



PLASTIC WASTE FREE ISLANDS

GRENADA

BUSINESS PLAN

WASTE-TO-PRODUCT



An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



Norad



ACKNOWLEDGMENTS

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AUTHORSHIP

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Implementing Agency



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WASTE-TO-PRODUCT

BUSINESS PLAN

PLASTIC WASTE FREE ISLANDS



The **Plastic Waste Free Islands (PWFI) Project** is part of the *Close the Plastic Tap* Program of IUCN. PWFI is a three-year project working in six islands in the Caribbean and Pacific.

Implemented in Fiji, Vanuatu and Samoa in Oceania and Antigua and Barbuda, Saint Lucia and Grenada in the Caribbean, the project seeks to promote island circular economy and to demonstrate effective, quantifiable solutions to addressing plastic leakage from Small Island Developing States (SIDS).

This business plan focusses on the “**Waste-to-product**” solution, in the geographic context of Grenada. It demonstrates how the solution can be realized, allowing for the creation of an alternative value chain.

MISSION

WHAT & WHY

What

- A successful business in Furniture and semi-finished products
 - Made from recycled plastic
 - Locally sourced and locally produced

Why

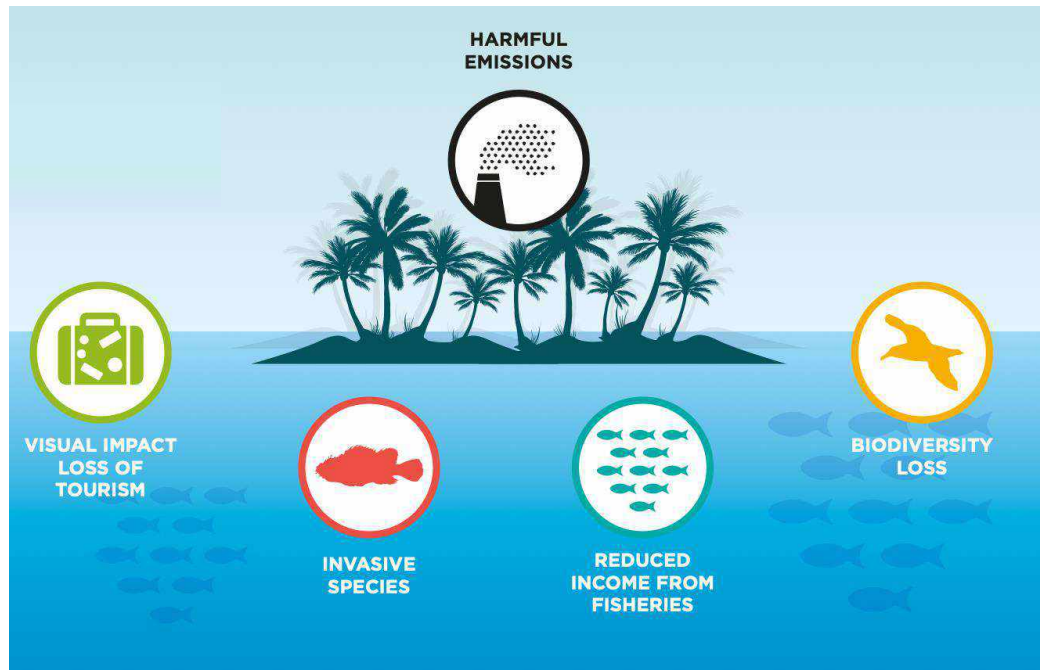
- Local business opportunity
 - Reduce Import-dependency
 - Enhance resource recovery options on-island
 - Job creation
- Reduce overfull landfills and high plastic leakage prevalence
 - Improved waste management
 - Lower environmental impact



WHY START THIS BUSINESS

PLASTIC WASTE GENERATION & LEAKAGE

Plastic Waste Generation: The total amount of plastic waste that is produced on an annual basis, per plastic material type



Financial and environmental impacts of plastic leakage

Plastic Waste Leakage: The amount of unaccounted waste that is calculated by the difference of plastic material imported and plastic waste disposed.

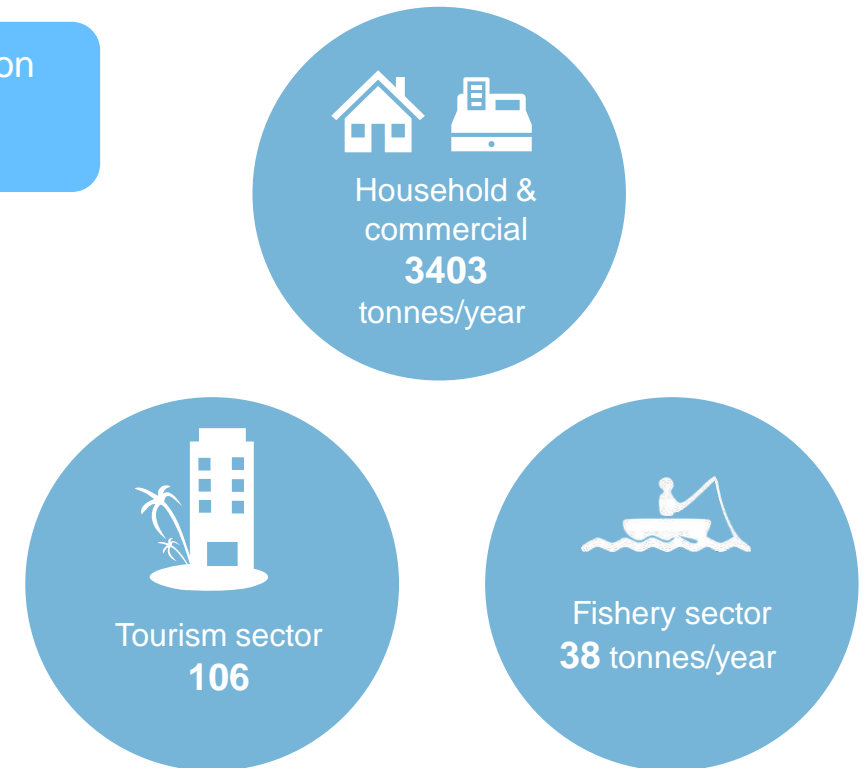
Polymer	Annual Imports 2018–2019 (T/y)	Total waste disposed 2019 (T/y)	Total recycled 2019 (T/y)	Leakage (T/y) – model-based estimate (95% credible interval)
PET (1)	1191.19	1023.66	0.8	168 (0.2–463)
HDPE (2)	1011.9	823.18	0.2	188 (0.6–471)
PVC (3)	37.53	15.42	0	22 (0.7–36)
LDPE (4)	732.66	549.02	0.2	186 (2.0–425)
PP (5)	419.77	242.11	0	178 (0.1–310)
PS (6)	343.28	135.02	0	210 (1–305)
Other (7)	1001.46	662.1	0	342 (78–727)
Overall	4737.78	3450.52	1.2	1294 (739–1910)

National plastic waste generation & leakage data Grenada, with polyolefins in blue.
Source: Final quantification report – Executive summary APWC July 2021

CONTEXTUAL ANALYSIS OF WASTE MANAGEMENT PRACTICES

The contextual analysis of waste management practices summarizes the current situation of waste management in Grenada. It evaluates actions like collection, sorting and recycling, as well as future ambitions.

- ❖ No central collection at source or segregation at landfill, no local plastics recyclers → landfill, or leakage
 - Except for PET → small scale collection for stockpiling and conversion into blocks and plant pots
 - Large volumes of rigid HDPE, PP and flexible LDPE waste that could be diverted quite easily from landfill
- ❖ National ambitions/initiatives/pipeline:
 - NSUPA: plastic recovery and recycling program to granulate recycled plastics in Carriacou
 - GSWMA anti-litter campaigns
 - GSWAMA environmentally friendly school initiative
 - PWF1 - Waste-to-product & Net-to-net recycling



3547 tonnes plastic waste generated/year

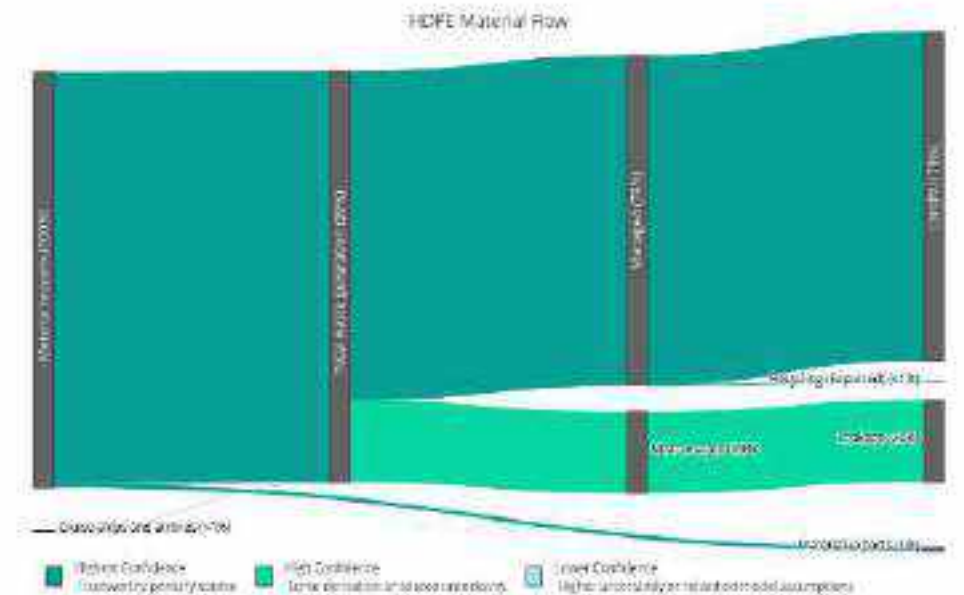
Source: Quantification report, Executive summary, APWC July 2021

TARGETED MATERIAL(S)

HDPE – CURRENT VALUE CHAIN

Class	Plastic Item	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (T/y)	Column 1	Total
HDPE 2	laundry detergents bottles hdpe	28.0	0.0		0.0		28.0
HDPE 2	beverage containers pvc hdpe	10.0	0.0		0.0		10.0
HDPE 2	beauty and personal care hdpe	18.2	0.0		0.2		18.4
HDPE 2	shampoo body wash hdpe	48.0	0.0		0.0		48.0
HDPE 2	light shopping plastic bags single use	290.2	0.0		0.0		290.2
HDPE 2	other hdpe	40.9	107.0		2.4		150.2
HDPE 2	home care hdpe	55.4	0.0		0.0		55.4
HDPE 2	garbage bags single use	6.6	0.0		0.0		6.6
HDPE 2	food containers hdpe	17.7	111.0		0.0		128.7
HDPE 2	cleaning agent products hdpe	57.5	29.5		7.4		94.4
							830.0

High-density Polyethylene (HDPE): A thermoplastic polymer used in a wide variety of applications, e.g. shampoo bottles and milk containers. HDPE is easily recyclable.



Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

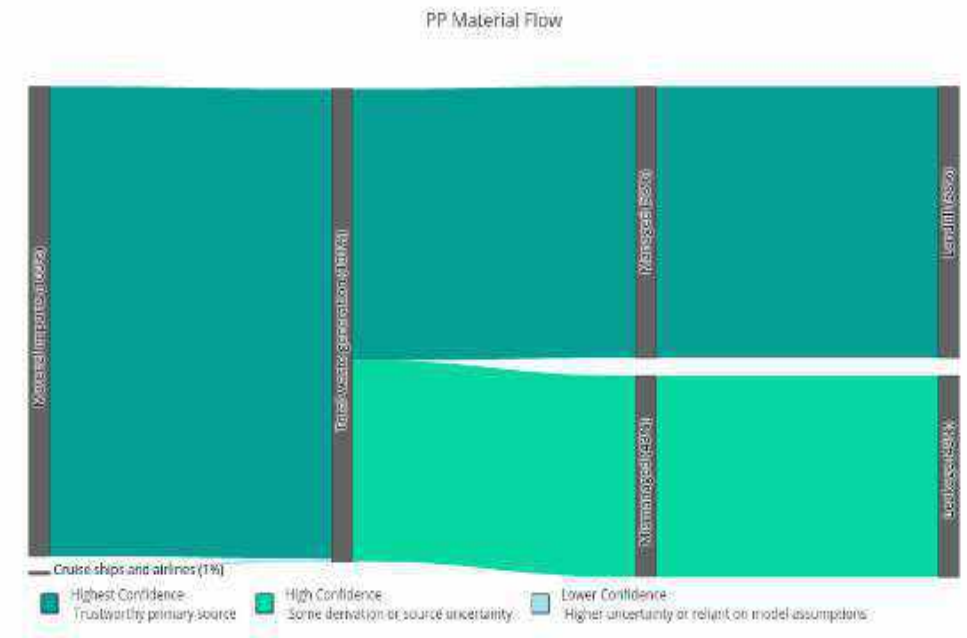
TARGETED MATERIAL(S)

PP – CURRENT VALUE CHAIN

Class	Item	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (T/y)	Total (T/y)
PP 5	straws single use	3.6	0.0		0.0	3.6
PP 5	food containers pp	15.0	2.5		0.2	17.7
PP 5	food semi rigid containers e.g. trays pp	7.3	13.4		0.0	20.7
PP 5	container lids pp	104.7	54.1		0.9	159.6
PP 5	other pp	16.1	0.0		0.0	16.1
PP 5	furniture houseware pp	1.1	0.0		0.0	1.1
PP 5	medicine bottles pp	0.9	0.0		0.0	0.9
PP 5	rope pp	3.8	0.0		0.9	4.7
PP 5	glossy shopping bags single use plastics	5.6	0.0		0.0	5.6
PP 5	single use take away food containers pp single use	9.6	2.8		0.1	12.5
						242.6

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Polypropylene (PP): A thermoplastic polymer used in a variety of applications. PP is sturdy can be used in a flexible or rigid form. PP can potentially be recycled.



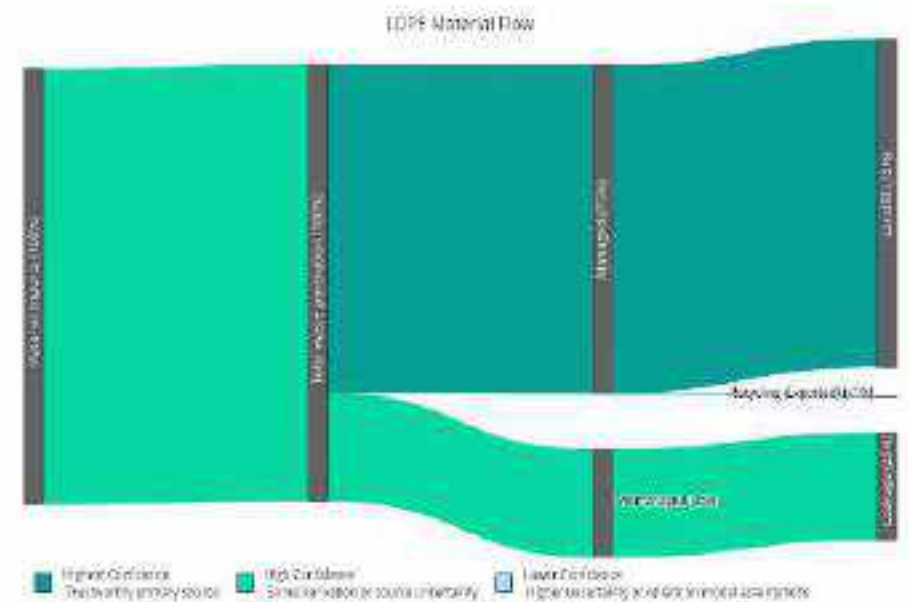
TARGETED MATERIAL(S)

LDPE – CURRENT VALUE CHAIN

Class	Item	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (T/y)	Total (T/y)
LDPE 4	other ldpe	5.9	0.0		0.0	5.9
LDPE 4	wrap foils cling films ldpe	0.0	48.0		0.0	48.0
LDPE 4	bubble wraps foils ldpe	3.6	19.7		0.0	23.3
LDPE 4	food containers ldpe	24.8	0.0		0.0	24.8
LDPE 4	soft plastic packaging single use plastics	263.1	90.3		0.2	353.5
LDPE 4	glossy shopping bags single use plastics	93.5	0.0		0.0	93.5
						549.0

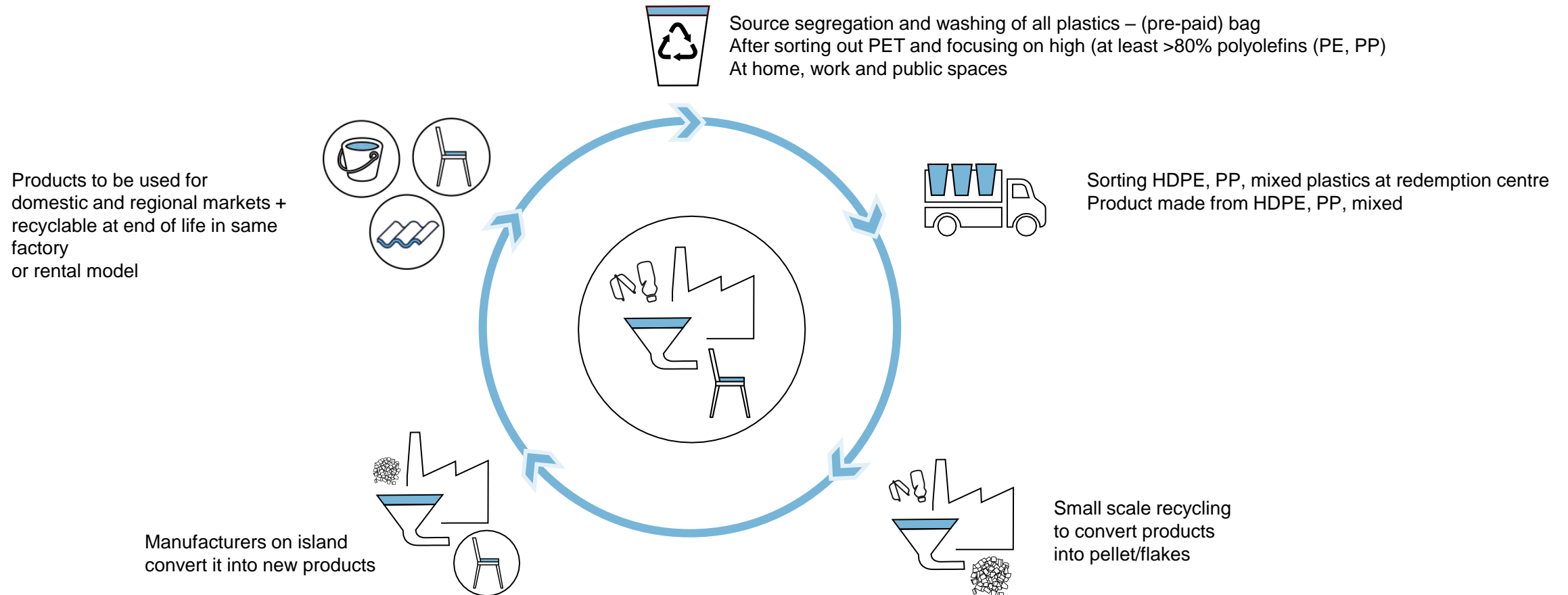
Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Low-density Polyethylene (LDPE): A thermoplastic polymer, which is a soft, flexible, lightweight plastic material, oftentimes used for plastic bags. LDPE is



OUTLINE WASTE TO PRODUCT

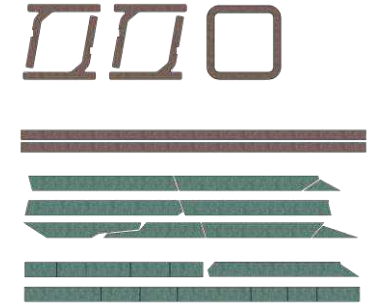
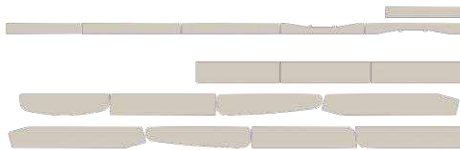
ALTERNATIVE VALUE CHAIN



