZPAC region

Packaging recovery rate by format - scenario comparison

Proportion of PoM, all ANZPAC

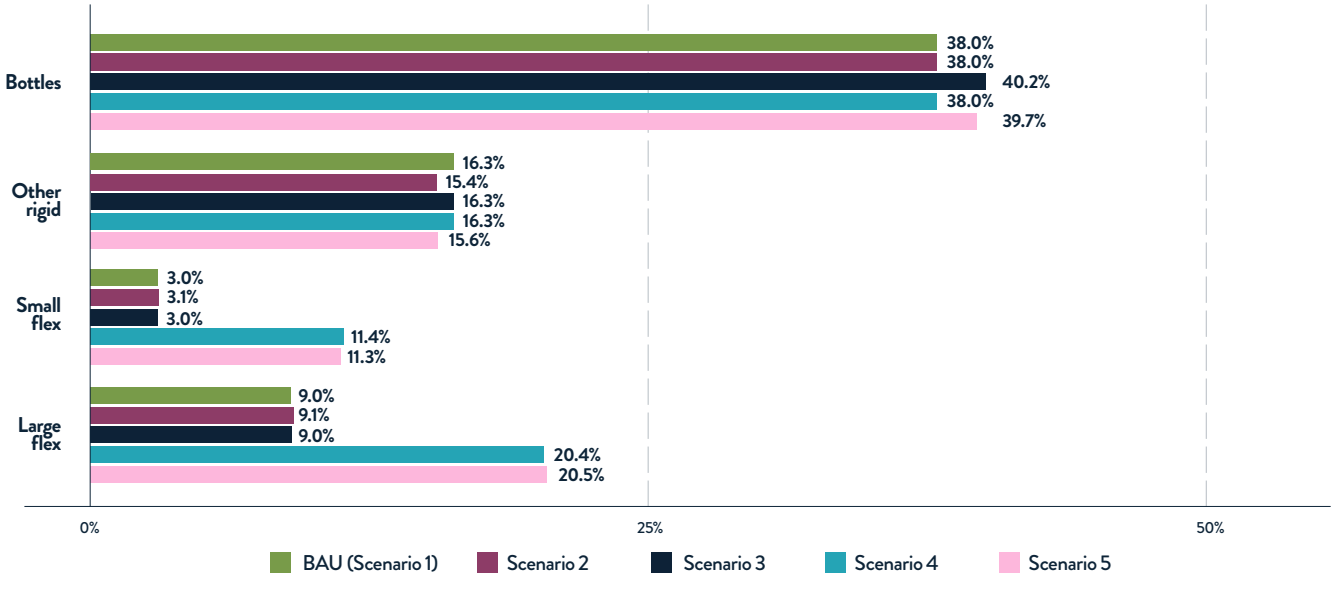


Figure 12: Comparison of plastic packaging recovery as a proportion of PoM, by packaging format and scenario for the ANZPAC region

3.3. Scenario analysis conclusions

The modelling developed for analysing ANZPAC plastic packaging flows is effective for evaluating potential future packaging management interventions in the region. The scenario analysis showed how future performance can be evaluated against ANZPAC Targets 1, 2 and 3, by comparing against a performance baseline. However, estimating Target 1 performance still relies on proxy data and assumptions.

All interventions evaluated in this scenario analysis show a positive impact on potential future ANZPAC Target performance. Advanced soft plastics recycling had the largest impact on overall ANZPAC recovery performance with the success of this recovery pathway assuming the achievement of high rates of soft plastics collection. The analysis highlights the importance of interventions to increase soft plastic collections, that could provide feedstocks for recovery facilities currently being developed in Australia.

CDS roll out, especially in the PICs was also shown to have a significant potential impact on recovery performance, however assumed CDS eligibility and redemption rates are optimistic, especially for the PICs where logistical challenges are present. The CDS roll out scenario does illustrate the potential impact of source separated collection systems can have on rigid packaging recoveries and expanding CDS to include non-beverage bottles as well as containers, will also lead to significant improvements on overall recovery.

4. CONSIDERATIONS FOR FUTURE ASSESSMENT

This section of the report discusses some important considerations for the future assessment of ANZPAC packaging material flows and measurement of performance against ANZPAC Targets.

4.1. Data uncertainty and data gaps

4.1.1. Informal collection

Informal collection is a pathway for the collection of valuable recyclable material in many developing countries including India, Vietnam and Mexico and Brazil (Nguyen et al., 2021; Guibrunet, 2019; Yokoo et al., 2018; Linzer & Lange, 2013; Kawai et al., 2012; Medina, 2008), and can be an important source of recyclable material where kerbside systems are not widespread.

Data on informal collection is difficult to obtain (Yokoo et al. 2018), due to the resource intensive nature of primary data collection, and lack of trackability, records and registers (Linzer & Lange, 2013). In the modelling for this project, informal collection is a component of the system specification however no data could be found to quantify informal collection flows. In the system specification, it was assumed that informally collected quantities would reduce collection losses, consistent with the literature on the informal collection of other waste streams such as metals and e-waste.

In the absence of data on this flow, an approach could be developed for estimating informal collection, taking proxy data from the literature. This would result in an estimate for informal collection that would be high in uncertainty. Primary data collection would give the most certain data, and would require survey of informal waste aggregators which may be difficult to acquire. Considering the data indicates that metals and e-waste are generally the main wastes collected by informal collection, with some rigid plastics collected where recycling capacity exists, it is possible that plastic packaging collection via informal pathways in the PICs is not significant.

4.1.2. Informal and formal reuse

Data is known to be limited for the formal reuse of plastic packaging, with data from Envisage Works (2021) being the only comprehensive summary of formal reuse flows available for packaging in the ANZPAC region. However, from the Envisage Works (2021) data, formal reuse flows are not relevant for the plastic packaging types in scope for this project.

Informal reuse, for example the reusing of packaging at households, faces similar issues as informal collection, in that data is difficult to obtain. In the absence of data, some proportion of packaging could be assumed to be kept within households to be reused, for periods of time bound by the expected lifetime of packaging types. For this, proxy data from the literature would be necessary, and again, would introduce high uncertainty into material flow estimates. Data points that could be used to estimate this flow may include: the likelihood of a packaging type being reused informally, the number of households participating in informal reuse, and the lifetime of packaging.

A further consideration for reuse in future analysis is how reuse impacts on recovery. Definitions for recovery rates are generally based on quantities recovered in a year compared to new packaging placed on the market in the same year. With this definition of recovery, the reuse of packaging introduces complexity. Reuse can be considered an accumulation of used packaging within households/businesses, therefore would only impact recovery if its primary use, any additional use, and collection for recovery occur within the same year. Disposal and recovery of reused packaging that occurs in a different year to when packaging was placed on the market, may artificially inflate recovery rates for that year. To account for this, any packaging reused could be considered effectively recycled, however this does not consider the fate of reused packaging after disposal. Alternatively, an analysis of the lifetime of reusable packaging could be incorporated into future MFA, that may provide estimate of the likelihood of reused packaging being disposed and recovered within the year the packaging was placed on the market.

4.1.3. Stockpiling

Stockpiling of sorted material is considered in the system specification, which assumes that any material that is sorted and not recovered in a single year, accumulates in stockpiles in the system. Data for this for the materials in scope is limited, with no stockpiles of material indicated in the data. Regardless of how this flow may be estimated, stockpiling of material would not impact on recovery rates as this material is not considered effectively recycled in the year the material was placed on the market. Stockpiling does however impact sorting efficiency estimation, whereby stockpiling is assumed to occur after sorting takes place.

4.2. Performance metrics against ANZPAC Targets

4.2.1. Measuring future performance

As indicated in Section 2.3, the analysis in this report does allow for the direct measurement of performance against ANZPAC Target 3, as the Target specifies an increase in quantities effectively recycled by 25%. For this, a baseline must be established from which this Target can be assessed. This project and the Blue Environment (2022) report establish a baseline for recovery for 2019-20. The metrics proposed in this report can be evaluated for each year and assessed against the recovery rates estimated in this report.

4.2.2. Problematic and unnecessary plastic packaging considerations

This project assumed that problematic and unnecessary plastic packaging types are consistent with Australian problematic and unnecessary packaging types in ISF (2021). It is not clear if this is an appropriate assumption for the entire ANZPAC region. This project utilised the proportion of problematic and unnecessary packaging types from APCO (2021) applied across the ANZPAC region, which has introduced considerable uncertainty in the estimates of performance against ANZPAC Target 1. A more thorough analysis of problematic plastic packaging types relevant for each ANZPAC country should be performed for future analysis of ANZPAC Target performance.

4.2.3. Plastic packaging recyclability considerations

This analysis has used the recyclability classification in EMF (2021) and Blue Environment (2022), which specifies that packaging is recyclable if there is a packaging collection and recycling system available and at scale and achieving a post-consumer recovery rate of 30%. This means that for some materials, the recovery rates estimated are actually higher than the proportion of recyclable packaging, for example, PP, PS and EPS packaging (see Figure 7). This discrepancy is because post-consumer recovery rates for some materials are below 30% but above 0%, and are therefore not considered recyclable. An alternative may be to estimate the proportion of plastic packaging that is recyclable based on these recovered quantities, assuming that what is recovered is some proportion of possible recyclable plastic packaging.

4.2.4. Recycled content of new plastic packaging

The estimate of recycled content is based on data in Envisage Works (2021), which is the best available data on recycled content in new packaging. The analysis in this report assumes that plastic packaging types are more or less consistent across the ANZPAC region, which may not be the case. Future assessment of ANZPAC Target 4 performance could utilise the Envisage Works (2021) data along with data collected from ACPO Members on recycled content of new plastic packaging placed on the market in New Zealand and PICs. If such data is difficult to obtain, Envisage Works (2021) data could be utilised for New Zealand and PICs, however further analysis on the distribution of product types placed on the market.

5. CONCLUSIONS

5.1. Findings

5.1.1. Material flows 2019-20

This project saw the completion of a MFA of used plastic packaging in the ANZPAC region for the 2019-20 financial year. Utilising data collected for the 2020 ANZPAC Baseline Recyclability Assessment, this analysis evaluated plastic packaging flows from the point of consumption to collection, sorting and recovery for 7 countries in the ANZPAC region (Australia, New Zealand, Fiji, Western Samoa, Solomon Islands, Tonga and Vanuatu).

Approximately 1.3 million tonnes of plastic packaging were placed on the market in 2019-20 across the ANZPAC region, including 487,000 tonnes of recyclable plastic packaging. The analysis estimated that only 216,000 tonnes of plastic packaging were recycled across ANZPAC — mainly in Australia and New Zealand.

Collection rates of used plastic packaging were quite poor across all packaging formats and regions. Most significant losses of recyclable material result from a failure to collect used packaging for recycling, that could be owing to a range of factors. These include plastic packaging designs limiting collection and recovery success, littering, lack of convenient collection infrastructure, poor disposal practices, or a combination of these factors. In total, approximately 17% of used plastic packaging was collected for recycling in 2019-20 across the region, which significantly limits potential recovery of used plastic packaging. Collection rates were highest in New Zealand and Australia, and poorest in the PICs. Rigid packaging generally had the highest rates of collection, with flexible packaging types having the lowest.

5.1.2. Performance against 2025 ANZPAC Targets

Metrics were proposed in this work to evaluate plastic packaging system performance against the 2025 ANZPAC Regional Targets.

Approximately 42% of plastic packaging placed on the market in the ANZPAC region was considered unnecessary and/or problematic (ANZPAC Target 1). This proportion was highest in the PICs, where flexible packaging types made up a higher proportion of plastic packaging placed on the market.

Approximately 37% of plastic packaging was considered recyclable—significantly less than the 100% target rate for 2025 (ANZPAC Target 2). This proportion again was lowest in the PICs, owing to the high proportion of flexible packaging placed on the market. New Zealand had the best performance of the ANZPAC countries, with 56% of plastic packaging placed on the market deemed recyclable.

Approximately 17% of all packaging PoM was recycled (ANZPAC Target 3). PICs again had the lowest performance, with New Zealand having the highest, with an overall plastic packaging recovery rate of 26%. Notably for this Target, the metrics calculated in this analysis cannot be used to directly measure performance against ANZPAC Target 3, which stipulates an increase in the quantity of plastic packaging recycling by 25%. The data generated and the approach used in this report however can serve to establish a baseline for future analysis to measure performance for this Target.

Recycled content made up approximately 4% of total plastic packaging placed on the market —significantly less than the target of 25% (ANZPAC Target 4). The distribution of recycled content across the ANZPAC region was consistent because, owing to data limitations, Australian proxy data was used to calculate this proportion.

5.1.3. Priority system interventions

A scenario analysis was performed to project plastic packaging consumption across ANZPAC in 2026-27, and to evaluate the performance of several system changes on future Target performance.

Implementing advanced soft plastics recycling had the largest overall impact on ANZPAC recovery performance, leading to an overall ANZPAC recovery rate of over 20%. Success of this recovery pathway relies on achieving high soft plastic collection rates, significantly above current collection rates.

Expansion of CDS in New Zealand and the PICs was also shown to have a significant potential impact, however assumed CDS eligibility and redemption rates are optimistic. The CDS scenario also illustrates the positive impact of source separation on rigid packaging recoveries, by bypassing less efficient collection systems. Expanding CDS to also include non-beverage and non-bottle containers may also lead to further significant improvements on overall recovery.

5.1.4. Data gaps

The modelling developed for analysing ANZPAC plastic packaging flows is effective for evaluating potential future packaging management interventions in the region. The scenario analysis showed how future performance can be evaluated against ANZPAC Targets 1, 2 and 3, by comparing against a performance baseline. However, estimating Target 1 performance still relies on proxy data and assumptions.

The MFA also evaluated data quality and impacts on available data on modelling uncertainty. Several data gaps and key uncertain plastic packaging flows were identified including: quantities of packaging collected via informal collection pathways, packaging reuse including via household reuse, sorting efficiency at PICs and New Zealand material recycling facilities, B2B plastic packaging collections, and recycled content in New Zealand and PICs plastic packaging placed on the market. Data gaps and uncertain flows were especially relevant for PICs, where data is limited to only a few data sources. Addressing the above data gaps may require additional primary data collection.

5.2. Recommendations

5.2.1. Applying circular plastic packaging design principles

The plastic packaging system performance against the 2025 ANZPAC Regional Targets clearly showed that innovation, redesign, and alternative use models are necessary to progress in recovery of plastic packaging. Focus needs to be on reduction of packaging, viable reuse models and systems, and recyclability in practice and at scale.

5.2.2. Improving collection rates

To increase the recovery the 1.3 million tonnes of plastic packaging placed on the ANZPAC market (in 2019-20), improved collection is needed across the region:

- Separation of recyclables and non-recyclables at households and businesses.
- Extension of CDS.
- Establishing more widespread collection systems in PICs for all formats.
- Applying recovery models that are geographically relevant in remote and regional communities.

5.2.3. Implementing system interventions

To move towards the 2025 ANZPAC Regional Targets, system changes are required to close the gaps in the Target performance. The two system interventions with the highest impact are introduction of advanced recycling technology for soft plastic recovery and CDS extension.

- Improved collection of soft plastic combined with advance recycling technology will significantly improve the overall recovery rate across the region. Therefore, innovative advance recycling solutions should be tested to identify opportunities for long term recovery solutions.
- CDS implementation in New Zealand and PICs will significantly increase recovery rates of plastic packaging and improve source separation of rigid plastic packaging.

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APPENDICES

A1. Overview of data uncertainty and data gaps

There are some levels of uncertainty in the data provided. Figure A1 shows the system diagram used for the MFA, with key uncertain flows and data gaps highlighted. Flows highlighted in red indicate estimated material flows with uncertainty measured as coefficient of variation above 15%. The coefficient of variation is the ratio of the standard deviation (an indicator of data dispersal) to the mean. This threshold was selected based on the relative uncertainty of material flows across the system. Uncertainty ranged from low (approximately 4%), such as packaging placed on the market, to high (up to 40% for flows where proxy data was used). High uncertainty is especially relevant for material flow estimates for the PICs, while generally, uncertainty was lowest for material flow estimates (and across material types) for Australia and New Zealand.

Addressing these uncertain flows may require different approaches. Flows relating to sorting losses (i.e., F2.10 and F5.10 in Figure A1) would require more up-to-date sorting efficiencies from academic or industry literature as proxy data, in the absence of actual data from MRFs. Alternatively, primary data collection for CDS loss rates as well as MRF sorting efficiencies could also be conducted, however data on MRF sorting has previously been identified as difficult to obtain given the commercial nature of MRFs. Flows with high uncertainty that are back-calculated in the MFA (e.g., collection losses) can be improved by lowering the uncertainty for related flows, for example, MRF flows. This is an effect of the propagation of uncertainties, which is the interaction between uncertainties across flows in the system. Improving the uncertainty of MRF flows may be impactful, as the MRF is a central feature of the system, with multiple input and output flows from that process. Updated proxy or primary collected data on MRF sorting, and more robust estimates of overseas exports and losses may improve uncertainty on collection losses.

Several data gaps were identified. Quantities of plastic packaging material collected via informal collections (flow F1.2) was unknown. A review of literature on informal waste collection pathways in developing countries indicated that this pathway is mostly focused on high-value waste streams, in particular e-waste, metals (including metal packaging, like aluminium cans), cardboard and some rigid plastics (Chi et al., 2014; Medina, 2008; Wang et al., 2020). On average, informal waste pickers represent from 0.5% to 2% of urban populations in developing countries (Linzner & Lange, 2013). In China, almost 6 million people were engaged with informal waste picking in the late 2000s and collection rates by the informal sector can be up to 50% for specific waste streams (Medina, 2008; Wilson et al., 2009). In Brazil, the income from informal waste collection can achieve twice the minimum wage and is frequently the only source of income for a whole family (Medina, 2008). In Vietnam, the informal sector is responsible for recycling almost 9% (by weight) and 26% (by volume) of household waste (Kawai et al., 2012). No data or studies were found specifically for the ANZPAC region and, since the data from other countries are diverse, it was not possible to make reasonable assumptions to estimate the informal collection flows that is an important gap in this report.