PRODUCT CONCEPT

MIXED EXTRUSION PRODUCTS

- Beams, planks, tiles and parts (semi-finished product)
- Outdoor public and private furniture (end product)
- Example Prototypes:
 - Park bench (mainly polyolefins)
 - Dimensions: L650 x W1520 x H825 mm
 - Weight: 75 kg
 - Intended use: Garden, park, wharf, public space (outdoor)
 - Trash tree / trash nest (mixed plastics)
 - Dimensions: L1280 x W1320 x H1545 mm
 - Weight: 43 kg
 - Intended use: public space (central collection points (outdoor))
 - Lounge chair (recycled HDPE)
 - Dimensions: L 805 x W 733 x H 729 mm
 - Weight: 14 kg
 - Intended use: garden, park, wharf, public space (outdoor)



- Other potential products
 - Lumber/timber, planks, posts
 - Purlin, rubbing styles
 - Street furniture, benches, picnic tables
 - Decking, cladding, siding
 - Fencing, bollards, palisade, edging
 - Shed foundation blocks, water side sheeting
 - Bridges, wharfs
 - Signage, litter bins, planters, raised waste platforms
 - Pergola, doghouse
 - Garden, patio, terrace furniture
 - Exercise equipment
 - Traffic control: Wheel stops, speed humps, and rumble bars



USER SCENARIOS

Furniture



- Modular, repairable
- Produced locally
- Weather & climate-proof
- Comfortable
- Durable



UNIQUE SELLING POINTS

SUSTAINABLE & DURABLE

Technology

- **Producibility:** can process flakes directly so no high machine investments needed
- **Scalability:** Semi-finished products can be stored, and once machines reach their maximum capacity, an extra machine can be added
- **Risk & compliance:** Quality performance, with health and safety compliant setup

Product performance

- **Sustainability – longer life:** material vs wood based sheet
 - Lifespan: 40+ years r-plastic lumber vs 20 years hardwood
- **Sustainability:** green image – local waste converted
- **Sustainability:** easily repaired / parts replaced / recyclable
 - Recyclable: r-plastic sheets 7x recyclable
- **Superior performance:** weather proof / termite proof / UV-resistant
- **Convenience:** easily cleaned
- **Superior Design:** high end product/ distinctive design / high quality surface finish

Market

- **Marketability:** Completely circular product
- **Marketability:** Different furniture for different markets; tourism (i.e. hotels, restaurants), public (schools), private
- **Marketability:** Locally made vs imported
- **Flexibility:** Semi-finished products which can be sold directly or made into different end products with existing wood working techniques

DIFFERENTIATION FROM COMPETITION

CHEAP furniture, timber,



Cheap plastic furniture



Hardwood lumber / timber



Fencing



Lounge furniture



Street furniture



Park/picnic furniture

- More durable and longer lasting than cheap plastic import patio chairs
- High-end design
- Lasting look
- Easy repair with local service and parts from producer
- Added sustainable image value

CONCEPT DESCRIPTION

MIXED PLASTIC EXTRUSION BASED

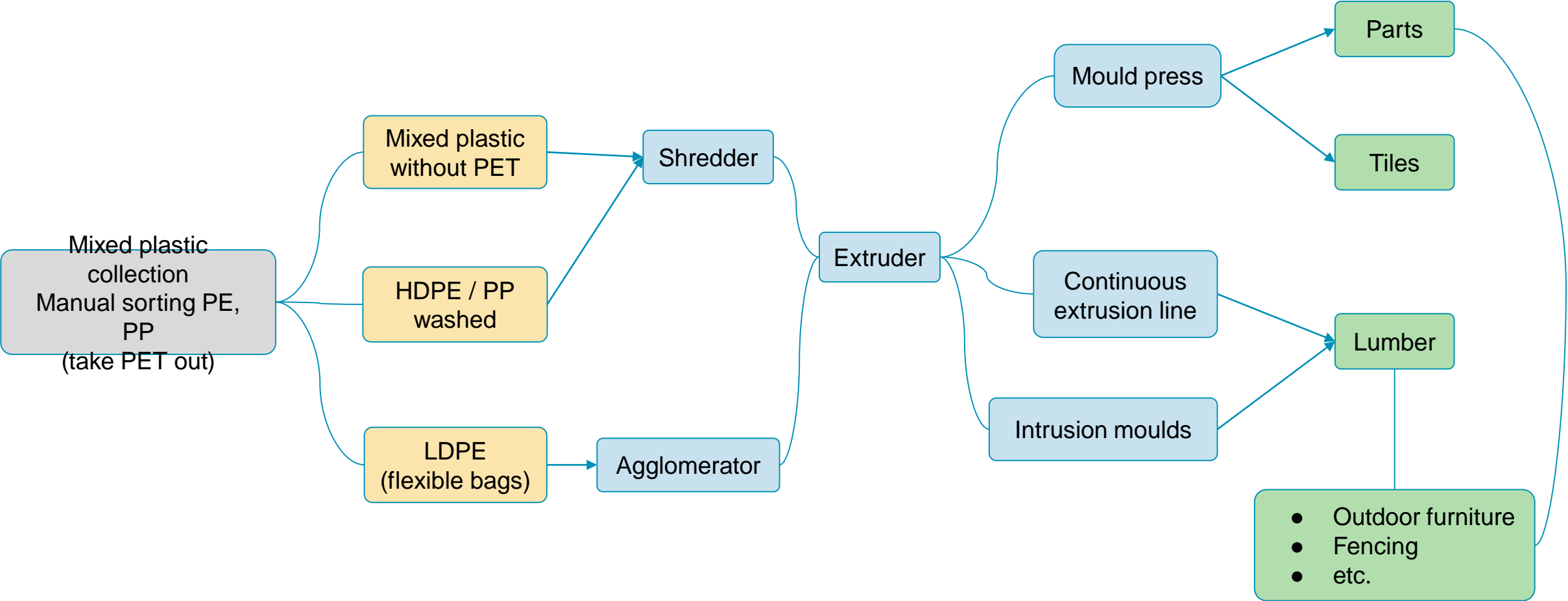
Technique: Extrusion based (setup around extruder) + add-on moulding options

- Machines: shredder and/or agglomerator, extruder, press + molds, intrusion moulds, or continuous extrusion line
- Woodworking equipment: Saw table / crosscut saw, mill, hand tools.
- Types of plastic converted:
 - High-end product: HDPE sorted & washed
 - Lower-end product: Mixed unwashed plastics with >70% PE/PP
- Amount of plastics used: e.g. 8.53 kg per 40x80x2800 beam, or 4.59 kg per 18x130x2800mm HDPE plank, or 75 kg per Bench
- Source of input materials: Collection of HDPE, PP, LDPE or all mixed plastics
 - through (pre-paid) bag with all plastics collection and after sorting
 - Island wide stimulation through Advanced Recovery Fee scheme / Container deposit Legislation (CDL)
- Impact: up to 150t/y = 12% of total PE/PP stream, 6.33% of total plastic generated



EXTRUSION BASED

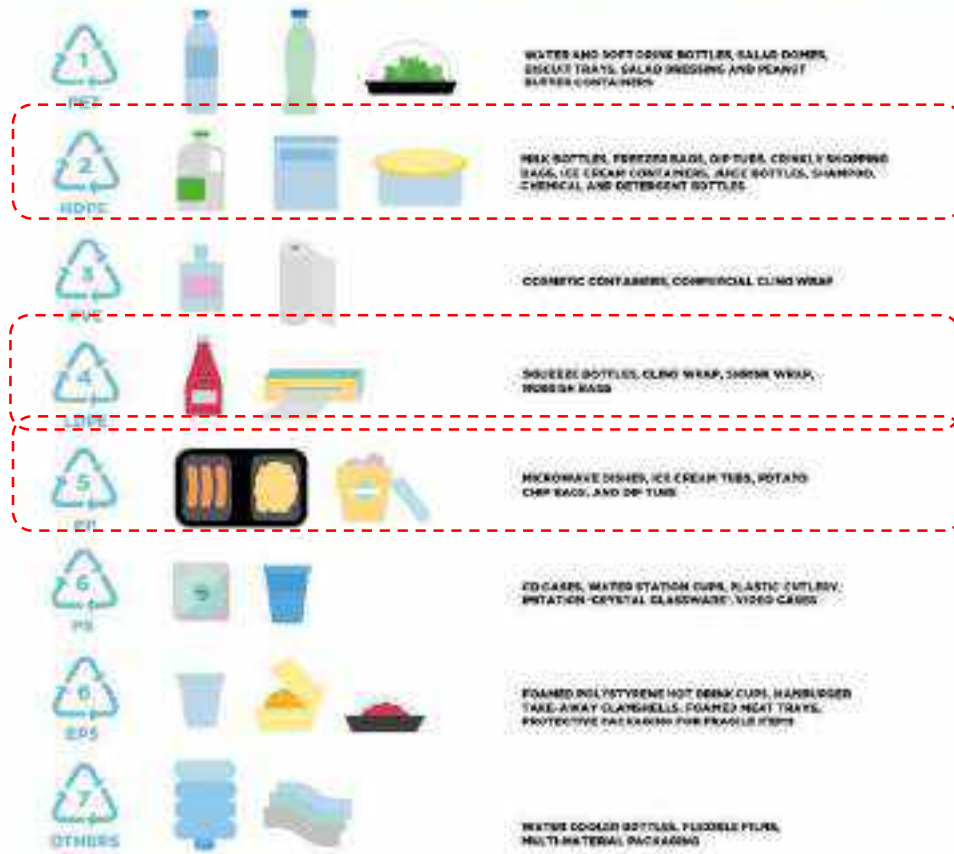
RECYCLING PROCESS



COLLECTION AND SORTING

IDENTIFYING

FIGURE 2: MAIN PLASTIC RESIN TYPES AND THEIR APPLICATIONS IN PACKAGING



Source: Project HornStream analysis.

Plastics have different properties
The focus in this business plan lays on:

- HDPE, PP and LDPE for their melting properties & easiness to recycle
- Slide 6-8 give an overview of what kind of applications are typically made of the targeted materials in the local context



COLLECTION AND SORTING

COLLECTION

Drop off points

- E.g. schools, supermarkets, public buildings, or resorts
- Incentives for consumers to sort and return plastic products
 - E.g. Discounts on end product
- Educational programmes and awareness campaign

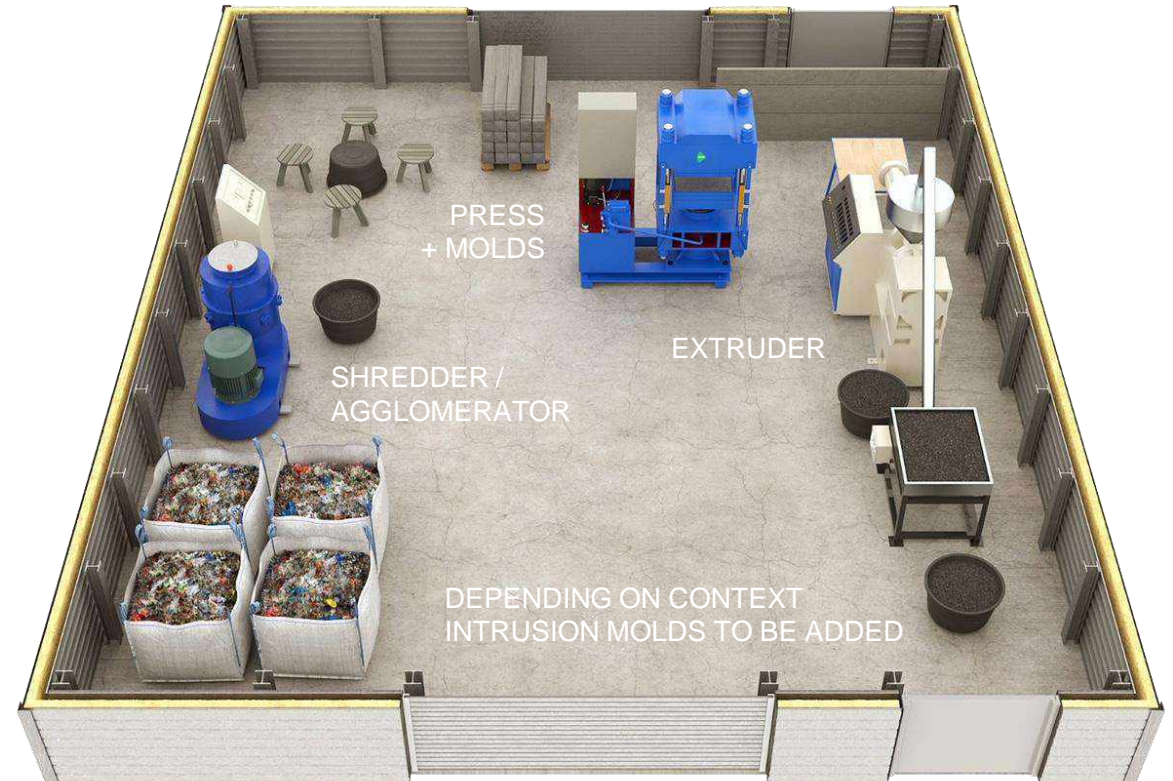
Collaboration with existing waste management structures is crucial

- E.g. partnership with municipal solid waste management
- Collaboration with ministries and government



MACHINERY

Machines	USD 49.000	
Shredder, 5 kW	USD 5.000	
Optional: shredder with washer		At a capacity of 250 kg/h 80kW is needed and will cost around 30.000 USD
Agglomerator	USD 5.000	
Extruder, 35 kW	USD 15.000	Spare parts like heating element and screw removal tool included
Intrusion moulds, on cart system	USD 10.000	
Press, 3 kW	USD 7.000	
Two moulds	USD 7.500	Mould costs are estimated because they depend on product design, and related production method (mill/laser/waterjet)
Optional: For 220V3P or 440V3P there will be extra costs (estimate) USD 2.00		Standard voltage of the machines is 380V, 50 or 60Hz.
Shipping (CIF) estimate	USD 14.000	Shipping cost are hard to predict due to fluctuations from china. Shipping costs of moulds not included; depends on local or remote production
Support at distance by Technical partner (3 years)	USD 10.000	
Detailed machine specification		
Support RFQ process		
Verification Factory acceptance test (FAT)		
Mould drawings		
Remote support for setting up facilities incl. unpacking and installing equipment		
Remote training and support machines start up		
Provide manuals, maintenance and user instructions		
Support on input mix and additives		
Total	USD 73.500	



Modular production hall layout example

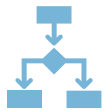
SELECTION FACTORS

TECHNIQUE AND PRODUCT



Impact

- (semi-) Industrial set-up and machinery to
 - Convert enough plastic to keep from landfill and (ocean) leakage
 - Get quality output that can compete with existing products
 - Create durable business
 - Create local employment



Flexibility

- Create different (mix of) semi-finished and end-products
- Create output material for different markets
- Enable sector-specific contribution to reduce waste
- Enable to convert different plastics



Viability

- Durable business plan / calculation
- Fitting the volumes on the island
- Ready for investors to step in
- Scalable: capacity aim is 150 tonnes / year



Complementarity to existing initiatives

- Utilizing local recycler's machinery, if compatible
- Tailor-made for local situation and market

TECHNOLOGY COMPARISON

MATRIX

This table provides a structured approach on how the recycling technology is selected. It is a general comparison example used for the technology selection, in which island specific factors have been considered.

PWFI - WASTE TO PRODUCT - TECHNOLOGY COMPARISON

Categories	Weighting factor	Sheet press	Intrusion	Mixed extrusion + moulding	Mould melting	Rotomoulding	Mixed extrusion additive	Injection moulding
Processing capacity - What volume of plastic can be converted (connect to volume on the island) small: < 20 tonnes / year Aim: medium: 20-500 tonnes / year large: > 500 tonnes / year in general the better the fit, high the score	3	★★★★●●	★★★★★	★★★★★	★★●●●●	★★★★●●	★★★★★●	★★★★●●
Marketability - Can the product compete with other products? - Will it replace a product for the better?	2	★★★★●●	★★★★★	★★★★★	★★●●●●	★★★★★	★★★★★	★★★★★
Costs - Investment to set up machinery - Energy consumption in use - Expected revenue	2	★★★★●●	★★★★●●	★★★★●●	★★★★★	★★●●●●	★★●●●●	★★●●●●
Environmental safety during / after use - Non-toxic risk during production - No leakage (microplastics) - Recyclable at EOL	2	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●
Ease of implementation - Preparation of the input material - less sorting - less influence of contamination - Complete and ready setup of the machinery - Low skill and easy learning	1	★★★★●●	★★★★★	★★★★●●	★★★★●●	★★●●●●	★★●●●●	★★●●●●
Product value - Product with long life-span - A high value end-product	1	★★★★●●	★★★★★	★★★★★	★★★★★	★★★★★	★★★★●●	★★★★●●
Overall score		★★★☆☆	★★★★☆	★★★★☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆

MARKET ANALYSIS

HOSPITALITY

Primary market

- Tourism - Hospitality Outdoor furniture and Construction, i.e. dinner chairs, fencing, plastic lumber

Secondary markets

- B2C: High-end consumer design furniture has similar product characteristics and demands (overlap villas and apartments)
- B2B: semi-finished products, i.e. Timber, lumber, Sheets for furniture makers. i.e. countertop
- Public: governmental, school furniture
- Public works, Infrastructure + construction: governmental, public furniture, e.g. park bench, picnic table, signage, fencing

Market size hospitality furniture

- 130+ hotels, resort, with 3222 apartments and rooms

Estimated annual expenditure on furniture

- USD 225,540 (3222 rooms and accommodations with a average spending of \$70/year/room on outdoor furniture)

Global expected CAGR (Compound Annual Growth Rate) tourism after Covid-pandemic

- 3.1% (2021-2026)

Longer term market fundamentals

- Shorter supply chains decrease need for imports
- Less pressure on landfill

Demand-drivers

- Showing sustainable focus
- Longer lasting alternatives
- Locally produced

MARKET ANALYSIS

HOSPITALITY + B2B

Market segmentation

(sub target groups describing needs and wants)

- General needs
 - Durable furniture
 - Easy to maintain / keep looking new
 - Indoors and outdoors application
- Needs Hotels/resorts
 - Sustainable added marketing value
- Needs villas/apartments, consumers
 - High end design

Buying patterns

- Current yearly renew due to poor quality and extreme weather conditions (market research)

Locations of potential customers

- Mostly coastal area

Specify domestic vs export markets

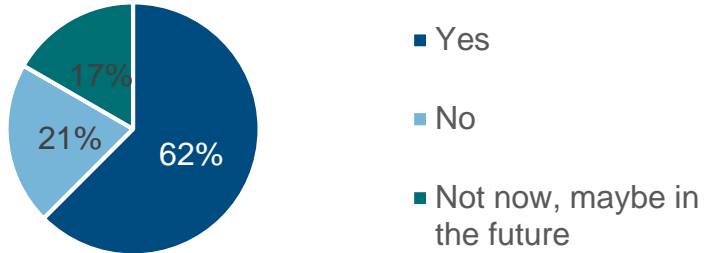
- Domestic: Local network of sub sellers (stores, DIY markets, furniture makers)
- Export potential:
 - Caribbean region with the options of expending for processing waste

Launching customers:

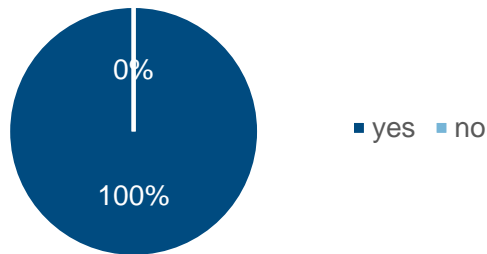
- Accommodations who collect material themselves
- Governmental bodies

BUSINESS DRIVERS

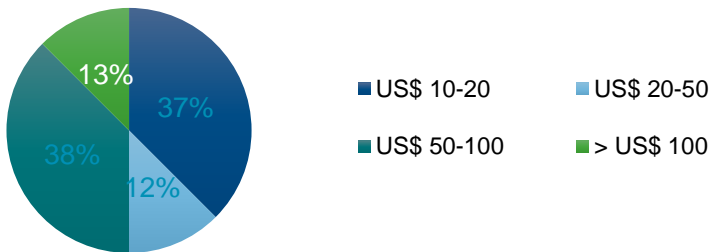
COMMERCIAL MARKET ANALYSIS TOURISM



62% willingness to purchase recycled plastic furniture made from own waste
+ 17% considering to purchase in the future



100% willingness to source-segregate recyclable plastics - place a separate bin for collecting HDPE/PP shampoo, body wash and detergent bottles at hotel/resort



Current budget for outdoor furniture (e.g. x1 plastic chair)?*

Saint Lucia survey results: 75% willingness to spend ±10% > average price

*This question was not part of the Grenada survey

BUSINESS DRIVERS

INDUSTRY SUPPORT – INNOVATION AWARDS

rHDPE dining chair made from Caribbean plastic waste streams:

shortlisted for the prestigious **Plastics Recycling Awards Europe 2021**

- Household and Leisure products category



MARKET INTRODUCTION PLAN

FROM FUNCTIONAL PROTOTYPE TO MARKET INTRODUCTION

Timeline for key milestones of product development

PHASE 1- has been completed

- Extrusion testing
- Feedstock preparations
- Product interest inventory
- Design concept for products
- Engineering
- Prototyping
 - assembly testing
 - impression and use testing
- Improving based on feedback

PHASE 2

- Securing finances; procurement of machinery; staff recruitment

PHASE 3

- Production testing
- Production procedures development
- Packaging development
- Commercial production based on staged approach

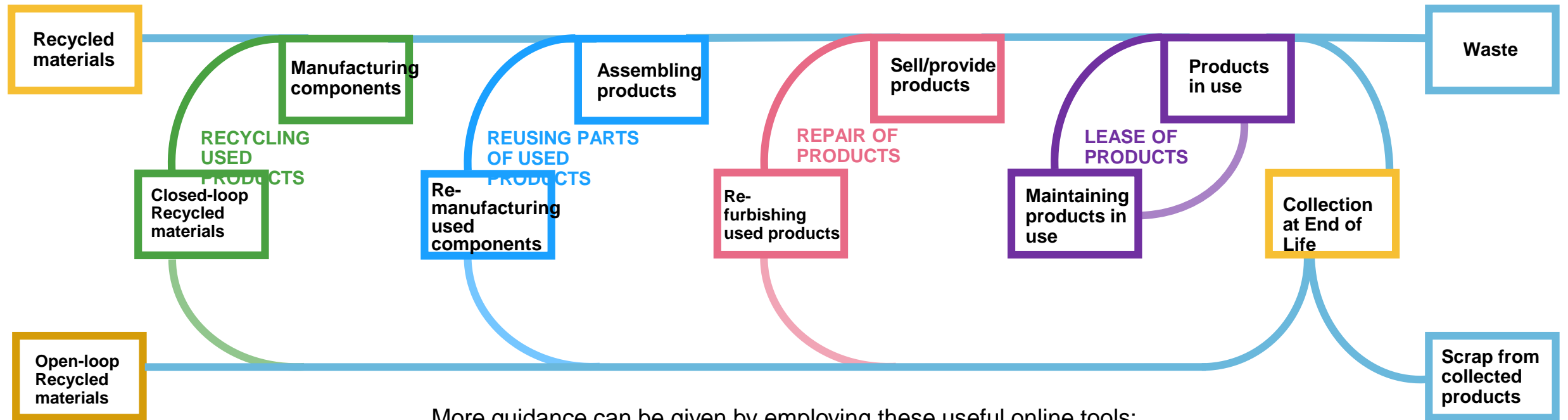
Engagement & Sales

- Sales approach
 - Personal sales contact
 - Online order and service website
- Sales channels
 - Sales person
 - Web shop
 - Furniture Stores
 - DIY stores
 - Workshop showroom/store
- Engagement (communication with target groups)
 - Sales person
 - Website
 - Showroom
 - Exhibition

POTENTIAL FOR CIRCULARITY

INCREASING CIRCULARITY

The below graph guides you on how to achieve maximum circularity for your product – on every step of the value chain!



More guidance can be given by employing these useful online tools:

[Circularity Calculator](#) and [Circularity Pathfinder](#)

OPERATIONS

KEY RESOURCES, ACTIVITIES, PEOPLE

Tools & Machines

- Shredder
- Optional agglomerator for flexibles processing
- Extruder
- Intrusion moulds
- Press + press moulds
- CNC mill
- Woodworking tools
- Pick up truck

Space & Permits

- 20 sqm stock
- 50 sqm production
- 20 sqm wood workshop

Key Tasks /activities

- Feedstock preparation
 - Collection
 - Washing
 - Shredding / agglomeration
- Production
 - Extrusion + intrusion + press moulding
 - Machine maintenance
- End product making
 - Cutting
 - Edge routing
 - CNC milling
 - Finishing
 - Packing
 - Servicing and repairs
- Sales and Distribution
 - Sales contact
 - Transportation: pick up and delivery

People

- Personnel: 7.5 - 9.4 FTE
 - Sales person
 - Technician
 - Admin + online
 - Collection & Distribution - Transport
- Collaborators
 - Retailers, stores
 - Tourism sector
 - Government
 - IUCN/Searious Business

Running costs

- Space rent
- Electricity, water
- Staff costs
- Transport

FINANCIALS

SUMMARY AND SALES OVERVIEW

Diversifying the product portfolio is necessary to build a sustainable business model. The sales overview example provides ideas for possible other products.

Sales Overview				
Products & Services	Selling Price Per Unit	Number of Expected Sales Per Month	Total Product Cost	Profit Margin
50 kgs of Medium Shredded Plastic	0.00	166.7	13.67	-100.00%
mixed Beam 2800 x 40 x 80 mm	16.00	300.0	14.58	9.72%
mixed Plank 2800 x 28 x 130 mm	17.90	180.0	16.25	10.19%
Pavement tile	10.70	460.0	9.65	10.87%
wide HDPE plank 2800 x 18 x 130 mm	14.80	180.0	13.51	9.55%
narrow HDPE plank 2800 x 18 x 65 mm	10.00	90.0	9.24	8.21%
Bench parts	0.00	12.0	34.60	-100.00%
Park bench	160.00	12.0	89.86	78.05%
Trash nest	230.00	30.0	129.09	78.17%
Lounge chair	49.00	30.0	27.57	77.71%
Side table / foot bench	32.00	15.0	17.77	80.09%
Dining chair	37.50	60.0	20.71	81.06%
Dining table	70.00	15.0	38.79	80.47%

Summary	
Starting capital	181,320.17
Months to Pay Back Investment	34
Full Time Employees Needed	7.5
Revenue Earned Per Month	30,578.00
Fixed Costs Per Month	1,560.00
Material Costs Per Month	17,639.83
Total Wages Paid Per Month	5,783.34
Total Profit Earned Per Month	5,594.83

FINANCIALS

CASH FLOW

Cash Flow

A cash flow analysis shows that you have enough money throughout your first year to buy materials, pay your employees, or make an investment into a new machine.

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Money In Bank (Beginning of Month)	181,320.17	32,298.19	39,613.21	46,928.23	54,243.25	61,558.27	68,873.29	76,188.32	83,503.34	90,818.36	98,133.38	105,448.40
Initial Investment	181,320.17											
Revenue	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00
Total Cash In	211,898.17	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00	30,578.00
Investment Costs	(156,337.00)											
Variable Costs	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)	(21,702.98)
Fixed Costs	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)
Total Cash Out	(179,599.98)	(23,262.98)	(23,262.98)	(23,262.98)	(23,262.98)	(23,262.98)	(23,262.98)	(23,262.98)	(23,262.98)	(23,262.98)	(23,262.98)	(23,262.98)
Net Cashflow	32,298.19	7,315.02	7,315.02	7,315.02	7,315.02	7,315.02	7,315.02	7,315.02	7,315.02	7,315.02	7,315.02	7,315.02
Money In Bank (End of Month)	32,298.19	39,613.21	46,928.23	54,243.25	61,558.27	68,873.29	76,188.32	83,503.34	90,818.36	98,133.38	105,448.40	112,763.42

FINANCIALS

PROFIT, LOSS

Profit and Loss

This table is to show how much money the company is projected to make each year. It assumes that you paid yourself for the hours you worked, so the "Net Income" at the bottom is the remaining profit made by your company. It is greatly influenced by the "Monthly Sales Improvement Rate" on the Dashboard page. This table is also useful to show your bank or include in grant applications.

	Year 1	Year 2	Year 3
Revenue	366,936.00	403,629.60	443,992.56
Cost of Sales	260,435.75	286,479.32	315,127.25
Net Revenue	106,500.25	117,150.28	128,865.31
Fixed Costs	18,720.00	18,720.00	18,720.00
Gross Income from Operations	87,780.25	98,430.28	110,145.31
Business Taxes	26,334.08	29,529.08	33,043.59
Net Income	61,446.18	68,901.19	77,101.71

Yearly Growth Rate

10%

(conservative scenario)

Business Tax Rate

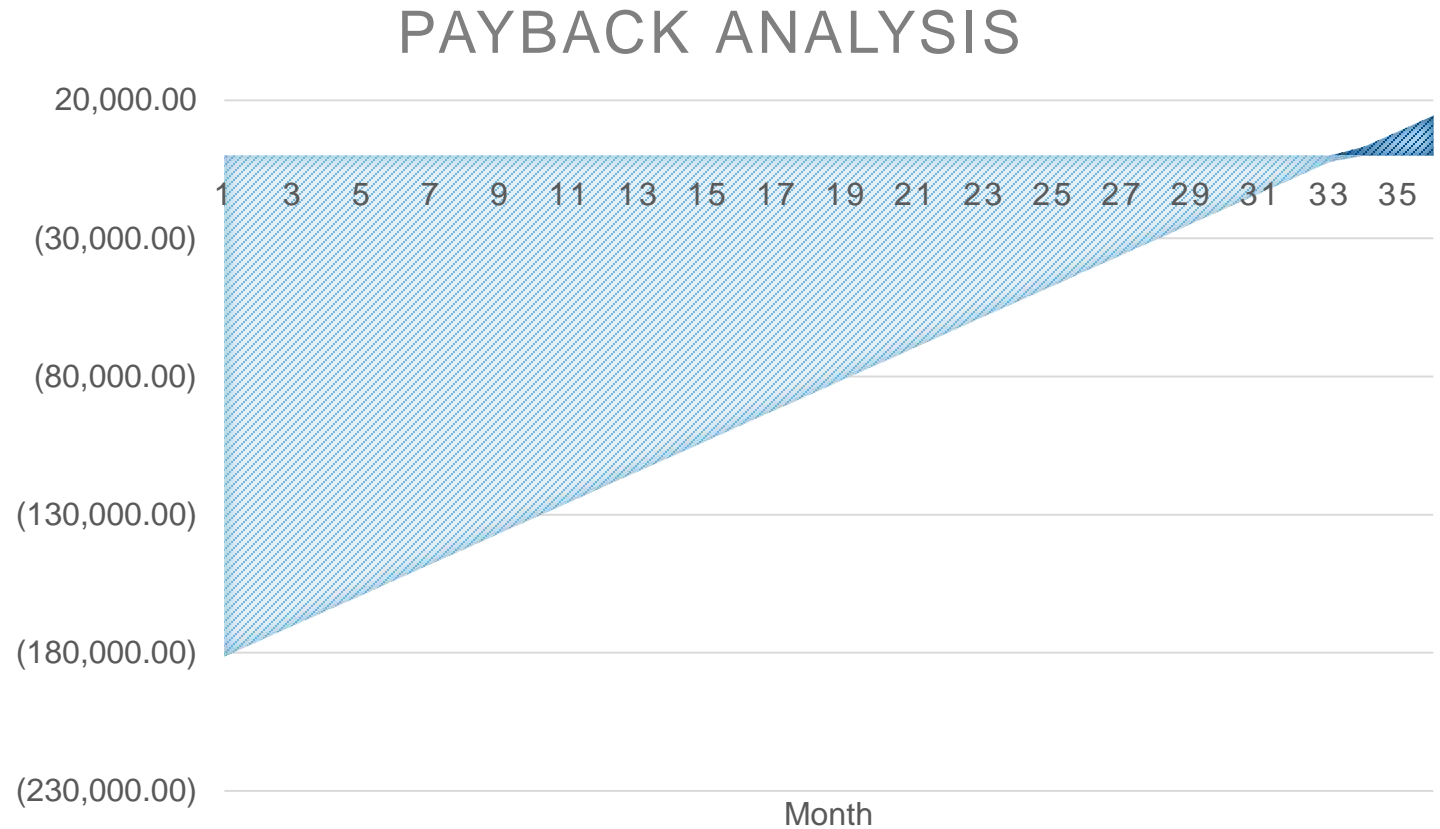
30.00%

FINANCIALS

FUNDING & ROI

Starting capital: US \$ 181,320
ROI 34 months

- Mostly machines and personnel






FINANCIALS

FUNDING PLAN

- Private money
- (Development) Bank loans: de-risking partner, e.g. offering loan guarantees)
Incl. IADB, ADB, IFC, CEB
- Investors/business accelerators ((pre)-seed, angel investment, early stage)
 - Caribbean Export Development Agency
 - Caribbean Business Angels Network
 - Blue Bio Value
 - Blue Natural Capital Finance Facility
 - Ennovent
 - For Good Venture
 - LatitudR (the extension of the Inclusive Regional Recycling Initiative (IRR))
 - SAGANA
 - Sky ocean ventures
- (Governmental) grants
 - Development Cooperation partners, incl. UK, Norway, Italy, US, Germany, Swiss, France, China, Japan,
 - UNDP Innovation Fund
 - IUCN
 - World Bank - ProBlue. NGOs could become a third party within a governmental program
- Caribbean Biodiversity Fund (Endowment Fund)
- OECS
- WWF
- Alliance to End Plastic Waste
- The Nature Conservancy Caribbean
- Ocean Foundation
- Plastic Solutions Fund
- Bill & Melinda Gates Foundation
- Commonwealth Clean Ocean Alliance
- Dow Business Impact Fund
- Handelens Miljofond
- Plastics Solutions Fund
- Gallifrey foundation
- Oak Foundation
- PRIMAT (Didier and Martine Primat Foundation)
- The Fondation SUEZ
- Waitt Foundation
- For Good Foundation
- Onepercentfortheplanet

FACTSHEET

BENEFITS

Financial benefits 	Environmental benefits 	Social benefits 
ROI – 34 months	Lower landfill pressure for government: up to 150 tonnes / year or 9% of HDPE/PP/LDPE waste diverted from landfill/dumping sites	Develop recycling market - Create more jobs in island in collection, sorting, cleaning, recycling – 7.5-11 FTE when converting 4% of total plastic waste generated
Better license to operate for construction and furniture market. And allows for green/circular public procurement	Approx. 164.7 tonnes of CO2 emissions saved by redirecting plastic waste into products	Contribution to cleaner island and attractiveness for local population and visitors
Customer loyalty for producers	Reduced amount of plastic waste that might leak into the environment. 150 tonnes / year diverted from potential leakage	
Lower waste disposal and clean-up costs for government: Approx. savings XCD 40,074		

FOR MORE INFORMATION

IUCN



IUCN_Plastics



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<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



#CloseThePlasticTap

Searious Business



SeariousBusiness



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<https://www.seariousbusiness.com/islands>



#PlasticWasteFreeIslands #CloseThePlasticTap





PLASTIC WASTE FREE ISLANDS

ANTIGUA AND BARBUDA

BUSINESS PLAN

BOTTLE-TO-BOTTLE RECYCLING



An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



Norad



ACKNOWLEDGMENTS

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This work could not have been accomplished, first and foremost, without the partners and stakeholders who supported the data collection efforts within each country. Above all, the PWFI team acknowledges the generous support of the Norwegian Agency for Development Cooperation (NORAD), and the cooperation of Searious Business.

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AUTHORSHIP

To be cited as

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Support and Funding



Technical Lead Authors



Implementing Agency



Design

Ludovic Di Donato

BOTTLE-TO-BOTTLE RECYCLING

BUSINESS PLAN

PLASTIC WASTE FREE ISLANDS



The **Plastic Waste Free Islands (PWFI) Project** is part of the *Close the Plastic Tap* Program of IUCN. PWFI is a three-year project working in six islands in the Caribbean and Pacific.

Implemented in Fiji, Vanuatu and Samoa in Oceania and Antigua and Barbuda, Saint Lucia and Grenada in the Caribbean, the project seeks to promote island circular economy and to demonstrate effective, quantifiable solutions to addressing plastic leakage from Small Island Developing States (SIDS).

This business plan focusses on the “**Bottle-to-Bottle-Recycling**” solution, in the geographic context of Antigua and Barbuda. It demonstrates how the solution can be realized, allowing for the creation of an alternative value chain.

MISSION

WHAT & WHY

What

- A successful deposit return scheme to enable Bottle-to-Bottle Recycling
 - A system that allows for effective collection, transport, processing and export of PET bottles for Bottle-to-Bottle Recycling
 - Strong legislative mechanisms which support an effective functioning of the scheme

Why

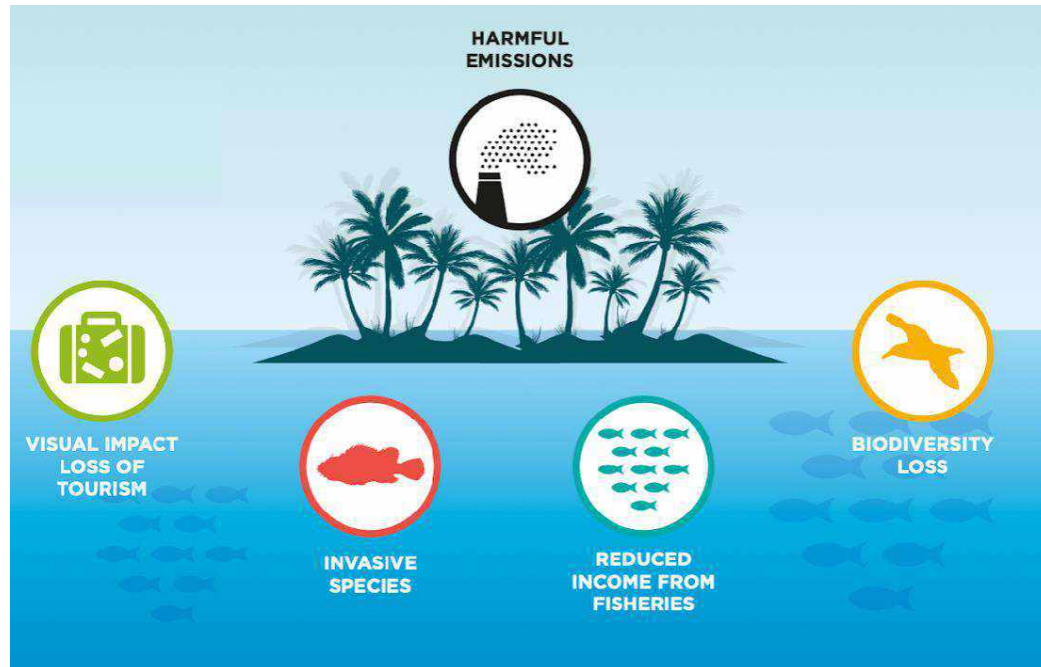
- Import-dependent economy, with limited end-of-life processing options on-island
- Scarce landfill space and high plastic leakage prevalence
- Local business opportunity for
 - Collectors
 - Transporters and PET processors
 - Economies of scale for exporters of plastic materials



PLASTIC WASTE GENERATION & LEAKAGE

ANTIGUA AND BARBUDA

Plastic Waste Generation: The total amount of plastic waste that is produced on an annual basis, per plastic material type



Financial and environmental impacts of plastic leakage

Plastic Waste Leakage: The amount of unaccounted waste that is calculated by the difference of plastic material imported and plastic waste disposed.