Flows of plastic packaging reuse (F1.3) was also unknown. While data on formal plastic packaging reuse is included in the Envisage Works (2021) data set, this does not include packaging types in scope of this project. Additionally, data was not available on the informal (e.g., household level) reuse of plastic packaging. The stockpiling of sorted plastic packaging (flow F7.8) was also unknown. While some data sources including SPREP (2020) indicated that some sorted plastic packaging is stockpiled in PICs, there was no data available for quantifying this flow. For Australia, data on stockpiled quantities are included in Envisage Works (2021), but not for relevant packaging material types.

A final data gap was the importation of plastic packaging for recovery (flow F0.9). SPREP (2020) indicated some flows of plastic waste is exported from PICs for recovery in Australia (namely Brisbane), however there is no data to quantify this flow. While this flow is considered a data gap, it was characterised in the context of future scenario modelling using this system specification, whereby regional recovery loops would be tested. Quantities of used plastic packaging imported to Australia would not contribute to Australian plastic packaging recovery rates, however would still contribute to the recovery rate in the originating country. This is because the recovery rate metric is calculated on packaging placed on the market and recovered within the same system.

In summary, uncertainty in the modelling estimates is within an acceptable range. Table A1 gives a summary of these identified uncertain flows and data gaps.

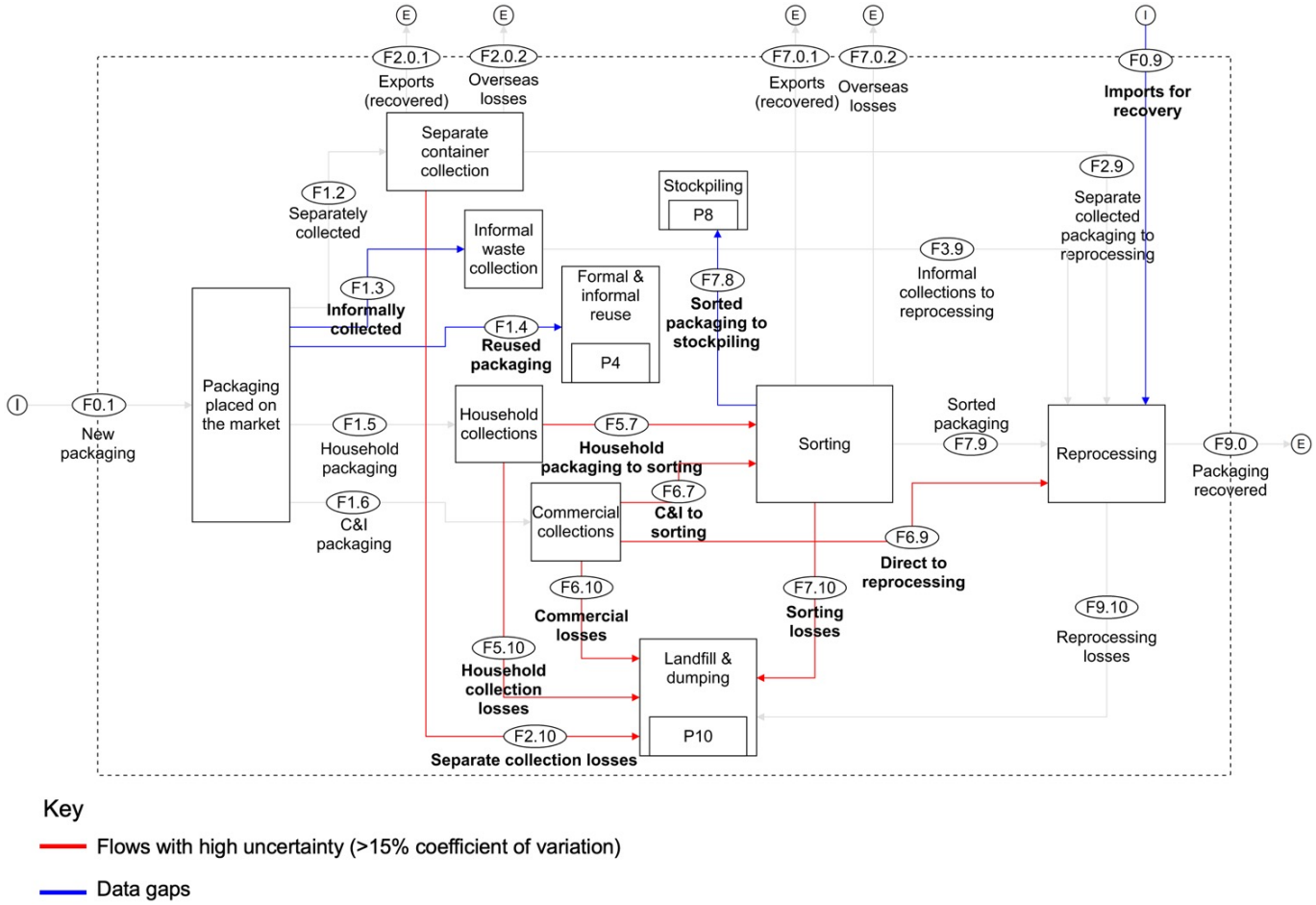


Figure A1: Key uncertain material flows and identified data gaps

Table A1: Descriptions of key uncertain material flows and identified data gaps

Flow	Related region(s)	Related material(s)	Description
High uncertainty flows (>15% coefficient of variation)			
F2.10	AUS	PET/HDPE	Proxy data is required to estimate these flow as no data exists on sorting efficiencies, however proxy data is out of date (>5 years).
F5.10	All	All	
F5.7	All	All	These flows are back calculated from other flows which also carry a degree of uncertainty (e.g., expected inputs to sorting).
F6.7	All	All	
F6.10	All	All	
F7.10	All	All	
F6.9	AUS/NZL	All	Data on this flow is based on Australian proxy data, however, is uncertain as underlying data from ISF (2021) is also an estimate.
Data gaps			
F1.3	All	All	Data on these flows was unavailable for this analysis.
F1.4	All	All	
F7.8	All	All	
F0.9	AUS/NZL	All	

A2. Collection rates and recovery rates with uncertainty

This section of the appendix contains summary tables for collection and recovery rates that have been duplicated from tables in the main body of the report and show calculated uncertainty ranges.

Table A2 – Summary of collection for recycling rate by collection stream and plastic packaging material across ANZPAC region

Material	Household waste collected for recycling rate [% of household derived waste]		C&I waste collected for recycling rate [% of C&I derived waste]	
PET	43%	±8.5%	23%	±4.6%
HDPE	31%	±6.1%	33%	±6.6%
PP	11%	±2.3%	17%	±3.4%
PS	75%	±15%	8%	±1.5%
EPS	2%	±0.5%	42%	±8.4%
PVC	61%	±12.3%	0%	
LDPE	3%	±0.6%	8%	±2.1%
Other	7%	±1.4%	26%	±5.1%
Total (region)	18%	±3.5%	17%	±3.5%

Table A3 – Summary of collection for recycling rate by collection stream and plastic packaging format across ANZPAC region

Formats	Household waste collected for recycling rate [% of household derived waste]		C&I waste collected for recycling rate [% of C&I derived waste]	
Bottles	38%	±7.6%	30%	±6%
Other rigid	17%	±3.5%	28%	±5.5%
All rigid	26%	±5.3%	29%	±5.7%
Small flexible	3%	±0.6%	6%	±1.2%
Large flexible	3%	±0.8%	11%	±2.9%
All flexible	3%	±0.6%	8%	±1.9%

Table A4 – Summary of plastic packaging recovery rates by material type and ANZPAC country for 2019-20

Material	AUS		NZL		FJI		WSM		SLB	TON	VUT	Total	
PET	43%	±9%	47%	±15%	<1%	±4%	3%	±4%	0	0	0	42%	±11%
HDPE	27%	±9%	46%	±15%	<1%	±4%	0		0	0	0	29%	±10%
PP	11%	±8%	1%	±15%	0		0		0	0	0	10%	±8%
PS	25%	±7%	21%	±15%	0		0		0	0	0	23%	±8%
EPS	19%	±10%	16%	±15%	0		0		0	0	0	16%	±10%
PVC	42%	±11%	11%	±15%	NA		NA		NA	NA	NA	37%	±12%
LDPE	4%	±8%	6%	±15%	<1%	±4%	0		0	0	0	4%	±9%
Other	9%	±4%	9%	±15%	0		0		0	0	0	9%	±6%
Total	**16%**	**±8%**	**26%**	**±15%**	**<1%**	**±4%**	**<1%**	**±4%**	**0**	**0**	**0**	**17%**	**±10%**

Table A5 – Summary of plastic packaging recovery rates by packaging format and ANZPAC country for 2019-20

Recovery rate (%) per country by packaging format													
Material	AUS		NZL		FJI		WSM		SLB	TON	VUT	Total	
Bottles	38%	±9%	45%	±15%	<1%	±4%	1%	±4%	0	0	0	38%	±10%
Other rigid	15%	±7%	30%	±15%	0		0		0	0	0	16%	±9%
All rigid	25%	±9%	37%	±15%	<1%	±4%	<1%	±4%	0	0	0	26%	±10%
Small flexible	3%	±7%	2%	±15%	0		0		0	0	0	3%	±8%
Large flexible	9%	±8%	9%	±15%	5%	±4%	0		0	0	0	9%	±9%
All flexible	4%	±8%	4%	±15%	<1%	±4%	0		0	0	0	4%	±8%