	Annual net Imports 2018-2019 (T/y)	Total disposed 2019 - landfill (T/y)	Total recycled 2019 (T/y)	Leakage (T/y) (95% credible interval)	Leakage Percent (95% credible interval)
PET (1)	892	796	156 (0.4-281)	16.4% (0.05%-33%)	892
HDPE (2)	629	535	109 (0-213)	16.9% (0%-39%)	629
LDPE (4)	449	401	69 (0.1-171)	14.6% (0.02%-41%)	449
PP (5)	181	148	41 (0-98)	21.6% (0.01%-63%)	181
PVC (3)	272	118	153 (0.3-116)	56.4% (0.3%-98%)	272
PS (6)	111	83	28 (0-58)	25.1% (0.01%-71%)	111
Other (7)	1.314	1.177	170 (0.2-362)	12.6% (0.02%-30%)	1.314
Overall	3.847	3.258	724 (302-952)	18.19% (7.6%-24%)	3.847

National plastic waste generation & leakage data Antigua and Barbuda with PET in blue.

Source: Final quantification report – Executive summary APWC July 2021

CONTEXTUAL ANALYSIS OF WASTE MANAGEMENT PRACTICES

ANTIGUA AND BARBUDA

The contextual analysis of waste management practices summarizes the current situation of waste management on Antigua and Barbuda. It evaluates actions like collection, sorting and recycling, as well as future ambitions.

- No central collection at source or segregation at landfill, no local plastics recyclers. So all plastics go to landfill, or leakage
 - Except for PET small-scale collection for stockpiling and export
- National ambitions / initiatives / pipeline:
 - Collection of PET bottles by Antigua and Barbuda Waste Recycling Corporation (ABWREC). Export to the USA without being economically viable
 - Incentivized PET bottle return program with one water brand (collaboration Oasis and ABWREC)
 - Advanced Recovery Fee system for recyclables, incl. PET and possibly HDPE is envisioned
 - PWF I PET bottles collection and export trial to ALPLA, Mexico
 - Green Corridor Sustainable Tourism Initiative (Green Tourism Initiative) expansion to more hotels / resorts



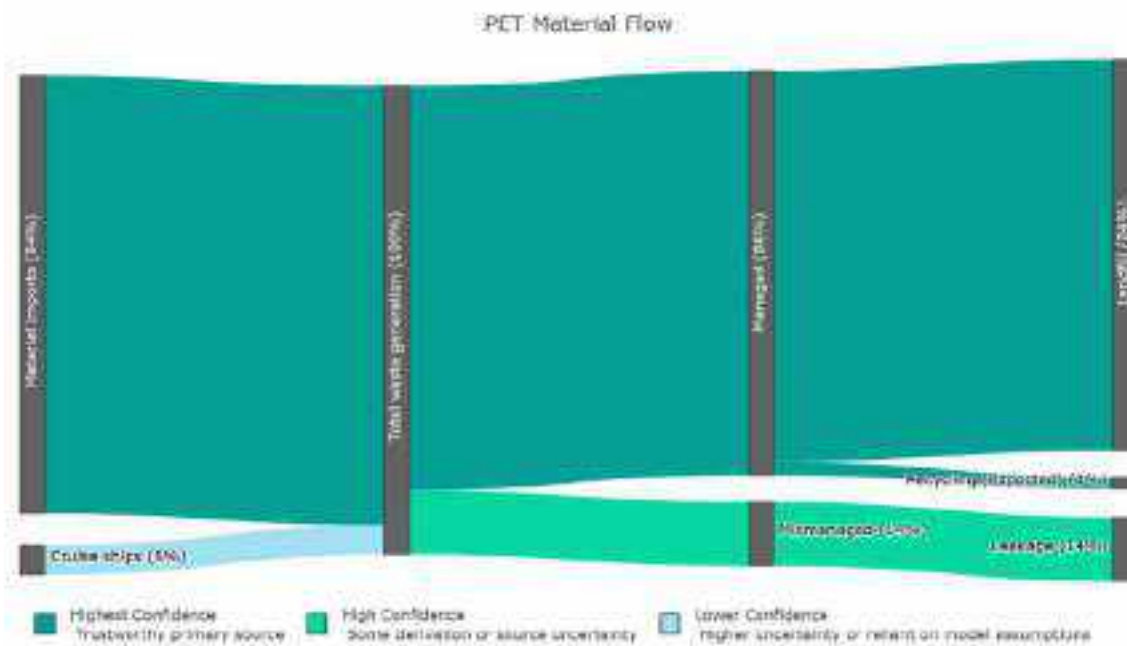
3253 tonnes plastic waste generated/year

Source: Quantification report, Executive summary, APWC July 2021

TARGETED MATERIAL

PET – CURRENT VALUE CHAIN

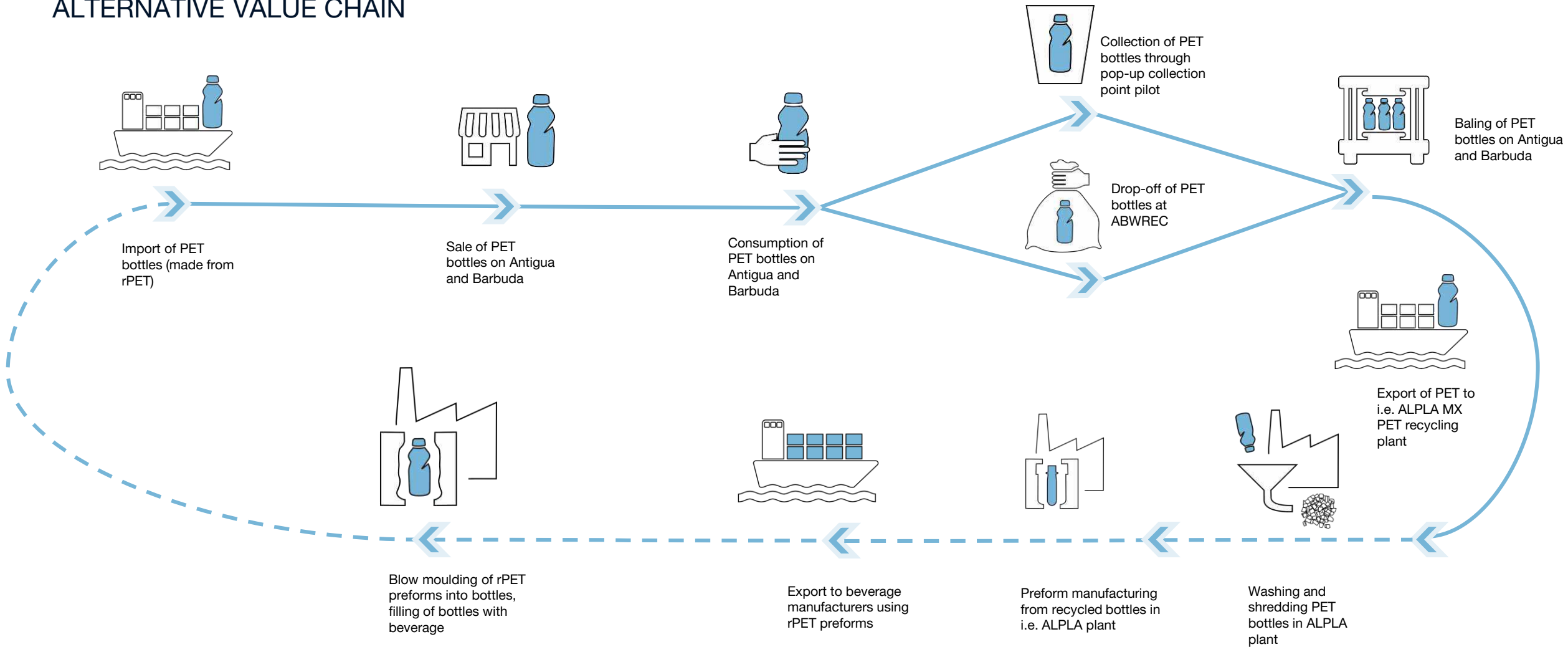
Polyethylene terephthalate (PET): A thermoplastic polymer of the polyester family, which is commonly used for beverage bottles and food packaging. PET is easily recyclable.



	Plastic Waste Generation	Household (t/y)	Commercial (t/y)	Tourism (t/y)	Fisheries (t/y)	Total (t/y)
PET 1	beverage containers water pet	213.51	106.33	115.30	1.71	436.84
PET 1	beverage containers not water pet	118.36	22.84	32.20	12.82	186.21
PET 1	food semi rigid containers e.g. trays pet	33.18	3.15	19.50	0.00	55.83
PET 1	single use take away food containers pet single use	0.01	0.00	0.00	0.00	0.01
PET 1	food flexible packaging pet	14.23	0.00	0.00	0.00	14.23
PET 1	Laundry detergent bottles	12.84	7.36	0.40	0.00	20.60
PET 1	shampoo body wash pet	8.29	0.00	0.00	0.00	8.29
PET 1	cooking oil pet	16.03	0.00	0.00	0.00	16.03
PET 1	cleaning agent products pet	4.76	2.36	0.00	0.00	7.12
PET 1	beauty and personal care pet	10.68	0.00	0.30	0.00	10.98
PET 1	textiles clothing pet	4.39	0.00	0.00	0.00	4.39
PET 1	toothpaste packaging pet	4.19	0.00	0.00	0.00	4.19
PET 1	other pet	27.84	10.60	2.60	0.00	41.04

OUTLINE BOTTLE TO BOTTLE RECYCLING

ALTERNATIVE VALUE CHAIN



OUTLINE BOTTLE TO BOTTLE RECYCLING

COLLECTION & RECYCLING STEPS

COLLECTION



- Manned collection points to ensure high level of efficiency and quality – combine with deposit return scheme including other materials used for beverage containers like HDPE, aluminum, liquid paper board etc.
- Separation of PET at source – distinction based on colors (transparent – light blue – other)
- Tracking of collected PET through log sheet, validation by weight and four-eye principle

TRANSPORT



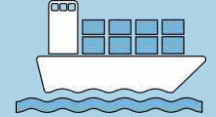
- Transportation by truck/van to processing facility
- Transportation is part of the value chain – therefore part of the tracking and validation
- If combined with deposit return scheme, high return rates can be expected – required transport on daily basis
- Could possibly be combined with NSWMA activities

PROCESSING



- PET gets baled (preferably with high-density baler), alternatively with metal compactor (optional: shredding of PET –possible when recycler has built trust in material)
- No liquids can stay in the bottles
- Caps and labels can stay on if they meet Design for Recycling Guidelines (no toxic adhesives in glues, no metal in labels/caps)
- Density goal of bales: 284 kg/m²
- Costs of labor and material

EXPORT

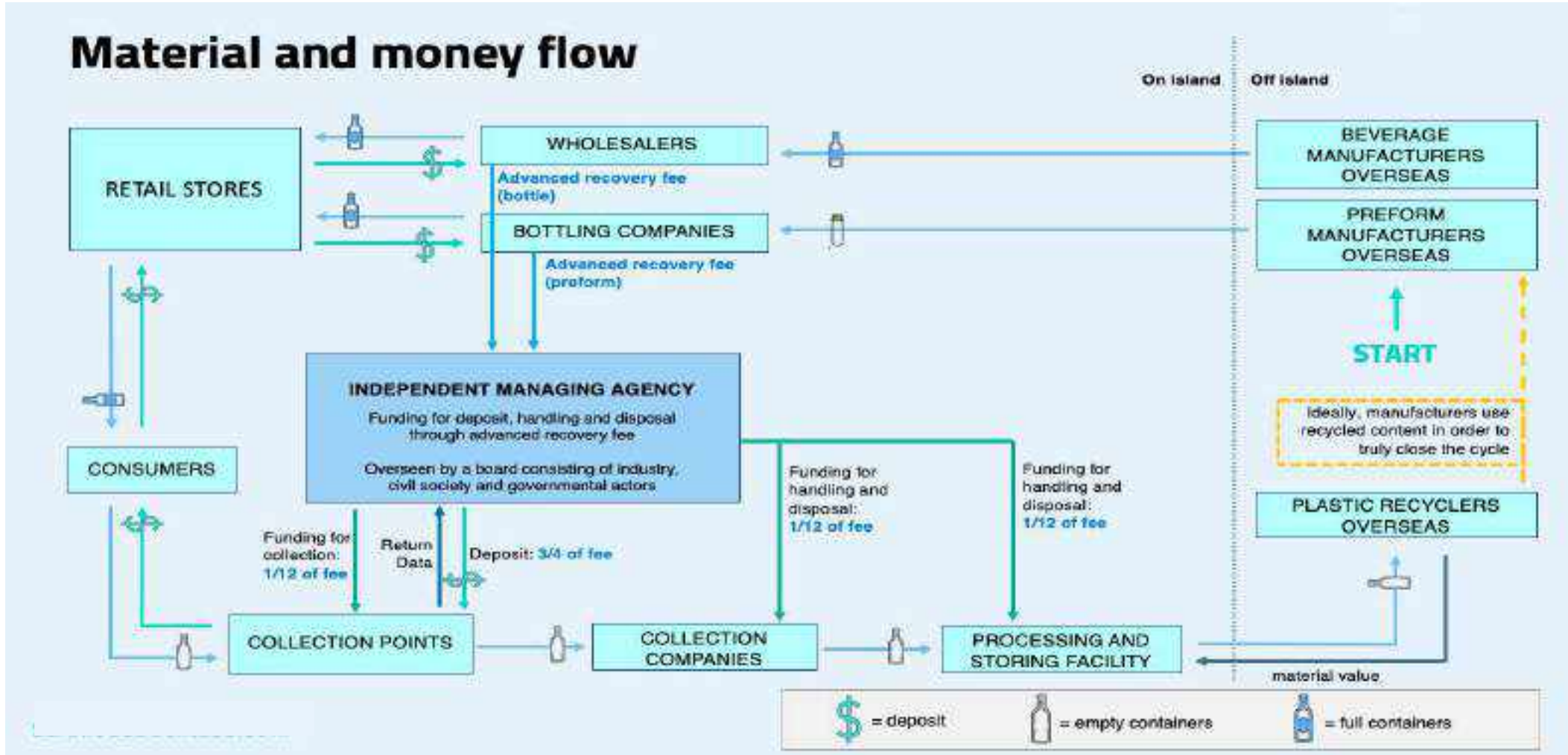


- Export to food grade recycling plant, e.g. ALPLA in Mexico
- Ensure stable, high quality to avoid negative business case because of high export costs
- Export to Mexico: In order to keep export costs low, negotiate for Deliver Duty Paid to Harbor, not end location
- Import of preforms made from recycled content to close the loop (incentivize incorporation of recycled %)

➔ KEY ENABLING FACTORS: Container deposit scheme, high-quality material, food-grade recycling plant

OUTLINE OF CONTAINER DEPOSIT SYSTEM

DEPOSIT RETURN ENABLING BOTTLE TO BOTTLE RECYCLING



BENEFITS OF DEPOSIT SYSTEMS

OVERVIEW OF SUCCESS FACTORS AND BEST PRACTICES

Incentivized collection

- Prevents littering and landfilling of PET bottles
- Low barriers for participation
- Creates understanding for value of plastics and the circular economy in society

Enhanced material quality

- Increased purity through separate collection of PET
- Higher material value through enhanced purity and quality
- Saves resources and plastic clean-up costs, as system allows for closed-loop recycling

Best Practices from other island states

- Barbados: Deposit fee of US\$ 0.05 for PET bottles. Has been in practice since 30 years
- Republic of Palau: Deposit fee of \$0.10, of which \$0.05 can be redeemed by consumer
- Kiribati: Deposit fee of AUD\$0.05, of which AUD\$0.04 can be redeemed by consumer

MANAGEMENT

RECOMMENDATIONS

Establishment of Independent Managing Agency

- Should be not-for-profit & independent
- Agency should fulfill the following tasks:
 - Collect funds from packaging producers
 - Contract partners in collection, transporting, processing and pay funds to them
 - Monitor and evaluate performance of scheme
 - Conduct audits
 - Overseeing and actively managing the scheme
- Should be governed by a Board of Directors
 - Board should represent actors from the beverage, retail grocery and recycling industries, government, actors with no vested financial interest
 - The legal entity should be not-for-profit in the form of an industry product stewardship organization
 - Ideally, board members should hold skills in Finance/Law/Environment/Resource Recovery

Best practice examples

- Canada: Not-for-profit Encorp Pacific, managing the return-it scheme



- Lithuania: Not-for-profit Užstato Sistemų Administratorius (USAD), managing the Gražinti vėta scheme



IMPORT/PRODUCTION

RECOMMENDATIONS

Design for Recycling

- For best uptake of Deposit Return Scheme, including effective Bottle-to-Bottle Recycling export routes, Design for Recycling (D4R) needs to be considered
- Recommendations include:
 - Always source PET made from recycled content (at least 50%)
 - If virgin material is sourced, only import transparent and light-blue PET bottles and/or preforms
 - Standardize as much as possible in collaboration with competitors

Recommended legislative change

- Include Design for Recycling (D4R) Guidelines and Measures into national EPR legislation
- Financially incentivize recyclable bottles / mandatory % of recycled content – i.e. D4R based eco-modulation and ring-fence income
- Ban specific unrecyclable PET products (strongly coloured bottles & preforms)

Best practice examples

- ‘Recyclass’ Design for Recycling Guidelines

RecyClass

- Design for Recycling Guidelines Oceania – ANZPAC Australia New Zealand Plastic Pact



IMPORT/PRODUCTION

RECOMMENDATIONS - DESIGN FOR RECYCLING GUIDELINES

Design for Recycling Guidelines: The following are guidelines for producers of PET beverage bottles. PET beverage bottles are commonly produced in the form of a *preform*, which is a miniature bottle which still needs to be blown into a full-size bottle by the beverage manufacturer. Already at the production process, the right design of a PET bottle and its additional components can enhance recycling at its end of life. These guidelines sum up the most important aspects this.