Table A6 – Plastic packaging format recovery volumes (for Australia and New Zealand only) by recovery pathway for 2019-20

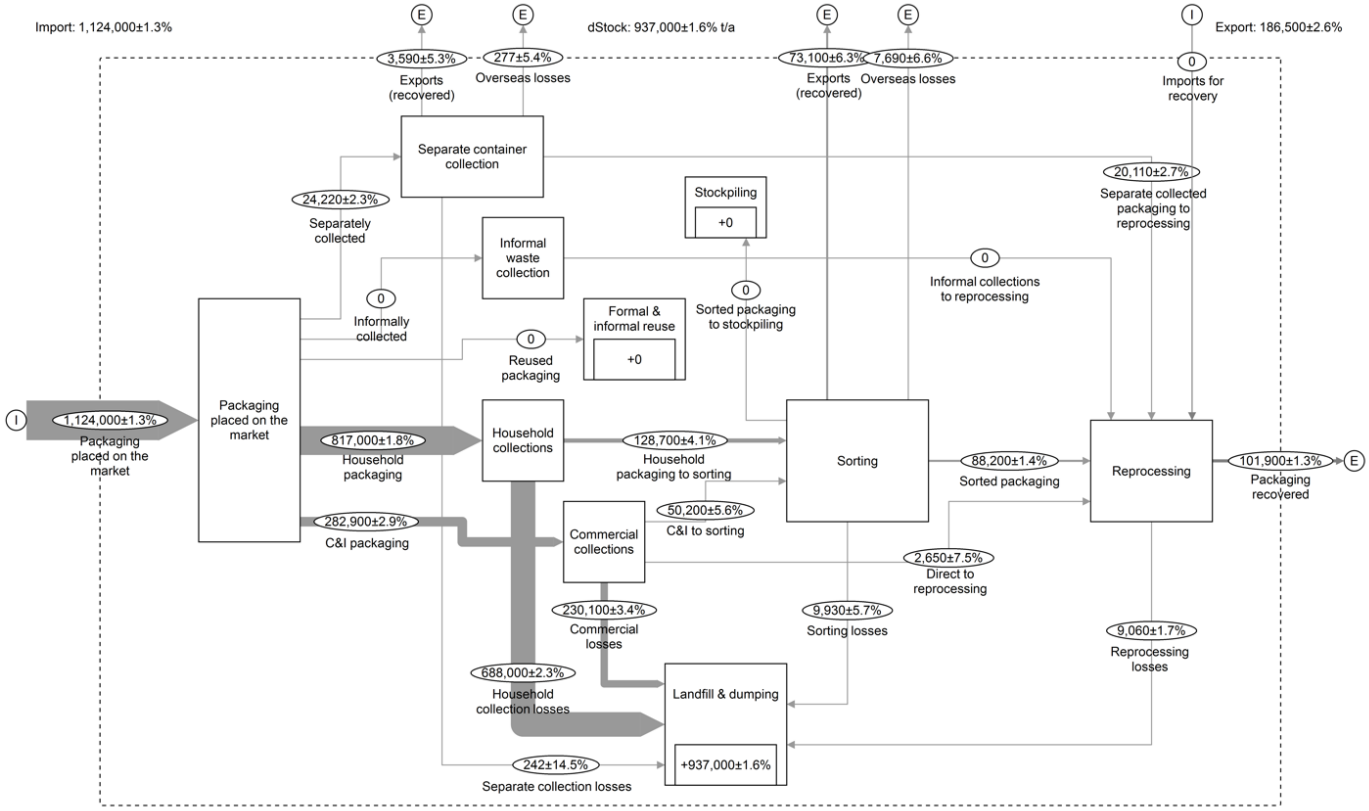
Formats	Recovery via overseas reprocessing [tonnes]		Recovery via local reprocessing [tonnes]	
Bottles	65,940	±14%	58,630	±6%
Other rigid	18,840	±14%	51,190	±7%
All rigid	84,780	±14%	109,820	±7%
Small flexible	4,230	±14%	9,650	±5%
Large flexible	2,960	±14%	4,880	±6%
All flexible	7,190	±14%	14,520	±5%

Table A7 – Summary of ANZPAC country performance against ANZPAC Regional Target metrics by percentage of material placed on the market (PoM)

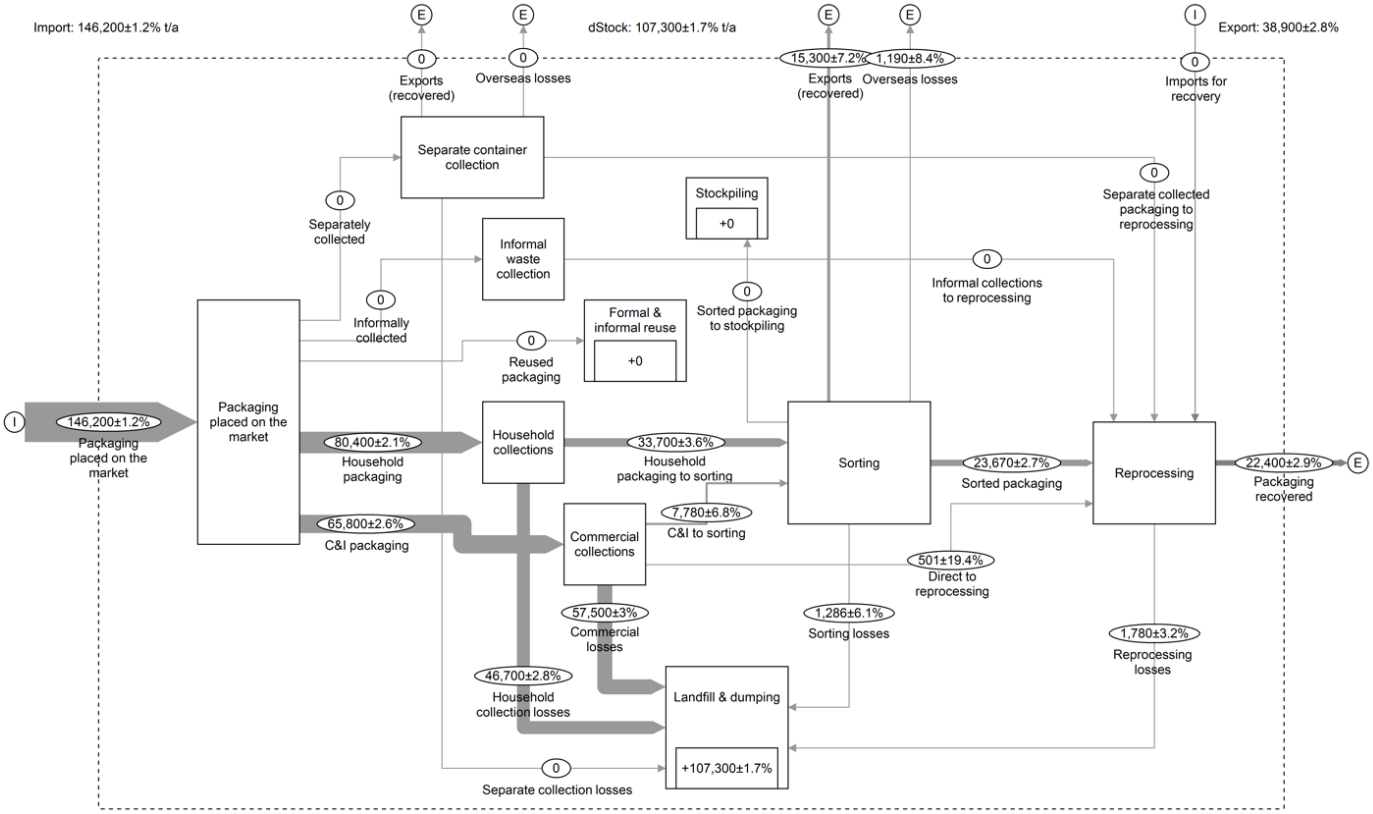
Country	Metric 1 – Unnecessary and problematic packaging [% of PoM]		Metric 2 – Recyclable packaging [% of PoM]		Metric 3 – Recovery rate [% of PoM]		Metric 4 – Recycled content in new packaging [% of PoM]	
Australia	42.6%	±15%	35.6%	±15%	15.9%	±8%	4.1%	±15%
New Zealand	35.3%	±15%	55.5%	±15%	25.8%	±15%	5.8%	±15%
Fiji	57.3%	±20%	19.4%	±20%	0.1%	±4%	4.2%	±20%
Western Samoa	50.7%	±20%	8.8%	±20%	0.3%	±4%	3.3%	±20%
Solomon Islands	52.5%	±20%	18.3%	±20%	0%	±0%*	4.6%	±20%
Tonga	57.3%	±20%	19.4%	±20%	0%	±0%*	4.2%	±20%
Vanuatu	37%	±20%	23.4%	±20%	0%	±0%*	5.7%	±20%
ANZPAC	**42.1%**	**±15%**	**37.4%**	**±15%**	**16.6%**	**±10%**	**4.3%**	**±15%**