Labels, Sleeves and Wraps

- PE/PP/OPP/EPS (density < 1g/cm³)

Colours

- Transparent or light blue

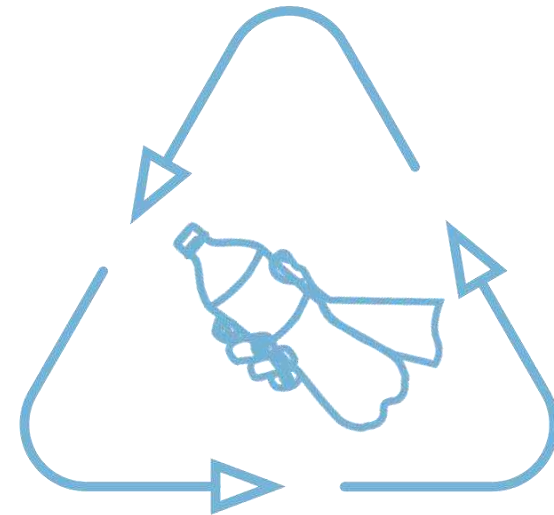
Closure system

- PE or PP with density < 1g/cm³

Adhesives for labels

- alkali/water soluble or alkali/water releasable at 60-80 Celsius

No additives



COLLECTION AND TRANSPORT

RECOMMENDATIONS

Collection

- Entities can apply to become officially contracted collection agency
- Collection Agencies are entitled to funds from the managing agency fund
- Tasks of collection agencies:
 - Collect used beverage containers at collection points
 - Make collection points accessible and easy to use for consumers
 - Pre-sort containers in different materials/colors
 - Ensure complete and comprehensive documentation of collection data

Transport

- Collection Agencies should be responsible for the transport from collection points to recycling facility
- Transport needs to be ensured between collection points, storage places and processing facilities on a regular basis

Best practice examples

- Low-tech solution: Hol' ab Germany – in-store collection points



- RePlast Saint Lucia Outdoor collection points



RePLAST OECS
Pilot Plastic Recycling Project

PROCESSING AND EXPORT

RECOMMENDATIONS

Processing

- Entities can apply to become an official processing agency
- Processing agencies are entitled to funds from the managing agency
- Tasks of the processing agencies include:
 - Receiving beverage containers
 - Do additional sorting if necessary to uphold high quality
 - Process (bale/shred/crush) beverage containers for export for recycling or domestic recycling
 - Ensure complete and comprehensive processing data
- Must comply with environmental standards

Export

- Export should be established between islands and recyclers overseas in long-term partnerships
- If possible, food-grade recycling should always be favored (closed-loop recycling), and most often offers the highest financial return

Best practice examples

- Antigua and Barbuda Waste Recycling Corporation (ABWREC) processing standards



- Food grade plant in Toluca, Mexico, for food-grade PET recycling

ALPLA

PROCESSING

RECOMMENDATIONS AND RECYCLING QUALITY REQUIREMENTS

- Bale density of 284 kg/cubic meter – good baling is essential to keep the export costs as low as possible!
- Meeting biosecurity standards is key! No organic matter (no animals, plants, soil, etc.) is allowed!
- It is important that the baling machines do not perforate the bottles
- Caps and labels can stay on the bottle if they meet design for recycling guidelines
- Highest price can be achieved if it is clear PET (and light-blue) only, pre-sorted in respective colors



FINANCIALS

MARKET ANALYSIS, COST OVERVIEW, USP

Major applications and markets for collected PET bottles under CDL

- Major market: Preforms made from 50% to 100% recycled PET - Food-grade PET bottle have highest revenues
- Alternative markets: non-food PET bottles, strapping, sheets
- Markets for used PET bottles: Mexico (through ALPLA), from 2023 on NUVI plant on the Dominican Republic
- Markets for rPET preforms: rising global demand through changing legislation in multiple countries

Volumes of PET bottles to be exported

- 40ft container
- e.g. ALPLA requires at minimum one full 40ft container (16 tons) of baled PET bottles

Source

- Used transparent and light blue (up to 3%) PET beverage bottle, blow-molded. Manned sorting and cleaning for stable and consistent flow of PET bottles

Costs and capacities

- Revenue: 487 - 658 USD / MT of PET, 75 tonnes/year. See costs & revenues per stakeholder on next slide
- Collection: 34 h / month
- Transport: 7 h / month
- Processing: (washing, sorting, shredding: 40 h / month
- Export: once per month

Unique selling points

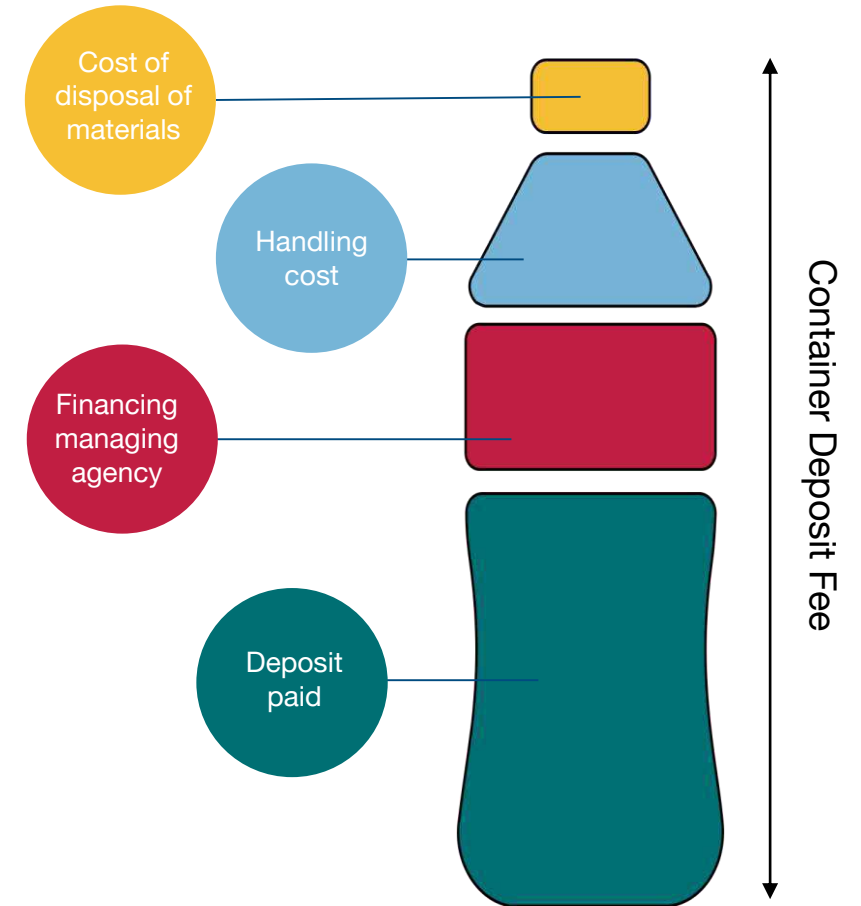
- Meeting recycling targets of beverage manufacturers
- Concept allows for high-standard export of valuable materials
- Meeting circularity/sustainability targets of governments
- Scalability: ALPLA processes all domestic (Mexican) Coca Cola bottles – Antigua and Barbuda could scale up.
- Marketability: Completely circular product, based on high readiness level from key stakeholders
- Risk & compliance: health and safety compliant local setup of processing

FINANCIALS

HOW TO FINANCE THE CONTAINER DEPOSIT SCHEME

- ❖ For the implementation and viability of the system on Antigua & Barbuda, we suggest to introduce a container deposit fee to be paid by producers and importers of beverage containers
- ❖ It needs to cover all the costs of activities necessary to uphold the system, while not putting too much pressure on local manufacturers and importers of items falling under the fee

Usually, about 15 – 20% of bottles are not getting returned. These unclaimed deposits can **additionally** finance the managing agency



FINANCIALS – 1/2

FULLY ESTABLISHED PERIOD

➔ Calculations based on 24,920,000 PET bottles being released into the local market per year. Envisioned recovery rate: 75% (18,690,000 PET bottles)

	Step	Description	Costs / annual PET bottle release (in XCD)	Costs / annual PET bottle release (in USD)	Costs per bottle (in USD)	Comments	paid/received by					
							bottlers / importers	collection point operators	transport companies	processing companies	managing agency	
Container Deposit Fee imposed on responsible producers			7763977	2872697.4	0.128	this translates to an advanced recovery fee of 0.35 XCD per PET bottle	-2872697.4					2872697.4
Costs covered by Container Deposit Fee	Deposit	Deposit on each bottle of 0.2 XCD	4984000	1844080	0.074			1844080				-1844080
	Collection	operating collection points (labour)	1451520	537062.4	0.029	In order to achieve the envisioned collection rate, 51.205 PET bottles must be collected per day. If 50 collection points are being established, each has to collect 1024 PET bottles per day (128 PET bottles per hour per collection point). 120960 hours of work are needed for collection (based on 2 persons per collection point, 8 hour shift every day). 120960 hours * 12 XCD (above minimum wage)			537062.4			-537062.4
	Transport	Pick-up from collection points	45657	16910	0.0009	One 40ft truck fits 42000 PET bottles. In order to achieve the envisioned collection rate, 445 truck trips are needed annually. Assumption: 30 km one-way between collection point and recycling facility: costs for gasoline: USD 18; costs for labour: USD 20 (2 hours). This totals up to 38 USD for one truck trip from collection point to recycling company				16910		-16910

FINANCIALS – 2/2

FULLY ESTABLISHED PERIOD

➔ Calculations based on 24,920,000 PET bottles being released into the local market per year. Envisioned recovery rate: 75% (18,690,000 PET bottles)

	Step	Description	Costs / annual PET bottle release (in XCD)	Costs / annual PET bottle release (in USD)	Costs per bottle (in USD)	Comments	paid/received by				
							bottlers / importers	collection point operators	transport companies	processing companies	managing agency
Costs covered by Container Deposit Fee	Processing	Handling costs - unloading vehicle	27000	9990	0.0005					9990	-9990
		Sorting & Baling - labour	630000	233100	0.012	Based on input from PWFI pilot on Antigua and B and multiplied by 40 (as 30 times as much bottles would be collected in actual scheme) Bale size is 1 m3 and the density requirement is 284 kg/per m3				233100	-233100
		Sorting & baling - supplies	144000	53280	0.003					53280	-53280
		stockpiling costs	112500	41625	0.002					41625	-41625
		export costs	345000	127650	0.007	based on 11500 XCD per 40ft container (fits 16 tonnes of baled PET bottles) 40 containers per year are required for 75% recovery rate					
	Management	Personnel costs for managing agency	16200	6000	0.00032	2 people in charge, full time					6000
		Promotion (material costs)	8100	3000	1.6E-04	for radio/TV ads, information material					
Total costs			7763977	2872697	0.128		-2872697	1844080	537062	354905	142650

FINANCIALS

SCHEME UPTAKE PERIOD

Setting goals and ambitions

- The managing agency should set careful collection targets, to allow an ideal scale-up in the first years after establishment of scheme
- Recovery rate goals could roughly follow the below recommendation, based on an updated baseline on current collection

Year after establishment of scheme	Recovery rate goal
Year 1	Determine baseline recovery rate
Year 2	Monitor baseline recovery rate
Year 3	5% increase from baseline
Year 4	5% increase from Year 3
Year 5	5% increase from Year 4

Increasing recovery rates

- Advertisement activities
- Contracting more collection agency locations

Enabling factors

- Action plan should be put in place to ensure the supporting waste management infrastructure is in place
- A detailed (reversed) material flow analysis will inform the design of the waste management infrastructure

CONTAINER DEPOSIT LEGISLATION (CDL)

STEP-BY-STEP IMPLEMENTATION PLAN




- STEP 1: Introduction of Legislation
- STEP 2: Creation of Managing Agency
- STEP 3: Starting date for mandatory payment from producers/importers
- STEP 4: Starting date for refund payments to consumers
- STEP 5: Submission of product stewardship plan from producers/importers
- STEP 6: Issuing of permits for producers/importers
- STEP 7: Contracting partners for collection, transporting and processing
- STEP 8: Activate full scheme



See *Container Deposit Fee policy paper Fiji* (Sept 2021) for details on all steps, including key definitions, role division for all stakeholders, financing the system, and the composition of the board

BENEFITS BOTTLE2BOTTLE RECYCLING

UNDER A WORKING CONTAINER DEPOSIT LEGISLATION

Financial benefits 	Environmental benefits 	Social benefits 
Revenues of PET bottles: 487 - 658 USD / tonnes	Lower landfill pressure for government. Amount of plastic waste diverted based on 75% collection rate with container deposit scheme: 476.2 tonnes/year = 59% of all PET waste generated on Antigua and Barbuda	Develop domestic recycling market - Create more jobs in island in collection, sorting, cleaning, recycling – 100 FTE when converting 59% of all PET waste
Attracting sustainable investments	Around 30% reduction of global warming, fossil resource scarcity and terrestrial acidification compared to landfilling PET bottles	Contribution to cleaner island and attractiveness for local population and visitors
Lower waste disposal and clean-up costs for government	Marine ecotoxicity reduced by > 50% compared to landfilling PET bottles	Human toxicity reduced > 50% compared to landfilling plastics
	Reduced amount of plastic waste that might leak into the environment. 476.2 tonnes/year = 59% of all PET waste generated	

FOR MORE INFORMATION

IUCN



IUCN_Plastics



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<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



#CloseThePlasticTap

Searious Business



SeariousBusiness



connect@seariousbusiness.com



<https://www.seariousbusiness.com/islands>



#PlasticWasteFreeIslands #CloseThePlasticTap





PLASTIC WASTE FREE ISLANDS

ANTIGUA AND BARBUDA

BUSINESS PLAN

WASTE-TO-PRODUCT



An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



Norad



ACKNOWLEDGMENTS

IUCN Plastic Waste Free Islands (PWFI) project wishes to thank the various partners from government, private sector and industry, academia and research, civil society and nongovernmental organisations that contributed to this work through their participation in workshops, meetings, field excursions, and related consultations within the country.

This work could not have been accomplished, first and foremost, without the partners and stakeholders who supported the data collection efforts within each country. Above all, the PWFI team acknowledges the generous support of the Norwegian Agency for Development Cooperation (NORAD), and the cooperation of Searious Business.

Thanks also goes to colleagues in the IUCN regional and country teams for their continuous and invaluable support throughout the implementation of the assessment.

AUTHORSHIP

To be cited as

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Support and Funding



Technical Lead Authors



Implementing Agency



Design

Ludovic Di Donato

WASTE-TO-PRODUCT

BUSINESS PLAN

PLASTIC WASTE FREE ISLANDS



The **Plastic Waste Free Islands (PWFI) Project** is part of the *Close the Plastic Tap* Program of IUCN. PWFI is a three-year project working in six islands in the Caribbean and Pacific.

Implemented in Fiji, Vanuatu and Samoa in Oceania and Antigua and Barbuda, Saint Lucia and Grenada in the Caribbean, the project seeks to promote island circular economy and to demonstrate effective, quantifiable solutions to addressing plastic leakage from Small Island Developing States (SIDS).

This business plan focusses on the **“Waste-to-product”** solution, in the geographic context of Antigua and Barbuda. It demonstrates how the solution can be realized, allowing for the creation of an alternative value chain.

MISSION

WHAT & WHY

What

- A successful business in Furniture and Semi-finished products
 - Made from recycled plastic
 - Locally sourced and locally produced

Why

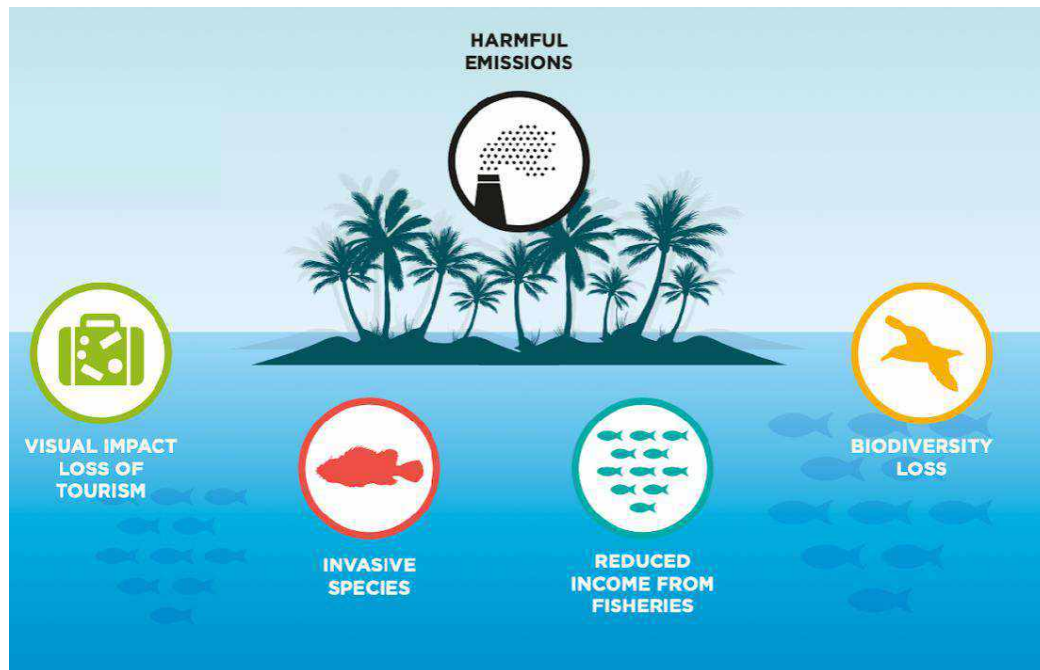
- Local business opportunity
 - Reduce import dependency
 - Enhance resource recovery options on-island
 - Job creation
- Reduce overfull landfills and high plastic leakage prevalence
 - Improved waste management
 - Lower environmental impact



WHY START THIS BUSINESS

PLASTIC WASTE GENERATION & LEAKAGE

Plastic Waste Generation: The total amount of plastic waste that is produced on an annual basis, per plastic material type



Financial and environmental impacts of plastic leakage

Plastic Waste Leakage: The amount of unaccounted waste that is calculated by the difference of plastic material imported and plastic waste disposed.

	Annual Imports 2018-2019	Total waste produced 2019	Leakage (T/y) - model based estimate (95% credible interval)
PET	892	796	130 (0.4-281)
HDPE	629	535	95 (0-213)
LDPE	449	401	69 (0.1-171)
PP	181	148	41 (0-98)
PVC	272	118	153 (0.3-116)
PS/EPS	111	83	28 (0-58)
Other Plastic	1,314	1,177	170 (0.2-362)
Overall	3,847	3,258	684 (302-952)

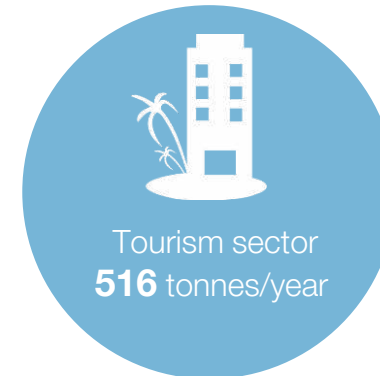
National plastic waste generation & leakage data Antigua and Barbuda with polyolefins in blue. Source: Final quantification report – Executive summary APWC July 2021

GENERAL STATUS OVERVIEW & SECTORAL DATA

ANTIGUA AND BARBUDA

The contextual analysis of waste management practices summarizes the current situation of waste management on Antigua and Barbuda. It evaluates actions like collection, sorting and recycling, as well as future ambitions.