*Note: no known recovery during study period

A3. Material flow diagram for Australia

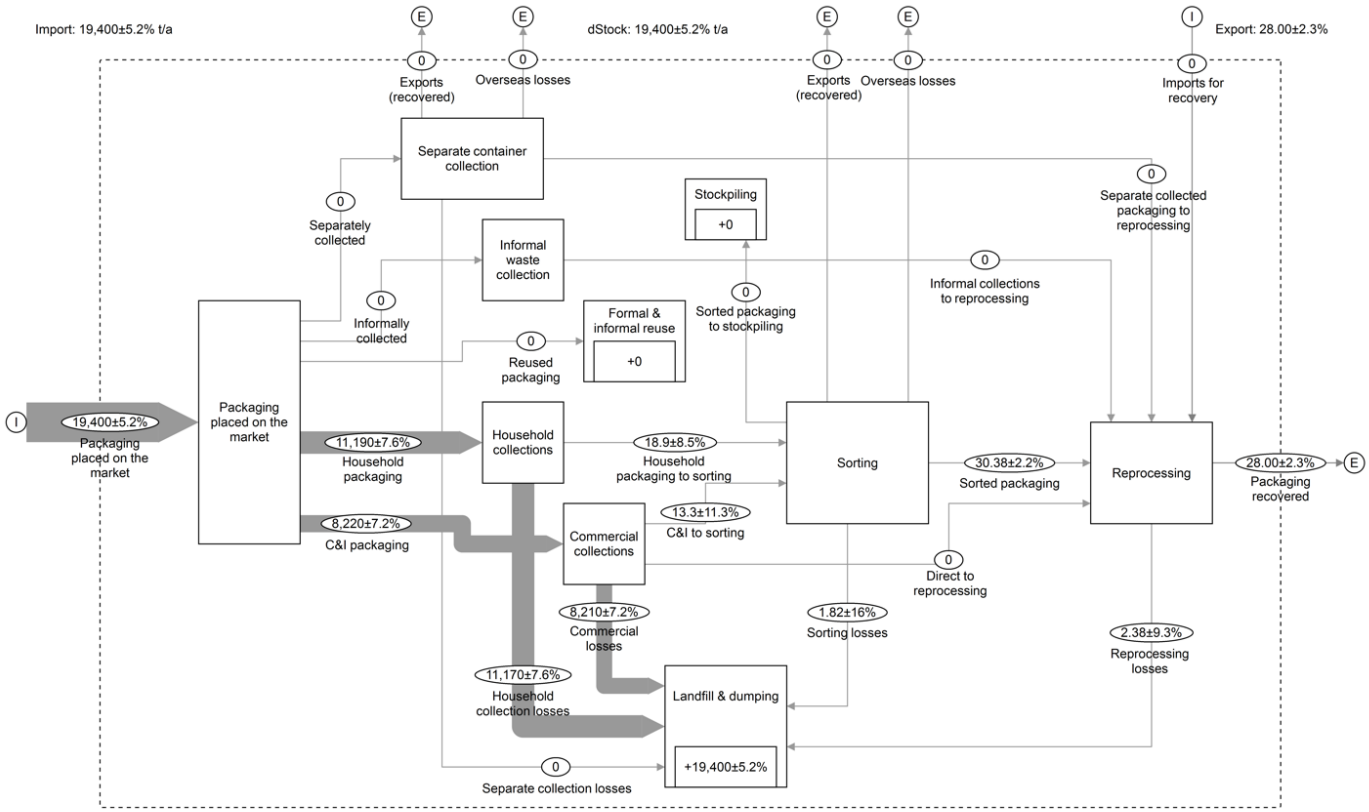


A4. Material flow diagram for New Zealand

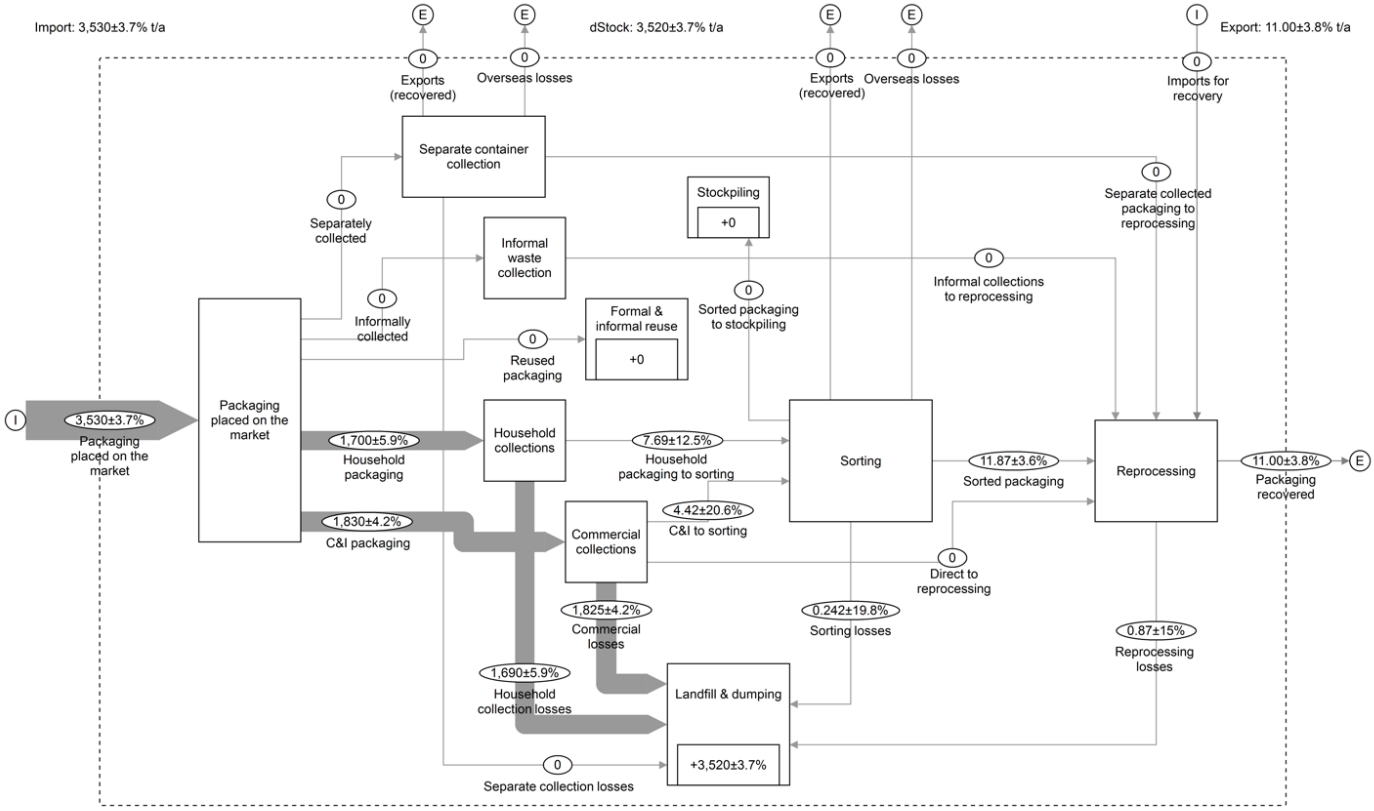


A5. Material flow diagrams for Pacific Islands Countries

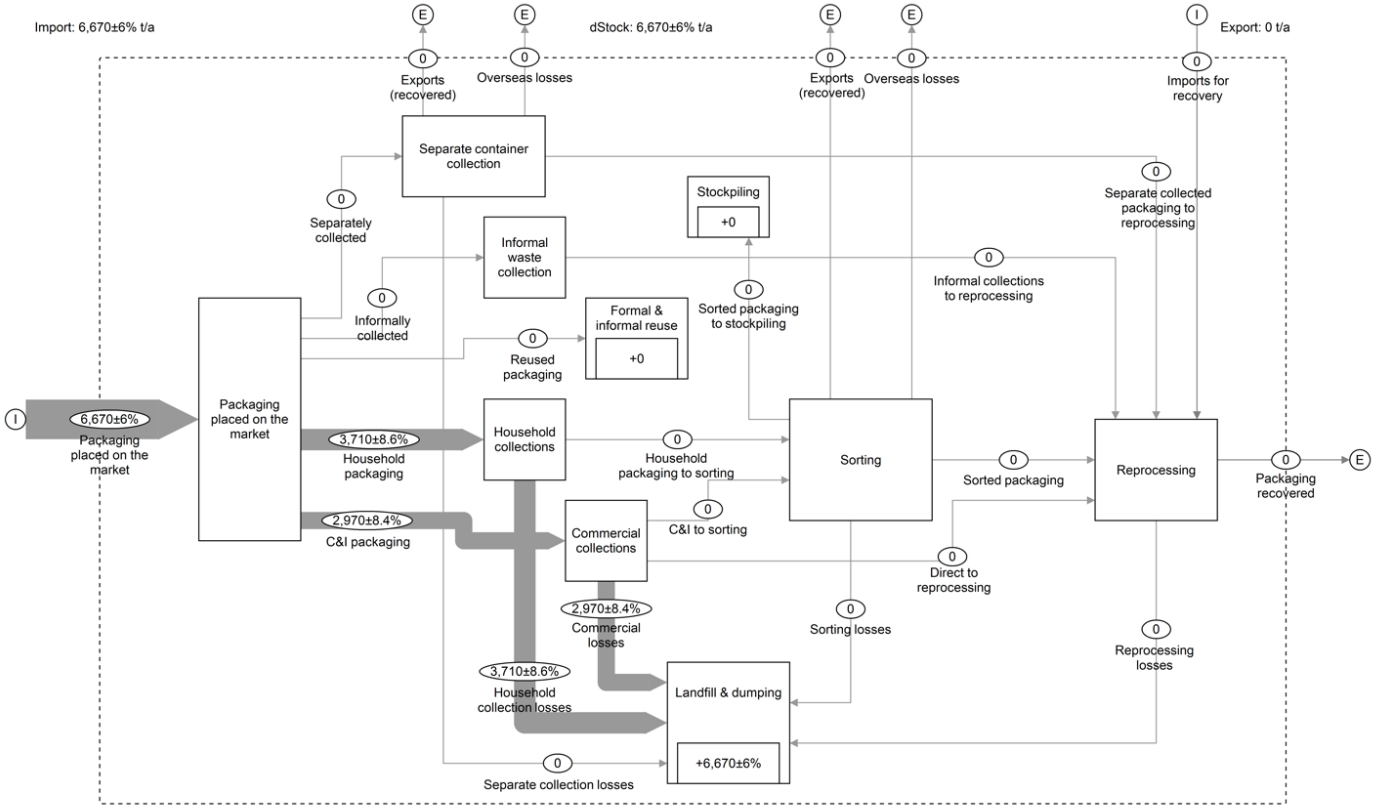
A5.1 Fiji



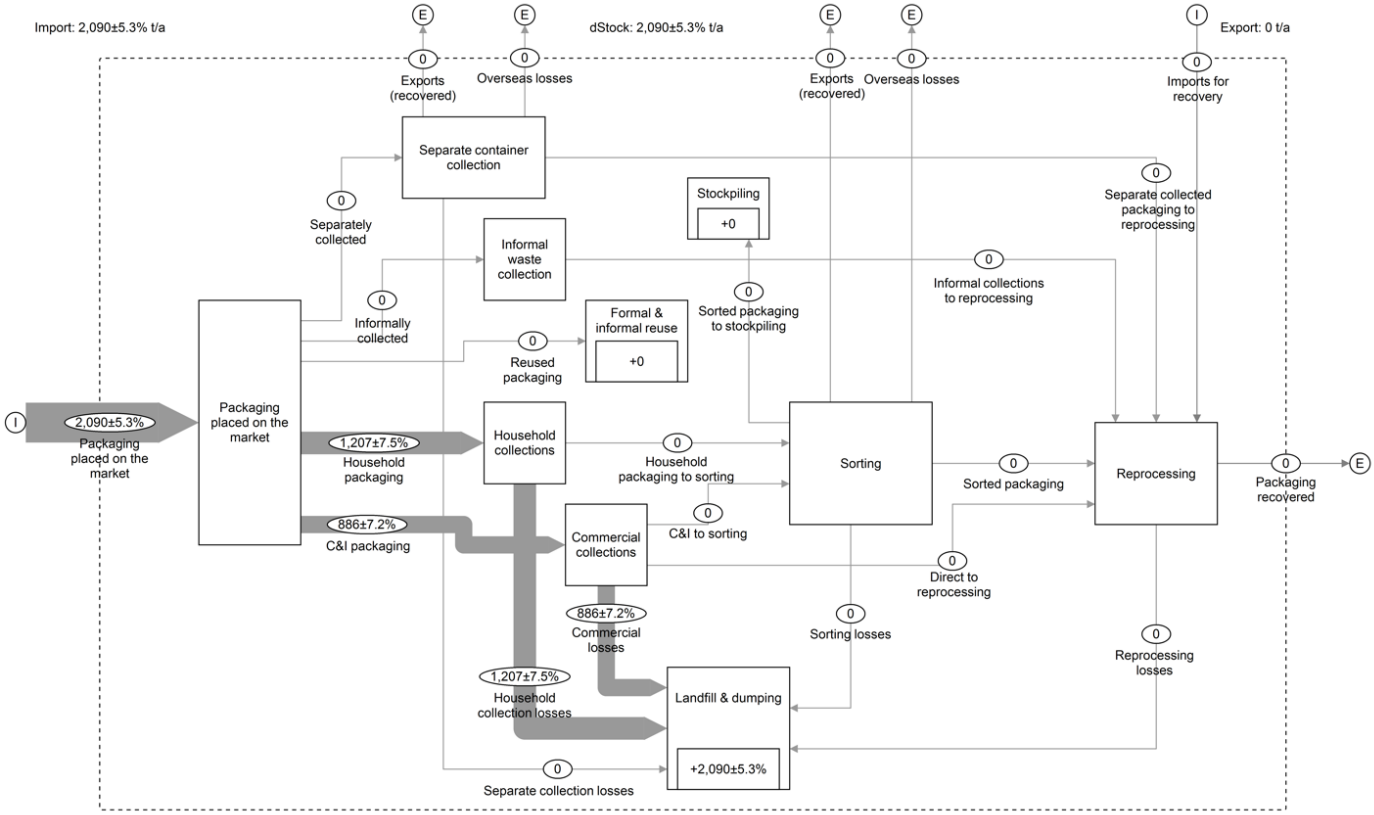
A5.2 Western Samoa



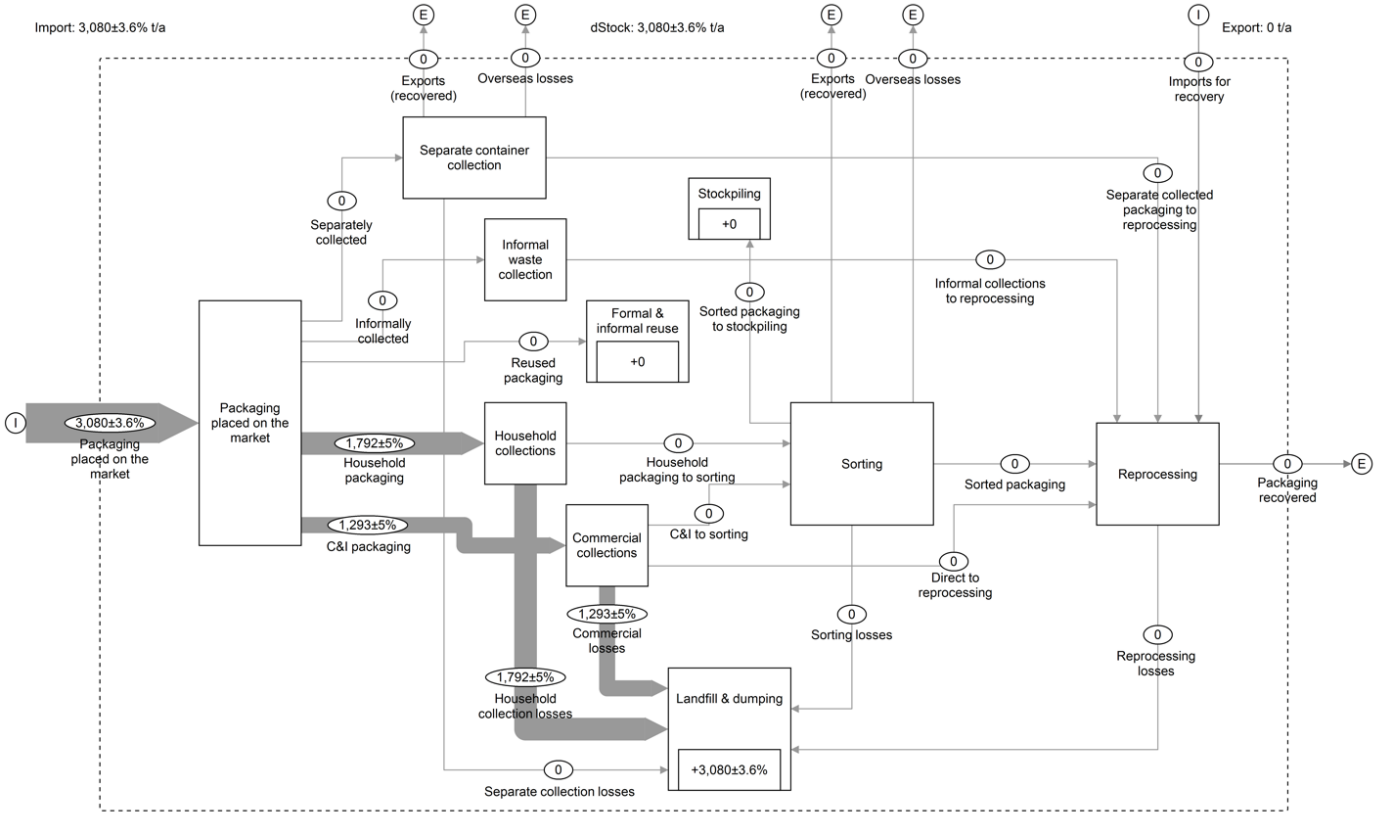
A5.3 Solomon Islands



A5.4 Tonga


Import: 2,090±5.3% t/a
dStock: 2,090±5.3% t/a
Export: 0 t/a
Exports (recovered)
Overseas losses
Exports (recovered)
Overseas losses
Imports for recovery
Separate container collection
Separately collected
Informal waste collection
Stockpiling
+0
Separate collected packaging to reprocessing
Informal collections to reprocessing
Informally collected
Formal & informal reuse
+0
Sorted packaging to stockpiling
Reused packaging
2,090±5.3%
Packaging placed on the market
Packaging placed on the market
1,207±7.5%
Household packaging
Household collections
Household packaging to sorting
Sorting
Sorted packaging
Reprocessing
Packaging recovered
886±7.2%
C&I packaging
Commercial collections
C&I to sorting
Direct to reprocessing
886±7.2%
Commercial losses
Sorting losses
Reprocessing losses
1,207±7.5%
Household collection losses
Landfill & dumping
+2,090±5.3%
Separate collection losses