- ❖ No central collection at source or segregation at landfill, no local plastics recyclers
 - ❑ landfill, or leakage
 - Except for PET❑ small-scale collection for stockpiling and export
 - Large volumes of rigid HDPE and PP waste that could be diverted quite easily from landfill
- ❖ National ambitions/initiatives/pipeline:
 - Collection of PET bottles by Antigua and Barbuda Waste Recycling Corporation (ABWREC). Export to the USA without economic viability
 - Incentivised PET bottle return program with one water brand (collaboration Oasis and ABWREC)
 - Advanced Recovery Fee system for recyclables, incl. PET and possibly HDPE is envisioned
 - PWFI PET bottles collection and export trial to ALPLA, Mexico
 - Green Corridor Sustainable Tourism Initiative (Green Tourism Initiative) expansion to more hotels / resorts



3253 tonnes plastic waste generated/year

Source: Quantification report, Executive summary, APWC July 2021

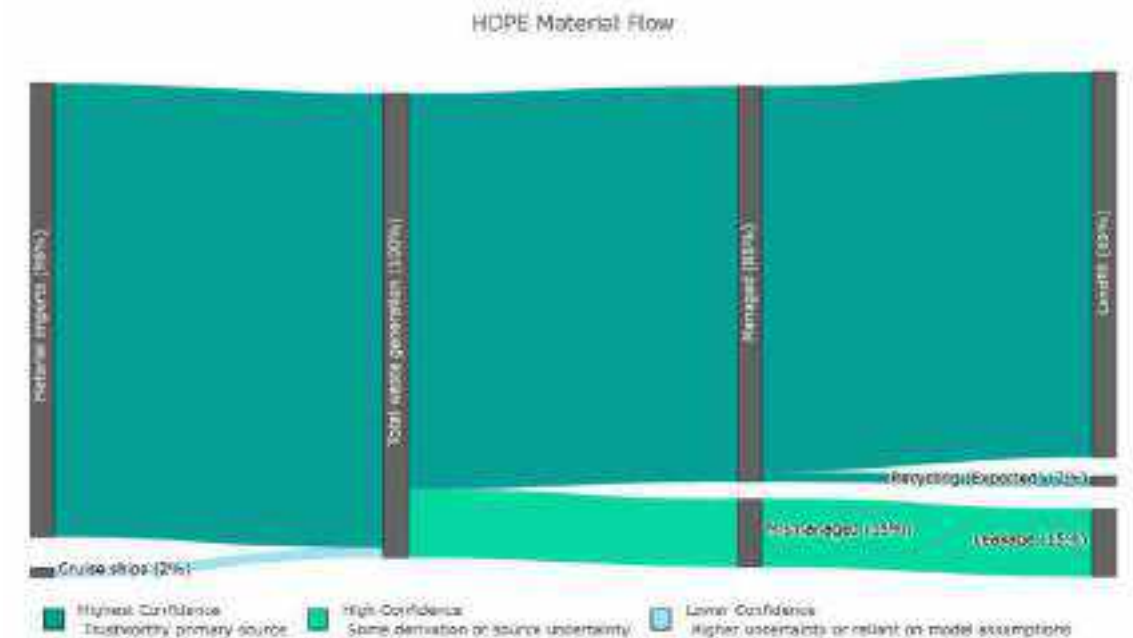
TARGETED MATERIAL(S)

HDPE – CURRENT VALUE CHAIN

Category	Material type	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (consumption based) (T/y)	Total (T/y)
HDPE 2	garbage bags single use	63,8	27,1	80,3	0,0	171,3
HDPE 2	lightweight plastic bags single use	64,2	53,8	27,7	0,0	145,7
HDPE 2	laundry detergents bottles hdpe	41,0	0,0	12,2	0,0	53,2
HDPE 2	cleaning agent products hdpe	31,5	4,1	4,3	0,0	39,9
HDPE 2	food containers hdpe	35,6	0,0	2,4	0,0	38,0
HDPE 2	other hdpe	21,1	0,0	10,3	0,0	31,4
HDPE 2	beauty and personal care hdpe	14,0	0,0	2,3	0,0	16,3
HDPE 2	light shopping plastic bags single use	1,4	10,1	0	0,0	11,5
HDPE 2	home care hdpe	5,7	0,0	5,1	0,0	10,8
HDPE 2	beverage containers pvc hdpe	7,6	2,2	0	0,0	9,8
HDPE 2	shampoo body wash hdpe	4,9	0,0	0	1,8	6,7
HDPE 2	shopping carrier bags hdpe	1,2	0,0	0	0,0	1,2
						535,8

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

High-density Polyethylene (HDPE): A thermoplastic polymer used in a wide variety of applications, e.g. shampoo bottles and milk containers. HDPE is easily recyclable.



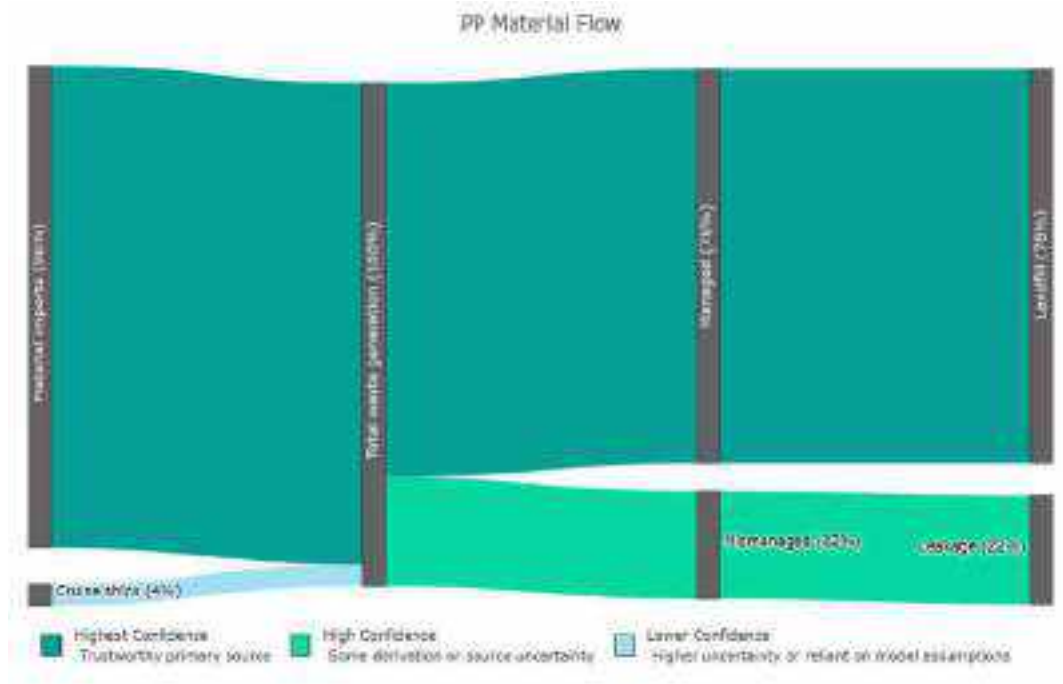
TARGETED MATERIAL(S)

PP – CURRENT VALUE CHAIN

Category	Material type	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (consumption based) (T/y)	Total (T/y)
PP 5	container lids pp	40,2	17,6	25	0,5	83,2
PP 5	bags resusable supermarket bags pp	17,8	0,0	0	0,0	17,8
PP 5	food containers pp	9,7	0,5	2,9	0,0	13,1
PP 5	food flexible packaging pp	4,0	3,9	1,7	0,0	9,6
PP 5	other pp	7,6	0,0	0	1,8	9,4
PP 5	food semi rigid containers e.g trays pp	7,0	0,0	0	0,0	7,0
PP 5	straws single use	1,8	3,6	0,3	0,0	5,8
PP 5	glossy shopping bags single use plastics	3,5	0,0	0	0,0	3,5
PP 5	medicine bottles pp	0,2	0,0	0	0,0	0,2
PP 5	single use take away food containers pp single use	0,0	0,0	0	0,0	0,0
						149,6

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Polypropylene (PP): A thermoplastic polymer used in a variety of applications. PP is sturdy can be used in a flexible or rigid form. PP can potentially be recycled.



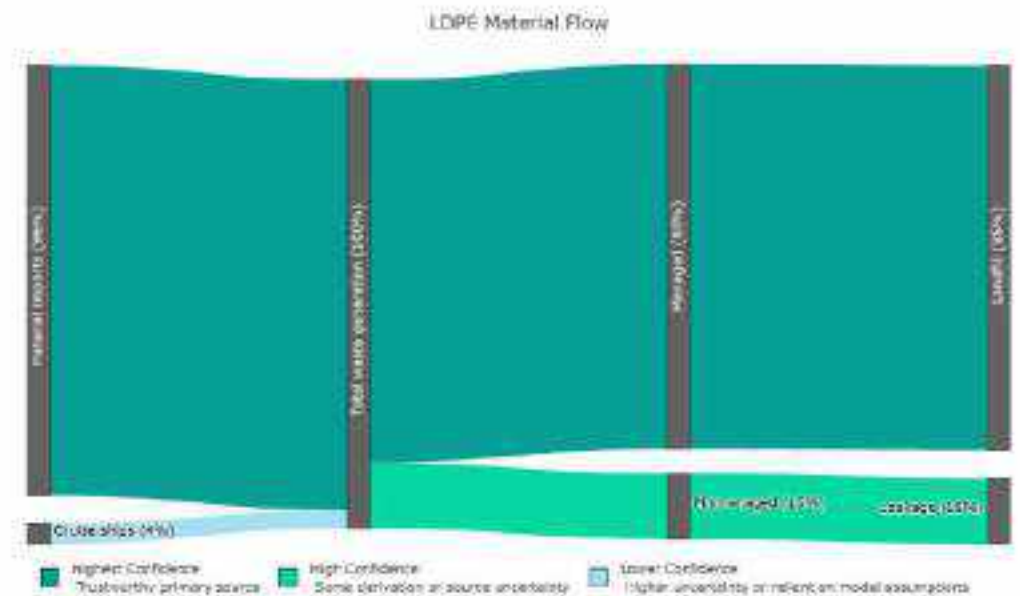
TARGETED MATERIAL(S)

LDPE – CURRENT VALUE CHAIN

Category	Material type	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (consumption based) (T/y)	Total (T/y)
LDPE 4	soft plastic packaging single use plastics	179,8	164,3	42,8	0,0	386,8
LDPE 4	wrap foils cling films ldpe	7,2	0,0	0,2	0,0	7,4
LDPE 4	glossy shopping bags single use plastics	3,2	0,0	0	0,0	3,2
LDPE 4	other ldpe	1,0	1,9	0	0,0	2,9
LDPE 4	container lids ldpe	0,2	0,0	0	0,0	0,2
						400,6

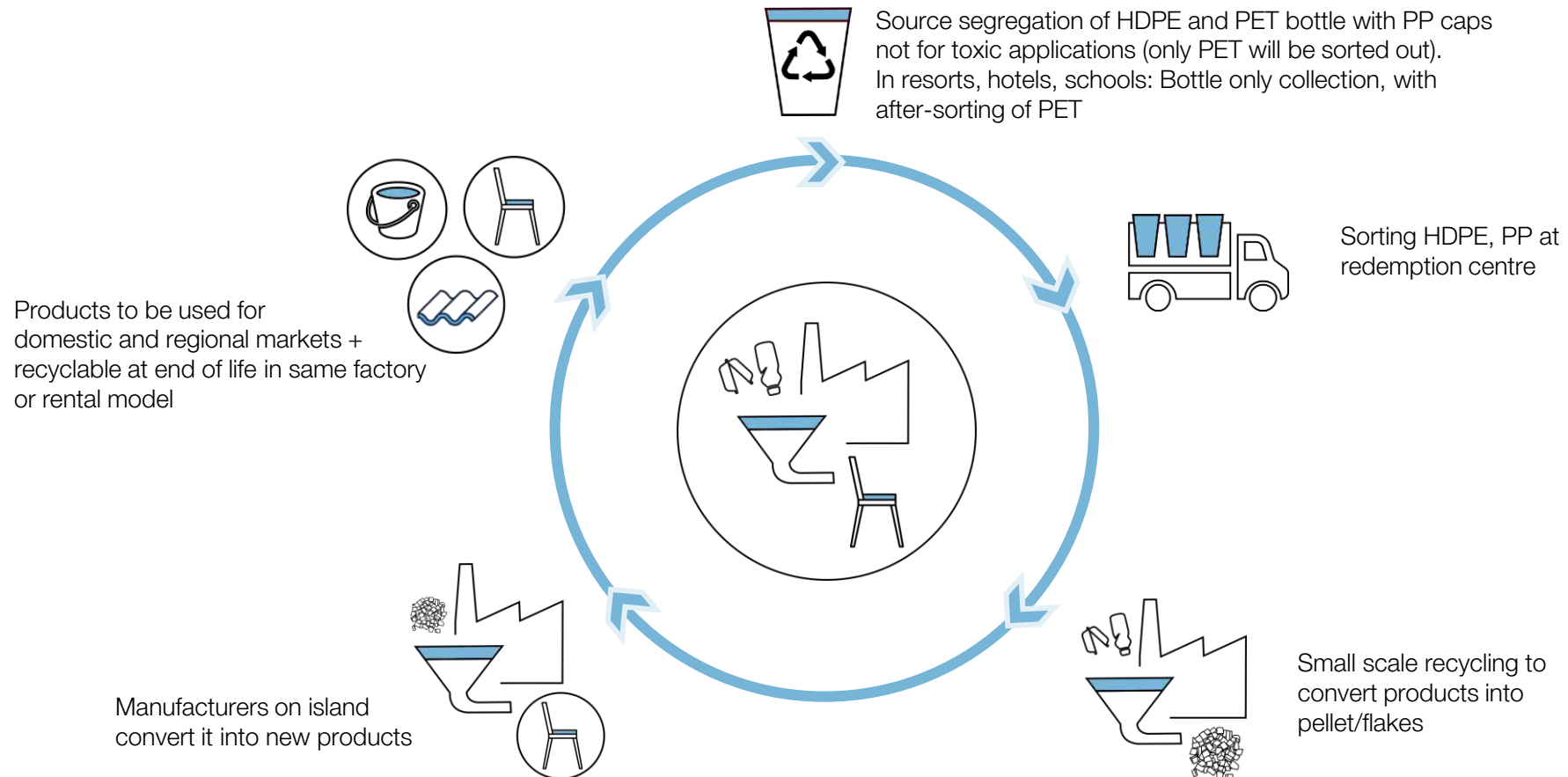
Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Low-density Polyethylene (LDPE): A thermoplastic polymer, which is a soft, flexible, lightweight plastic material, oftentimes used for plastic bags. LDPE is recyclable.



WASTE TO PRODUCT

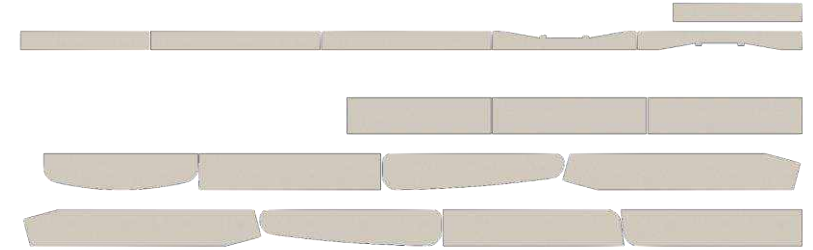
ALTERNATIVE VALUE CHAIN



CONCEPT DESCRIPTION

EXTRUSION BASED FURNITURE

- Plastic lumber, beams, planks, tiles and parts (semi-finished product)
- Outdoor furniture (end-product)
- Example Prototype : Lounge chair recycled HDPE
 - Dimensions: L 805 x W 733 x H 729 mm
 - Weight: 14 kg
 - Intended use: garden, park, wharf, public space (outdoor)
- Other related products
 - Table
 - Lounge chair
 - Side table
 - Park bench
 - Patio furniture



USER SCENARIOS

Furniture

- Comfortable
- Durable
- Climate/weather-proof
- Modular, repairable
- Locally manufactured



UNIQUE SELLING POINTS

SUSTAINABLE & DURABLE

Technology

- Producibility: can process flakes directly so no high machine investments needed
- Scalability: Semi-finished products can be stored, and once machines reach their maximum capacity, an extra machine can be added
- Risk & compliance: Quality performance, with health and safety compliant setup

Product performance

- Sustainability – longer life: material vs wood based sheet
 - Lifespan: 40+ years r-plastic lumber vs 20 years hardwood
- Sustainability: green image – local waste converted
- Sustainability: easily repaired / parts replaced / recyclable
 - Recyclable: r-plastic sheets 7x recyclable
- Superior performance: weather proof / termite proof / UV-resistant
- Convenience: easily cleaned
- Superior Design: high end product/ distinctive design / high quality surface finish

Market

- Marketability: Completely circular product
- Marketability: Different furniture for different markets; tourism (i.e. hotels, restaurants), public (schools), private
- Marketability: Locally made vs imported
- Flexibility: Semi-finished products which can be sold directly or made into different end products with existing wood working techniques

DIFFERENTIATION FROM COMPETITION

HOSPITALITY SECTOR



Cheap plastic furniture



Cheap metal



Wicker



Pool lounge furniture



Picknick furniture



Hardwood furniture

- More durable and longer lasting than cheap plastic import patio chairs
- High-end design
- Lasting look
- Easy repair with local service and parts from producer
- Added sustainable image value

CONCEPT DESCRIPTION

MIXED PLASTIC EXTRUSION BASED

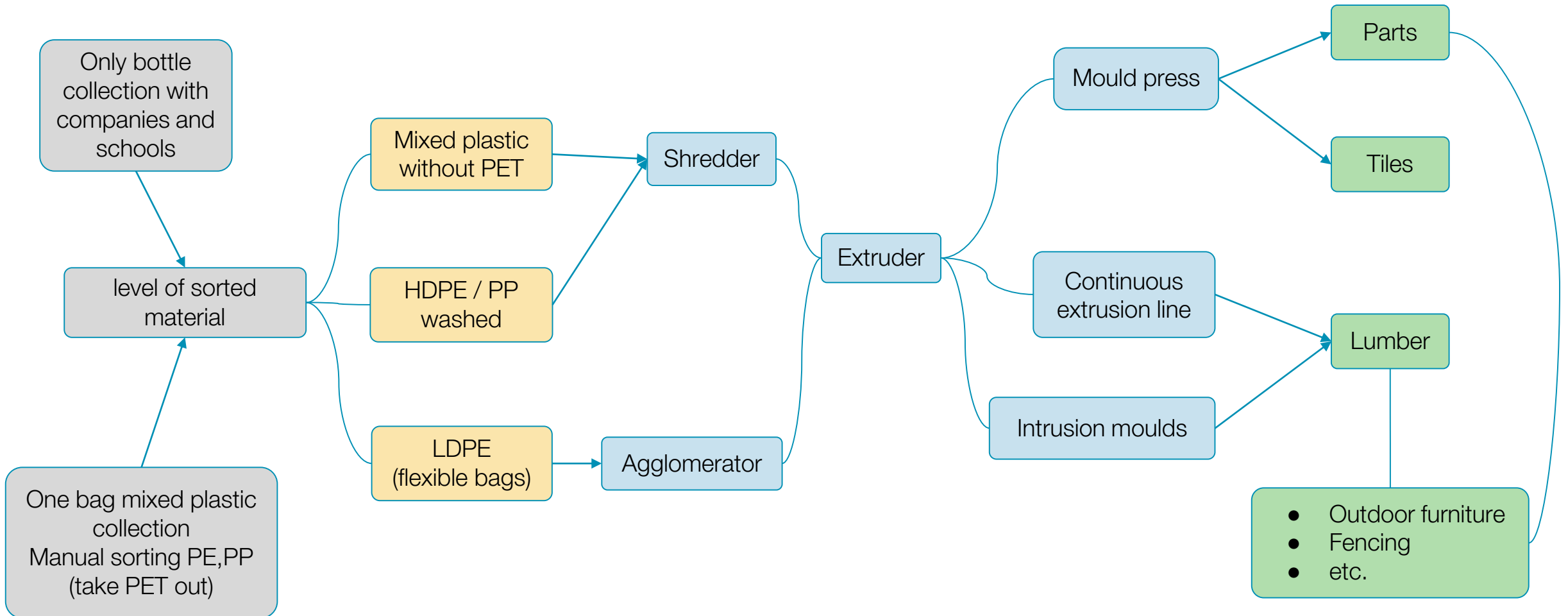
Technique: Extrusion based (setup around extruder) + add-on moulding options

- Machines: shredder and/or agglomerator, extruder, press + moulds, intrusion moulds, or continuous extrusion line
- Woodworking equipment: Saw table / crosscut saw, mill, hand tools.
- Types of plastic converted:
 - High-end product: HDPE sorted & washed
 - Lower-end product: Mixed unwashed plastics with >70% PE/PP
- Amount of plastics used: e.g. 8.53 kg per 40x80x2800 beam, or 4.59 kg per 18x130x2800mm HDPE plank, or 75 kg per Bench
- Source of input materials: Collection of HDPE, PP, (LDPE) or all mixed plastics
 - Source segregation in resorts, hotels, schools:
Bottle only collection HDPE + PP caps, with after-sorting of PET
 - to be expanded in a later stage with public collection points
 - bags can be added for LDPE, if an agglomerator is added
- Impact: up to 150 tonnes / year = 15% of total HDPE + PP + LDPE stream, 5% of total plastic generated



OUTLINE WASTE TO PRODUCT

RECYCLING PROCESS



COLLECTION AND SORTING

IDENTIFYING

FIGURE 2: MAIN PLASTIC RESIN TYPES AND THEIR APPLICATIONS IN PACKAGING



Source: Plastics Platform analysis

Plastics have different properties
The focus in this business plan lays on:

- HDPE, PP and LDPE for their melting properties & easiness to recycle
- Slide 6-8 give an overview of what kind of applications are typically made of the targeted materials in the local context



COLLECTION AND SORTING

COLLECTION

Drop off points

- E.g. schools, supermarkets, public buildings, or resorts
- Incentives for consumers to sort and return plastic products
 - E.g. Discounts on end product
- Educational programmes and awareness campaign

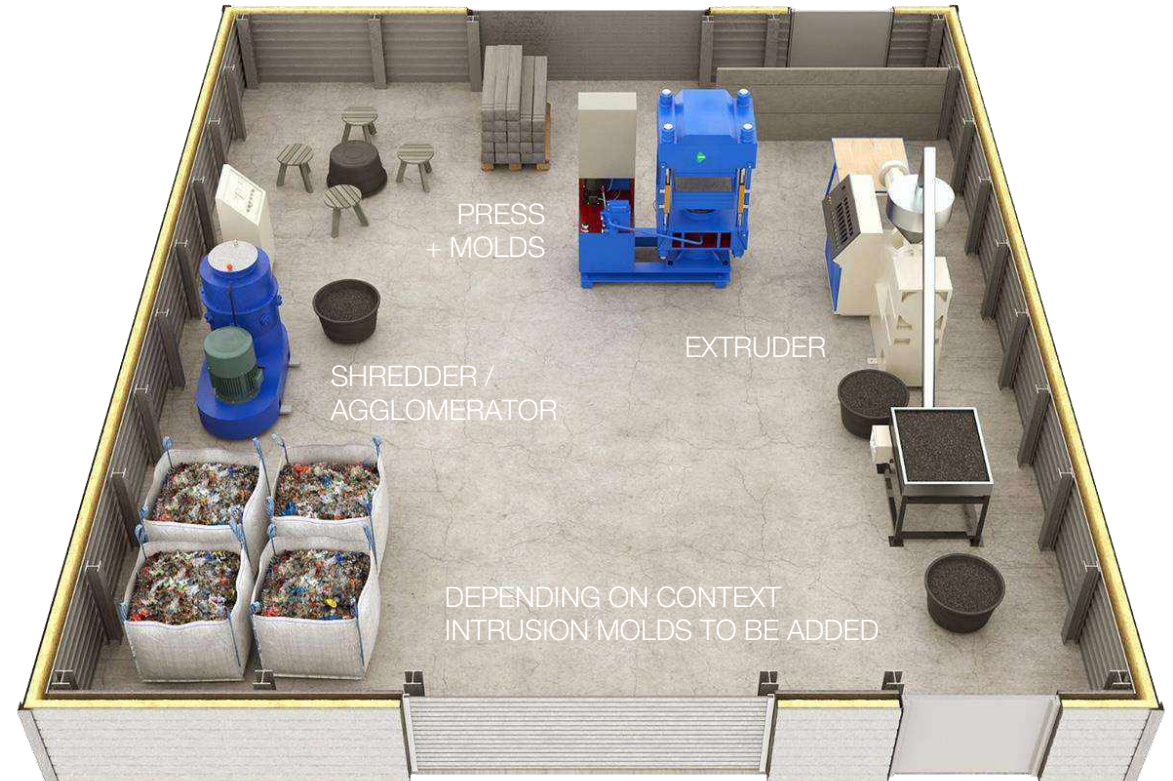
Collaboration with existing waste management structures is crucial

- E.g. partnership with municipal solid waste management
- Collaboration with ministries and government



MACHINERY

Machines	USD 49.000	
Shredder, 5 kW	USD 5.000	
Optional: shredder with washer		At a capacity of 250 kg/h 80kW is needed and will cost around 30.000 USD
Agglomerator	USD 5.000	
Extruder, 35 kW	USD 15.000	Spare parts like heating element and screw removal tool included
Intrusion moulds, on cart system	USD 10.000	
Press, 3 kW	USD 7.000	
Two moulds	USD 7.500	Mould costs are estimated because they depend on product design, and related production method (mill/laser/waterjet)
Optional: For 220V3P or 440V3P there will be extra costs (estimate) USD 2.00		Standard voltage of the machines is 380V, 50 or 60Hz.
Shipping (CIF) estimate	USD 14.000	Shipping cost are hard to predict due to fluctuations from china. Shipping costs of moulds not included; depends on local or remote production
Support at distance by Technical partner (3 years)	USD 10.000	
Detailed machine specification		
Support RFQ process		
Verification Factory acceptance test (FAT)		
Mould drawings		
Remote support for setting up facilities incl. unpacking and installing equipment		
Remote training and support machines start up		
Provide manuals, maintenance and user instructions		
Support on input mix and additives		
Total	USD 73.500	



Modular production hall layout example

SELECTION FACTORS

TECHNIQUE AND PRODUCT



Impact

- (semi-) Industrial set-up and machinery to
 - Convert enough plastic to keep from landfill and (ocean) leakage
 - Get quality output that can compete with existing products
 - Create durable business
 - Create local employment



Flexibility

- Create different (mix of) semi-finished and end-products
- Create output material for different markets
- Enable sector-specific contribution to reduce waste
- Enable to convert different plastics



Viability

- Durable business plan / calculation
- Fitting the volumes on the island
- Ready for investors to step in
- Scalable: capacity aim is 150 tonnes / year



Complementarity to existing initiatives

- Utilizing local recycler's machinery, if compatible
- Tailor-made for local situation and market

SELECTION APPROACH

Recycling technology

This table provides a structured approach on how the recycling technology is selected. It is a general comparison example used for the technology selection, in which island specific factors have been considered.

PWFI - WASTE TO PRODUCT - TECHNOLOGY COMPARISON

Categories	Weighting factor	Sheet press	Intrusion	Mixed extrusion + moulding	Mould melting	Rotomoulding	Mixed extrusion additive	Injection moulding
Processing capacity • What volume of plastic can be converted (connected to volume of the island) small: < 20 tonnes / year Aim: medium: 20-500 tonnes / year large: > 500 tonnes / year In general the better the fit, high the score	1	★★★★●●	★★★★★★	★★★★★★	★★●●●●	★★★★●●	★★★★★★●	★★★★●●
Marketability • Can the product compete with other products? • Will it replace a product for the better?	1	★★★★●●	★★★★★★	★★★★★★	★★●●●●	★★★★★★	★★★★★★	★★★★★★
Costs • Investment to set up machinery • Energy consumption in use • Expected revenue	-2	★★★★●●	★★★★●●	★★★★●●	★★★★★★	★★●●●●	★★●●●●	★★●●●●
Environmental safety during / after use • Non-toxic risk during production • No leakage (microplastic) • Recyclable at EOL	2	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●
Ease of implementation • Preparation of the input material - less sorting - less influence of contamination • Complete and ready setup of the machinery • Low skill and easy learning	1	★★★★●●	★★★★★★	★★★★●●	★★★★●●	★★●●●●	★★●●●●	★★●●●●
Product value • Product with long life-span • A high value end-product	1	★★★★●●	★★★★★★	★★★★★★	★★★★★★	★★★★★★	★★★★●●	★★★★●●
Overall score		★★★☆☆	★★★★☆	★★★★☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆

MARKET ANALYSIS

HOSPITALITY + B2B

Primary market

- Tourism - Hospitality Outdoor furniture and Construction, i.e. dinner chairs, fencing, plastic lumber

Secondary markets

- B2C: High-end consumer design furniture has similar product characteristics and demands (overlap villas and apartments)
- B2B: semi-finished products, i.e. timber, lumber, sheets for furniture makers. i.e. countertop
- Public: governmental, school furniture
- Public works, Infrastructure + construction: governmental, public furniture, e.g. park bench, picnic table, signage, fencing

Market size hospitality furniture

- 60+ hotels & resorts with over 3,000 rooms

Estimated total annual expenditure on furniture

- USD 210,000 (3000 rooms and accommodations with an average spending of \$70/year/room on outdoor furniture)

Global expected CAGR (Compound Annual Growth Rate) tourism after Covid-pandemic

- 3.1% (2021-2026)

Longer term market fundamentals

- Shorter supply chains decrease need for imports
- Less pressure on landfill

Demand-drivers

- Showing sustainable focus
- Longer-lasting alternatives
- Locally produced

MARKET ANALYSIS

HOSPITALITY + B2B

Market needs

- Durable furniture
- Easy to maintain / high quality
- Indoor and outdoor application
- Sustainable / green
- High-end design

Buying patterns

- Current yearly renew due to poor quality and extreme weather conditions

Locations of potential customers

- Mostly coastal area

Specify domestic vs export markets

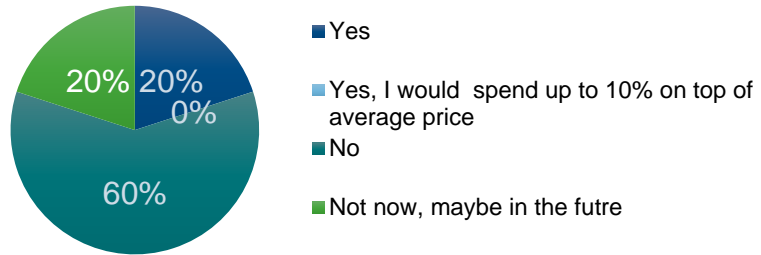
- Domestic: local network of sub sellers (stores, Do-It-Yourself markets, furniture makers)
- Export potential:
 - Caribbean region: local furniture production based on recycled plastic lumber

Launching customers

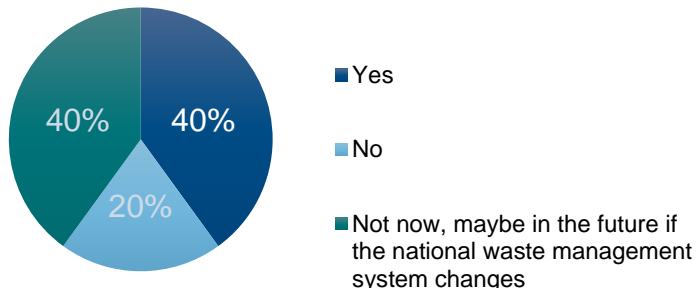
- Accommodations that collect material themselves
- Governmental bodies

BUSINESS DRIVERS

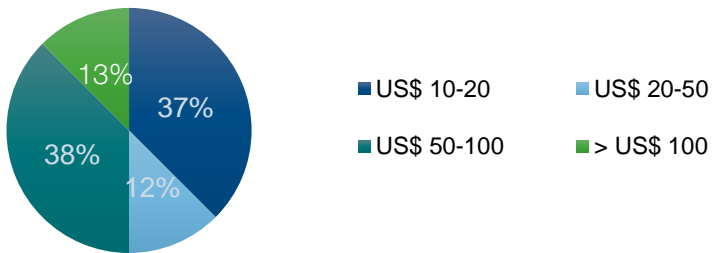
COMMERCIAL MARKET ANALYSIS HOSPITALITY



20% willingness to purchase recycled plastic furniture made from own waste + **20% willing to consider** purchasing in the future



40% willingness to source-segregate recyclable plastics + 40% if the national waste management system changes - place a separate bin for collecting HDPE / PP shampoo, body wash and detergent bottles at hotel / resort



Current budget for outdoor furniture (e.g. x1 plastic chair)*:

Saint Lucia survey results: 75% willingness to spend $\pm 10\%$ > average price

*This question was not part of the Antigua & Barbuda survey

BUSINESS DRIVERS

INDUSTRY SUPPORT – INNOVATION AWARDS

Recycled HDPE dining chair made from Caribbean plastic waste streams is already recognized by industry experts as a promising and innovative business plan:

shortlisted for the prestigious **Plastics Recycling Awards Europe 2021**

- Household and Leisure products category



MARKET INTRODUCTION PLAN

FROM FUNCTIONAL PROTOTYPE TO MARKET INTRODUCTION

Timeline for key milestones of product development

PHASE 1- has been completed

- Extrusion testing
- Feedstock preparations
- Product interest inventory
- Design concept for products
- Engineering
- Prototyping
 - assembly testing
 - impression and use testing
- Improving based on feedback

PHASE 2

- Securing finances; procurement of machinery; staff recruitment

PHASE 3

- Production testing
- Production procedures development
- Packaging development
- Commercial production based on staged approach

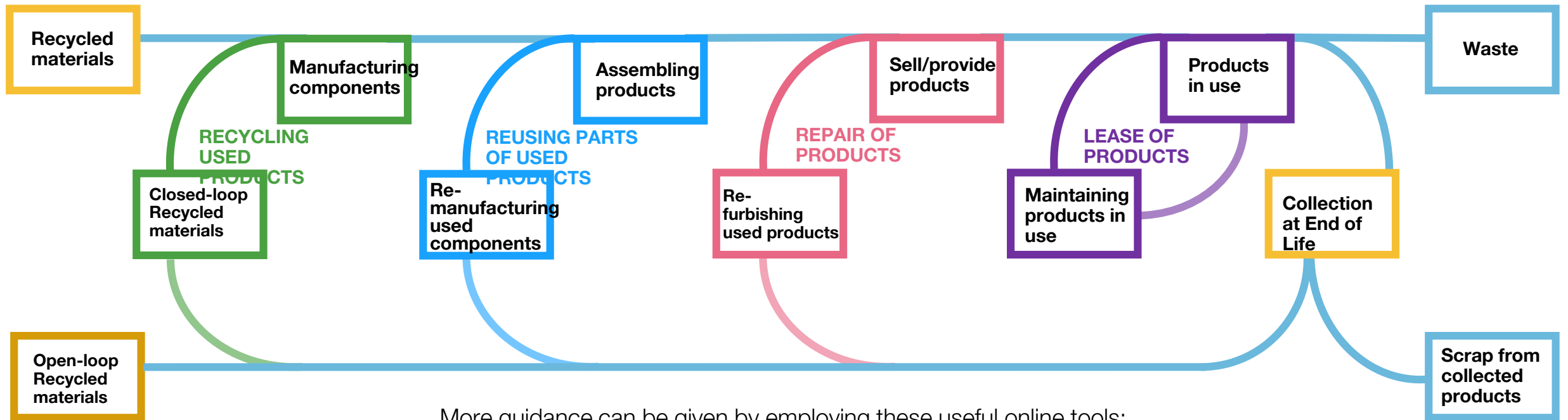
Engagement & Sales

- Sales approach
 - Personal sales contact
 - Online order and service website
- Sales channels
 - Sales person
 - Web shop
 - Furniture stores
 - Do-It-Yourself stores
 - Workshop showroom/store
- Engagement (communication with target groups)
 - Sales person
 - Website
 - Showroom
 - Exhibition

POTENTIAL FOR CIRCULARITY

INCREASING CIRCULARITY

The below graph guides you on how to achieve maximum circularity for your product – on every step of the value chain!



More guidance can be given by employing these useful online tools:

[Circularity Calculator](#) and [Circularity Pathfinder](#)

OPERATIONS

KEY RESOURCES, ACTIVITIES, PEOPLE

Tools & Machines

- Shredder
- Optional agglomerator if collection is expanded for flexibles processing
- Extruder
- Intrusion moulds
- Press + press moulds
- CNC mill
- Woodworking tools
- Pick-up truck

Space & Permits

- 20 sqm stock
- 50 sqm production
- 20 sqm wood workshop

Key Tasks /activities

- Feedstock preparation
 - Collection
 - Washing
 - Shredding / agglomeration
- Production
 - Extrusion + intrusion + press moulding
 - Machine maintenance
- End-product making
 - Cutting
 - Edge routing
 - CNC milling
 - Finishing
 - Packing
 - Servicing and repairs
- Sales and Distribution
 - Sales contact
 - Transportation: pick-up and delivery

People

- Personnel: 7.5 up to 11 FTE
 - Sales person
 - Technician
 - Admin + online
 - Collection & Distribution - Transport
- Collaborators
 - Retailers, stores
 - Tourism sector
 - Government
 - IUCN/Serious Business

Running costs

- Space rent
- Electricity, water
- Staff costs
- Transport

FINANCIALS

SUMMARY AND SALES OVERVIEW

Diversifying the product portfolio is necessary to build a sustainable business model. The sales overview example provides ideas for possible other products.

Sales Overview				
Products & Services	Selling Price Per Unit	Number of Expected Sales Per Month	Total Product Cost	Profit Margin
50 kgs of Medium Shredded Plastic	0.00	166.7	17.73	-100.00%
mixed Beam 2800 x 40 x 80 mm	17.00	300.0	15.32	10.96%
mixed Plank 2800 x 28 x 130 mm	19.00	180.0	16.98	11.87%
Pavement tile	11.70	460.0	10.51	11.30%
wide HDPE plank 2800 x 18 x 130 mm	17.40	180.0	15.48	12.42%
narrow HDPE plank 2800 x 18 x 65 mm	12.30	90.0	10.96	12.19%
Bench parts	0.00	12.0	36.08	-100.00%
Park bench	165.00	12.0	91.58	80.17%
Trash nest	240.00	30.0	131.89	81.97%
Lounge chair	53.00	30.0	29.49	79.74%
Side table / foot bench	34.00	15.0	18.78	81.08%
Dining chair	40.00	60.0	22.05	81.37%
Dining table	74.00	15.0	40.47	82.87%

Summary	
Starting capital	183,532.06
Months to Pay Back Investment	33
Full Time Employees Needed	7.5
Revenue Earned Per Month	32,931.0
Fixed Costs Per Month	1,560.00
Material Costs Per Month	17,639.83
Total Wages Paid Per Month	7,995.24
Total Profit Earned Per Month	5,735.94

FINANCIALS

CASH FLOW

Cash Flow

A cash flow analysis shows that you have enough money throughout your first year to buy materials, pay your employees, or make an investment into a new machine.

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Money In Bank (Beginning of Month)	183,532.06	35,309.09	43,423.12	51,537.15	59,651.18	67,765.21	75,879.24	83,993.27	92,107.30	100,221.33	108,335.36	116,449.39
Initial Investment	183,532.06											
Revenue	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00
Total Cash In	216,463.06	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00	32,931.00
Investment Costs	(156,337.00)											
Variable Costs	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)	(23,256.97)
Fixed Costs	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)
Total Cash Out	(181,153.97)	(24,816.97)	(24,816.97)	(24,816.97)	(24,816.97)	(24,816.97)	(24,816.97)	(24,816.97)	(24,816.97)	(24,816.97)	(24,816.97)	(24,816.97)
Net Cashflow	35,309.09	8,114.03	8,114.03	8,114.03	8,114.03	8,114.03	8,114.03	8,114.03	8,114.03	8,114.03	8,114.03	8,114.03
Money In Bank (End of Month)	35,309.09	43,423.12	51,537.15	59,651.18	67,765.21	75,879.24	83,993.27	92,107.30	100,221.33	108,335.36	116,449.39	124,563.42

FINANCIALS

PROFIT, LOSS

Profit and Loss

This table is to show how much money the company is projected to make each year. It assumes that you paid yourself for the hours you worked, so the "Net Income" at the bottom is the remaining profit made by your company. It is greatly influenced by the "Monthly Sales Improvement Rate" on the Dashboard page. This table is also useful to show your bank or include in grant applications.