A5.5 Vanuatu


Import: 3,080±3.6% t/a
dStock: 3,080±3.6% t/a
Export: 0 t/a
Exports (recovered)
Overseas losses
Exports (recovered)
Overseas losses
Imports for recovery
Separate container collection
Separately collected
Informal waste collection
Stockpiling
+0
Separate collected packaging to reprocessing
Informal collections to reprocessing
Informally collected
Formal & informal reuse
+0
Sorted packaging to stockpiling
Reused packaging
3,080±3.6%
Packaging placed on the market
Packaging placed on the market
1,792±5%
Household packaging
Household collections
Household packaging to sorting
Sorting
Sorted packaging
Reprocessing
Packaging recovered
1,293±5%
C&I packaging
Commercial collections
C&I to sorting
Direct to reprocessing
1,293±5%
Commercial losses
Sorting losses
Reprocessing losses
1,792±5%
Household collection losses
Landfill & dumping
+3,080±3.6%
Separate collection losses

A6. Scenario analysis results

A6.1. Business-as-usual, 2026-27 (Scenario 1)

Table A8 and Table A9 show quantities of estimated plastic packaging recovery for Scenario 2 by ANZPAC country on a material type and format basis. Note that collection and recovery system assumptions are consistent with the 2019-20 system for this scenario, therefore recovery rates are the same as those presented for 2019-20. Overall, a projected 238,100 tonnes of plastic packaging recovery were estimated for 2026-27—an increase of approximately 10%, consistent with projected increases in plastic packaging placed on the market compared to 2019-20.

Packaging collection and recovery system assumptions are consistent between considered the business as usual (BAU) case, which the other scenarios are compared to.

Table A8 – Estimated quantities of plastic packaging recovered in 2026-27 by ANZPAC region and material for Scenario 1

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
PET	61,200	21,900	0	0	0	0	0	83,100
HDPE	62,900	13,400	0	0	0	0	0	76,300
PP	22,100	100	0	0	0	0	0	22,200
PS	4,800	300	0	0	0	0	0	5,100
EPS	4,800	400	0	0	0	0	0	5,200
PVC	2,100	100	No PVC placed on the market					2,200
LDPE	15,700	1,900	0	0	0	0	0	17,500
Other	23,800	2,800	0	0	0	0	0	26,500
Total	**197,200**	**40,800**	**0**	**0**	**0**	**0**	**0**	**238,100**

Table A9 – Estimated quantities of plastic packaging recovered in 2026-27 by ANZPAC region and packaging format for Scenario 1

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Bottles	114,400	22,600	0	0	0	0	0	137,200
Other rigid	60,900	16,300	0	0	0	0	0	77,100
All rigid	175,100	38,900	0	0	0	0	0	214,300
Small flexible	14,600	600	0	0	0	0	0	15,300
Large flexible	7,300	1,400	0	0	0	0	0	8,600
All flexible	22,000	2,000	0	0	0	0	0	24,200

Scenario 1 plastic packaging collection and recovery system assumptions are consistent with the 2019-20 system, and is considered the business as usual (BAU) case. Performance for Scenarios 2 to 5 are compared with BAU, to understand the impact of system intervention on baseline 2026-27 packaging flows.

A6.2. Standardised regional material bans, 2026-27 (Scenario 2)

Table A10 and Table A11 present further data on plastic packaging placed on the market for Scenario 2, broken down by material type, format and ANZPAC country. Impacts on overall quantities placed on the market from the material bans were greatest in the PICs. Solomon Islands in particular would see an approximately 23% reduction in quantities of plastic packaging PoM from the introduction of these material bans and substitutions.

Table A10 – Estimated plastic packaging placed on the market in 2026-27 by ANZPAC region and material type (Scenario 2)

Material	AUS		NZL		FJI		WSM		SLB		TON		VUT		Total	
PET	145,600	(3%)	47,500	(1%)	4,500	(2%)	400	(1%)	1,700	(2%)	500	(2%)	1,000	(2%)	201,100	(2%)
HDPE	235,100	(2%)	29,900	(3%)	2,600	(4%)	500	(2%)	1,000	(4%)	300	(4%)	900	(4%)	270,300	(2%)
PP	271,000	(32%)	18,500	(27%)	1,400	(130%)	900	(21%)	900	(260%)	100	(130%)	400	(166%)	293,200	(32%)
PS	0	(-100%)	0	(-100%)	0	(-100%)	0	(-100%)	0	(-100%)	0	(-100%)	0	(-100%)	0	(-100%)
EPS	2,200	(-91%)	200	(-91%)	300	(-91%)	0	(-91%)	100	(-91%)	0	(-91%)	0	(-91%)	2800	(-100%)
PVC	0	(-100%)	0	(-100%)	No PVC placed on the market in BAU										0	(-100%)
LDPE	368,000	(-14%)	31,100	(-11%)	2,800	(-21%)	800	(-16%)	2,100	(-22%)	300	(-21%)	800	(-22%)	405,700	(-14%)
Other	263,500	(0%)	31,800	(0%)	6,100	(0%)	1,000	(0%)	1,200	(0%)	600	(0%)	400	(0%)	304,600	(0%)
Total	**1,140,900**	**(-8%)**	**151,400**	**(-4%)**	**169,00**	**(-19%)**	**3,200**	**(-14%)**	**6,300**	**(-23%)**	**1,800**	**(-19%)**	**3,100**	**(-15%)**	**1,323,500**	**(-8%)**

Table A11 – Estimated plastic packaging placed on the market in 2026-27 by ANZPAC region and packaging format (Scenario 2)

Material	AUS		NZL		FJI		WSM		SLB		TON		VUT		Total	
Bottles	303,600	(0%)	51,000	(0%)	5,600	(0%)	900	(0%)	2,100	(0%)	600	(0%)	1,400	(0%)	365,000	(0%)
Other rigid	362,200	(-10%)	49,500	(-7%)	5,600	(-37%)	1,500	(-20%)	2,100	(-37%)	600	(-37%)	800	(-29%)	422,400	(-11%)
All rigid	665,800	(-5%)	100,500	(-3%)	11,100	(-23%)	2,400	(-14%)	4,200	(-23%)	1,200	(-23%)	2,200	(-13%)	787,400	(-6%)
Small flexible	394,800	(-14%)	36,000	(-9%)	5,500	(-12%)	700	(-16%)	2,000	(-23%)	600	(-12%)	800	(-20%)	440,500	(-13%)
Large flexible	80,200	(0%)	14,900	(0%)	300	(0%)	0	(0%)	100	(0%)	0	(0%)	100	(0%)	95,600	(0%)
All flexible	475,000	(-12%)	50,900	(-7%)	5,800	(-12%)	800	(-16%)	2,100	(-22%)	600	(-12%)	900	(-19%)	536,100	(-11%)

Table A12 and Table A13 summarise projected plastic packaging recovery rates for Scenario 2. An estimated 226,100 tonnes of plastic packaging are expected to be recovered in this scenario. Although this quantity is smaller than BAU in absolute terms, comparison of overall recovery rates shows a relative increase for Scenario 2 of 3% compared to BAU, due to overall reduction of packaging PoM in this scenario.

On a material basis, overall PET, HDPE and PP recovery rates are slightly lower in Scenario 2 compared to BAU. This is because the proportion of non-bottle format types, which have a lower recovery rate compared to bottles, increase in Scenario 2 due to substitution of PVC and PS packaging. This highlights that packaging format recovery rates should be considered when identifying packaging type substitutions in response to material bans to optimise recovery.

This scenario ultimately illustrates how changing the composition of the packaging stream, via material bans and substitutions, may impact on the recovery system. The largest impacts from material bans are seen in the substitution of plastic packaging formats with paper (or other non-plastic) materials, which reduces the use of plastic packaging types which typically have poorer recyclability.

Table A12: Estimated plastic packaging recovery rates in 2026-27 by ANZPAC region and material for Scenario 2

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
PET	42.4%	46.3%	0.2%	3.2%	0.0%	0.0%	0.0%	41.7%
HDPE	27.0%	46.1%	0.3%	0.0%	0.0%	0.0%	0.0%	28.6%
PP	9.0%	1.4%	0.0%	0.0%	0.0%	0.0%	0.0%	8.4%
PS	No PS packaging placed on the market							
EPS	19.2%	16.1%	0.0%	0.0%	0.0%	0.0%	0.0%	16.0%
PVC	No PVC packaging placed on the market							
LDPE	5.3%	6.9%	0.6%	0.0%	0.0%	0.0%	0.0%	5.3%
Other	9.0%	8.7%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%
Total	**16.3%**	**26.7%**	**0.2%**	**0.4%**	**0.0%**	**0.0%**	**0.0%**	**17.1%**

Table A13: Estimated plastic packaging recovery rates in 2026-27 by ANZPAC region and packaging format for Scenario 2

Formats	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Bottles	38.1%	44.9%	0.3%	1.3%	0%	0%	0%	38%
Other rigid	13.7%	31.7%	0%	0%	0%	0%	0%	15.4%
All rigid	24.8%	38.4%	0.2%	0.5%	0%	0%	0%	25.9%
Small flexible	3.3%	1.5%	0%	0%	0%	0%	0%	3.1%
Large flexible	9.1%	9.1%	4.8%	0%	0%	0%	0%	9%
All flexible	4.3%	3.7%	0.2%	0%	0%	0%	0%	4.1%

A6.3. Container deposit scheme implementation across ANZPAC region, 2026-27 (Scenario 3)

Table A14 and Table A15 summarise estimated recovery rates by material type and format for each country. An estimated 245,900 tonnes of plastic packaging were recovered for Scenario 3—an increase of approximately 3% compared to BAU. This increase in recovery is attributed to the additional collection and recovery of PET and HDPE bottles via expansion of CDS schemes across ANZPAC. Therefore, Scenario 3 does not impact on other rigid or flexible packaging recovery. The overall impact of CDS expansion on bottle packaging is approximately 32,400 tonnes, which could be improved further through increasing the redemption rates of current CDS eligible packaging. This could be achieved through a greater number of CDS drop-off locations, improved incentives, and through greater consumer awareness. The overall impact of CDS rollout on ANZPAC recovery rates however is not large. This can be attributed to bottles making up only 25% of total plastic packaging.

Table A14: Estimated plastic packaging recovery rates in 2026-27 by ANZPAC region and material for Scenario 3

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
PET	43.1%	59.9%	18.2%	21.4%	17.9%	18%	18.1%	46.1%
HDPE	27.4%	46.6%	0.8%	0.6%	0.6%	0.6%	0.6%	29%
PP	10.7%	0.9%	0%	0%	0%	0%	0%	10%
PS	25.5%	21.3%	0%	0%	0%	0%	0%	23.5%
EPS	19.2%	16.1%	0%	0%	0%	0%	0%	16%
PVC	42.1%	10.5%	No PVC placed on the market					37.4%
LDPE	4.5%	6%	0.4%	0%	0%	0%	0%	4.5%
Other	9%	8.7%	0%	0%	0%	0%	0%	8.7%
Total	15.9%	29.9%	4%	2.1%	3.7%	3.9%	4.7%	17.1%

Table A15: Estimated plastic packaging recovery rates in 2026-27 by ANZPAC region and packaging format for Scenario 3

Formats	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Bottles	38.1%	57.6%	15%	9.1%	14.5%	14.7%	12.5%	40.2%
Other rigid	15.1%	30.5%	0%	0%	0%	0%	0%	16.3%
All rigid	24.9%	43.7%	5.8%	2.8%	5.4%	5.6%	6.8%	26.6%
Small flexible	3.2%	1.6%	0%	0%	0%	0%	0%	3%
Large flexible	9.1%	9.1%	4.8%	0%	0%	0%	0%	9%
All flexible	4.1%	3.6%	0.2%	0%	0%	0%	0%	4%

A6.4. Advanced recycling for soft plastics, 2026-27 (Scenario 4)

To model the collection of soft plastics for these recovery processes, collection rates for rigid plastic were used. These were calculated for each country and material where recovery systems existed in the Blue Environment (2022) data and are summarised in Table A16. Collection rates in the PICs are low, where recycling systems are not widespread. Collection rates for soft plastics in Australia and New Zealand are significantly higher than in BAU, reflecting the higher levels of collection for rigid packaging compared to soft plastics in those countries.

Table A16: Soft plastic collection rates, as a proportion of PoM for BAU (Scenario 1) and Scenario 4

Country	Soft plastics PoM (2026-27)	BAU soft plastics collection rate	Scenario 4 soft plastic collection rate
AUS	537,400	4.9%	15.7%
NZL	54,700	4.3%	14.4%
FJI	6,500	0.2%	1.3%
WSM	900	0%	2.8%
SLB	2,600	0%	2.0%
TON	700	0%	1.1%
VUT	1,100	0%	1.1%
ANZPAC	604,000	4.8%	15.3%

Table A17 and Table A18 summarise estimated recovery rates by material type and format. The total recovery rate is estimated to be approximately 20% of plastic packaging placed on the market in this scenario—an increase of approximately 4%-percentage points compared to BAU. Soft plastic recovery increased from 4% in BAU, to 13% in Scenario 4. Overall, approximately 77,300 tonnes of soft plastics were recovered in this scenario—an increase of 53,200 tonnes compared to baseline.

Overall, recovery rate performance improved compared to baseline by approximately 20% for all of ANZPAC, indicating that advanced soft plastics recycling could be significant towards meeting ANZPAC Target 3. While optimistic, this scenario shows the potential recoverable quantities of soft plastics, if collection rates similar to rigid packaging could be achieved for soft plastics, and if recovery rates could achieve those of pyrolysis systems internationally.

Table A17: Estimated plastic packaging recovery rates in 2026-27 by ANZPAC region and material for Scenario 4

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
PET	43.1%	46.5%	0.2%	3.3%	0%	0%	0%	42.2%
HDPE	27.4%	46%	0.3%	0%	0%	0%	0%	28.9%
PP	15.5%	4.8%	0%	0.9%	0%	0%	0%	14.7%
PS	25.5%	21.3%	0%	0%	0%	0%	0%	23.5%
EPS	19.2%	16.1%	0%	0%	0%	0%	0%	16%
PVC	42.1%	10.5%	No PVC placed on the market					37.4%
LDPE	15.4%	19.7%	2%	2.2%	1.6%	1.6%	1%	15.5%
Other	9%	8.7%	0%	0%	0%	0%	0%	8.7%
Total	19.8%	28.8%	0.4%	0.9%	0.5%	0.3%	0.3%	20.3%

Table A18: Estimated plastic packaging recovery rates in 2026-27 by ANZPAC region and packaging format for Scenario 4

Formats	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Bottles	38.1%	44.9%	0.3%	1.3%	0%	0%	0%	38%
Other rigid	15.1%	30.5%	0%	0%	0%	0%	0%	16.3%
All rigid	24.9%	37.5%	0.1%	0.4%	0%	0%	0%	25.7%
Small flexible	11.9%	8.6%	0.9%	2.3%	1.6%	0.9%	0.9%	11.4%
Large flexible	20%	22.8%	6.4%	2.2%	1.6%	1.6%	1%	20.4%
All flexible	13.1%	12.5%	1.1%	2.3%	1.6%	0.9%	0.9%	12.8%

A6.5. Combined scenario, 2026-27 (Scenario 5)

Table A19 and Table A20 summarises projected recovery rates for Scenario 5. Note that quantities of plastic packaging placed on the market in Scenario 5 are consistent with those estimated in Scenario 2, on account of material bans which are also assumed for Scenario 5. Total plastic packaging recovery in 2026-27 under this scenario was estimated as 21.2%, which is an increase of 4.6% points compared to BAU (Scenario 1). Total recovered quantities were estimated at approximately 280,200 tonnes. In this scenario, soft plastics recovery represented 25% of all recovery, increasing from 10% of all recovery in BAU.

Table A19: Estimated plastic packaging recovery rates in 2026-27 by ANZPAC region and material for Scenario 5

Material	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
PET	42.0%	59.3%	18.0%	21.1%	17.6%	17.7%	17.7%	45.1%
HDPE	26.7%	48.3%	0.8%	0.6%	0.5%	0.5%	0.5%	28.6%
PP	15.6%	7.8%	1.0%	1.2%	1.3%	1.0%	0.7%	14.9%
PS	No PS packaging placed on the market							
EPS	19.2%	16.1%	0.0%	0.0%	0.0%	0.0%	0.0%	16.0%
PVC	No PVC packaging placed on the market							
LDPE	16.3%	20.7%	2.3%	2.2%	1.6%	1.6%	1.0%	16.4%
Other	9.0%	8.7%	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%
Total	**19.9%**	**34.2%**	**5.3%**	**3.1%**	**5.3%**	**5.1%**	**5.8%**	**21.2%**

Table A20: Estimated plastic packaging recovery rates in 2026-27 by ANZPAC region and packaging format for Scenario 5

Formats	AUS	NZL	FJI	WSM	SLB	TON	VUT	Total
Bottles	37.7%	57.0%	15.0%	9.1%	14.5%	14.7%	12.5%	39.7%
Other rigid	13.7%	33.1%	0.0%	0.0%	0.0%	0.0%	0.0%	15.6%
All rigid	24.6%	45.2%	7.5%	3.3%	7.1%	7.3%	7.8%	26.8%
Small flexible	11.8%	8.0%	0.8%	2.4%	1.7%	0.8%	0.9%	11.3%
Large flexible	20.1%	22.9%	6.5%	2.2%	1.6%	1.6%	1.0%	20.5%
All flexible	13.2%	12.4%	1.1%	2.4%	1.7%	0.8%	0.9%	12.9%

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