	Year 1	Year 2	Year 3
Revenue	395,172.00	434,689.20	478,158.12
Cost of Sales	279,083.65	306,992.01	337,691.21
Net Revenue	116,088.35	127,697.19	140,466.91
Fixed Costs	18,720.00	18,720.00	18,720.00
Gross Income from Operations	97,368.35	108,977.19	121,746.91
Business Taxes	24,342.09	27,244.30	30,436.73
Net Income	73,026.27	81,732.89	91,310.18

Yearly Growth Rate

10%

(conservative scenario)

Business Tax Rate

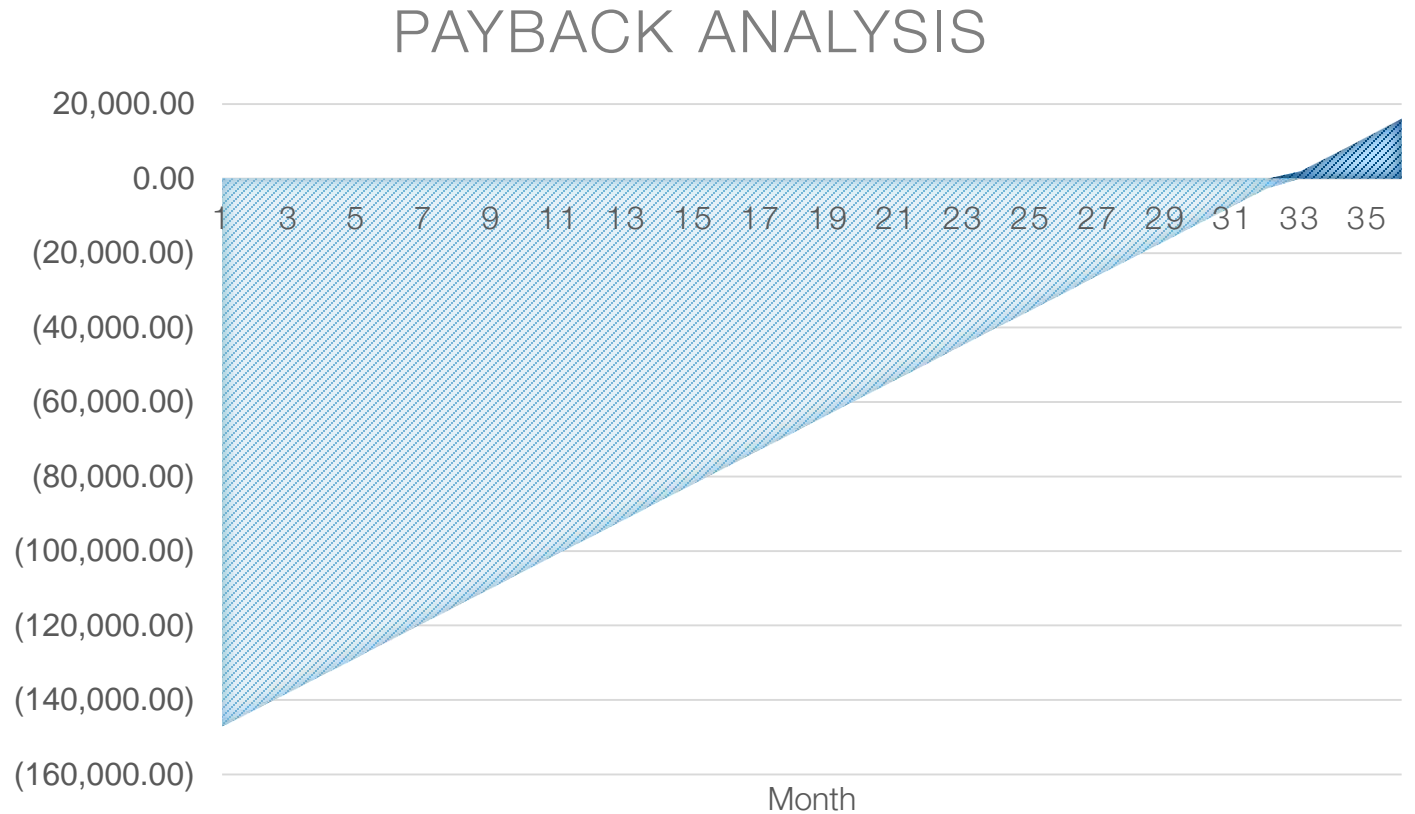
25.00%

FINANCIALS

FUNDING & ROI

Starting capital: US \$ 183,532,
ROI 33 months

- Mostly machines and personnel






FINANCIALS

FUNDING PLAN

- Private money
- (Development) Bank loans: de-risking partner, e.g. offering loan guarantees
Incl. IADB, ADB, IFC, CEB
- Investors/business accelerators ((pre)-seed, angel investment, early stage)
 - Caribbean Export Development Agency
 - Caribbean Business Angels Network
 - Blue Bio Value
 - Blue Natural Capital Finance Facility
 - Ennovent
 - For Good Venture
 - LatitudR (the extension of the Inclusive Regional Recycling Initiative (IRR))
 - SAGANA
 - Sky ocean ventures
- (Governmental) grants
 - Development Cooperation partners, incl. UK, Norway, Italy, US, Germany, Swiss, France, China, Japan,
 - UNDP Innovation Fund
 - IUCN
 - World Bank - ProBlue. NGOs could become a third party within a governmental program

FACTSHEET

BENEFITS

Financial benefits 	Environmental benefits 	Social benefits 
ROI – 33 months	Lower landfill pressure for government: up to 150 tonnes / year or 14% HDPE/PP/LDPE waste diverted from landfill/dumpsites	Develop recycling market - Create more jobs in island in collection, sorting, cleaning, recycling – 7.5-11 FTE when converting 5% of total plastic waste generated
Better license to operate for construction and furniture market. And allows for green/circular public procurement	Approx. 164.7 tonnes of CO2 emissions saved by redirecting plastic waste into products	Contribution to cleaner island and attractiveness for local population and visitors
Customer loyalty for producers	Reduced amount of plastic waste that might leak into the environment. up to 150 tonnes / year diverted from potential leakage	
Lower waste disposal and clean-up costs for government: Approx. savings XCD 21,323 /year		

FOR MORE INFORMATION

IUCN



IUCN_Plastics



plastics@iucn.org



<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



#CloseThePlasticTap

Searious Business



SeariousBusiness



connect@seariousbusiness.com



<https://www.seariousbusiness.com/islands>



#PlasticWasteFreelands #CloseThePlasticTap





PLASTIC WASTE FREE ISLANDS

FIJI

BUSINESS PLAN

WASTE-TO-PRODUCT



An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



Norad



ACKNOWLEDGMENTS

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This work could not have been accomplished, first and foremost, without the partners and stakeholders who supported the data collection efforts within each country. Above all, the PWFI team acknowledges the generous support of the Norwegian Agency for Development Cooperation (NORAD), and the cooperation of Searious Business.

Thanks also goes to colleagues in the IUCN regional and country teams for their continuous and invaluable support throughout the implementation of the assessment.

AUTHORSHIP

To be cited as

Searious Business, (2021). Report to IUCN Plastic Waste Free Islands, Waste-to-Product Business Plan, Fiji, Gland, Switzerland, IUCN

Support and Funding



Technical Lead Authors



Implementing Agency



Design

Ludovic Di Donato

WASTE-TO-PRODUCT

BUSINESS PLAN

PLASTIC WASTE FREE ISLANDS



The **Plastic Waste Free Islands (PWFI) Project** is part of the *Close the Plastic Tap* Program of IUCN. PWFI is a three-year project working in six islands in the Caribbean and Pacific.

Implemented in Fiji, Vanuatu and Samoa in Oceania and Antigua and Barbuda, Saint Lucia and Grenada in the Caribbean, the project seeks to promote island circular economy and to demonstrate effective, quantifiable solutions to addressing plastic leakage from Small Island Developing States (SIDS).

This business plan focusses on the “**Waste-to-product**” solution, in the geographic context of Fiji. It demonstrates how the solution can be realized, allowing for the creation of an alternative value chain.

MISSION

WHAT & WHY

What

- A successful business in Furniture and semi-finished products
 - Made from recycled plastic
 - Locally sourced and locally produced

Why

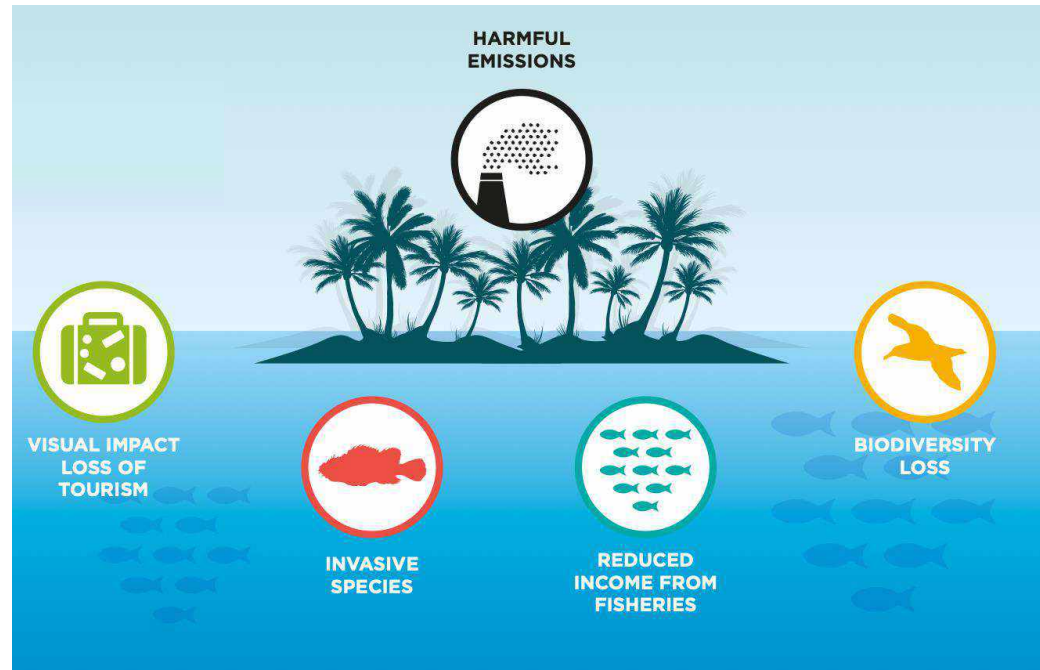
- Local business opportunity
 - Reduce Import-dependency
 - Enhance resource recovery options on-island
 - Job creation
- Reduce overfull landfills and high plastic leakage prevalence
 - Improved waste management
 - Lower environmental impact



WHY START THIS BUSINESS

PLASTIC WASTE GENERATION & LEAKAGE

Plastic Waste Generation: The total amount of plastic waste that is produced on an annual basis, per plastic material type



Financial and environmental impacts of plastic leakage

Plastic Waste Leakage: The amount of unaccounted waste that is calculated by the difference of plastic material imported and plastic waste disposed.

	Annual net Imports 2018-2019 (T/y)	Total disposed 2019 - landfill (T/y)	Total disposed 2019 – dumpsite (T/y)	Total recycled 2019 (T/y)	Leakage (T/y) (95% credible interval)
PET (1)	4540	2164	1459	10	951 (3-2091)
HDPE (2)	2246	974	706	6	567 (2-1402)
PVC (3)	160	853	53	0	52 (0.3-126)
LDPE (4)	1854	514	584	12	429 (1-1079)
PP (5)	1254	55	369	0	378 (2-887)
PS (6)	3942	2021	810	0	1120 (18-2408)
Other (7)	5671	2634	1688	0	1382 (5-2817)
Overall	19667	9215	5669	28.2	4880 (1675-7946)

National plastic waste generation & leakage data Fiji with polyolefins in blue.
Source: Final quantification report – Executive summary APWC July 2021

CONTEXTUAL ANALYSIS OF WASTE MANAGEMENT PRACTICES

The contextual analysis of waste management practices summarizes the current situation of waste management in Fiji. It evaluates actions like collection, sorting and recycling, as well as future ambitions.

- No wide scale source segregation, collection, or segregation at landfill, except for PET bottles
 - Large volumes of rigid HDPE, PP and flexible LDPE waste that could be diverted quite easily from landfill
- Key initiatives (250 of 1825t/y PET is collected)
 - Recyclers – i.e. Waste Recyclers Ltd. : 25yrs of PET collection (for export); and local collection & recycling initiatives (CBOs, NGOs)
 - Marina – “Best profit Idea”: yellow bags for unrecyclable waste (\$2/bag) - all recyclables free of charge
 - Bottling companies - plastic pledges (100% recycling, % recycled content) and collection through Mission Pacific
 - SPREP/PRIF/JICA/JPRISM – Waste Management investments and CDL/ARF-feasibility study
- Pipeline:
 - Hot wash flake installation for PET
 - Advanced Recovery Fee system policy paper is being developed by PWFI for recyclables, incl PET and possibly HDPE
 - Bottle to Bottle recycling, PWFI-Working Group Waste-to-Product Business Plan, Fiji, 2021, IUCN



Source: Quantification report, Executive summary, APWC July 2021

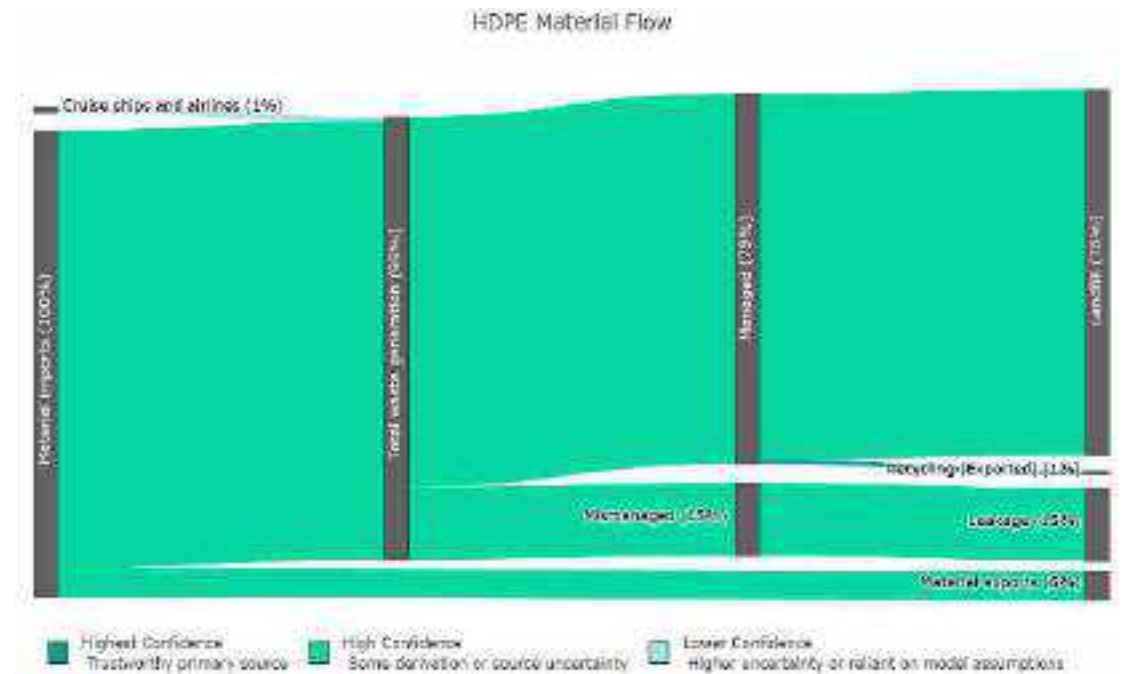
TARGETED MATERIAL(S)

HDPE – CURRENT VALUE CHAIN

Polymer type	Plastic Item	Household (T/y)	Commercial (T/y)	Tourism land (T/y)	Fisheries (T/y)	Total
HDPE 2	beauty and personal care hdpe	194.50	0.00	0.00	0.22	194.72
HDPE 2	garbage bags single use	28.80	923.30	14.60	0.00	966.70
HDPE 2	light shopping plastic bags single use	134.90	0.00	0.00	0.00	134.90
HDPE 2	food containers hdpe	41.10	2.60	0.00	0.00	43.70
HDPE 2	other hdpe	56.90	14.00	0.00	0.00	70.90
HDPE 2	cleaning agent products hdpe	68.60	2.00	0.00	0.00	70.60
HDPE 2	home care hdpe	9.00	0.00	0.00	0.00	9.00
HDPE 2	beverage containers pvc hdpe	29.20	0.00	0.00	0.00	29.20
HDPE 2	shampoo body wash hdpe	38.90	0.00	0.00	0.00	38.90
HDPE 2	laundry detergents bottles hdpe	104.00	2.10	8.10	0.00	114.20
						1,680.1

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

High-density Polyethylene (HDPE): A thermoplastic polymer used in a wide variety of applications, e.g. shampoo bottles and milk containers. HDPE is easily recyclable.



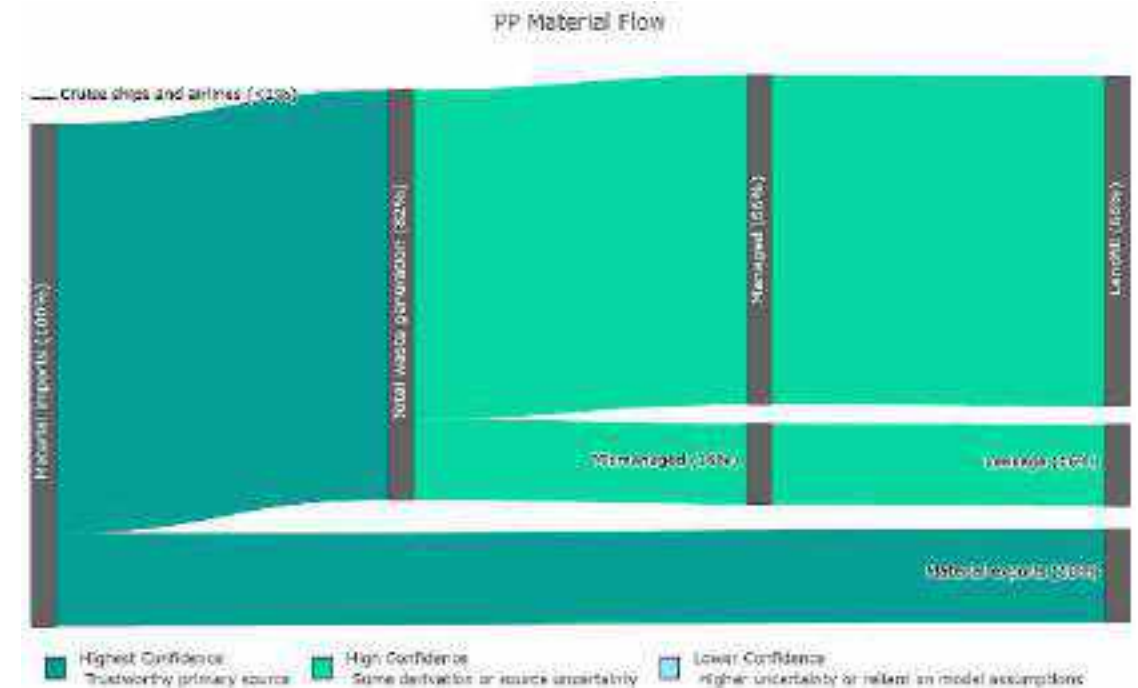
TARGETED MATERIAL(S)

PP – CURRENT VALUE CHAIN

Polymer type	Plastic Item	Household (T/y)	Commercial (T/y)	Tourism land (T/y)	Fisheries (T/y)	Total
PP 5	food semi rigid containers e.g trays pp	137.50	234.10	8.20	0.74	380.54
PP 5	food containers pp	57.40	1.40	6.70	0.68	66.18
PP 5	container lids pp	33.80	46.90	23.00	0.41	104.11
PP 5	glossy shopping bags single use plastics	17.70	59.10	0.00	0.17	76.97
PP 5	rope pp	61.80	20.50	23.80	0.00	106.10
PP 5	medicine bottles pp	7.90	0.00	1.60	0.00	9.50
PP 5	other pp	126.90	0.00	0.00	0.00	126.90
PP 5	straws single use	0.10	0.00	0.00	0.00	0.10
PP 5	single use take away food containers pp single use	6.60	1.60	0.00	0.00	8.20
						882.6

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Polypropylene (PP): A thermoplastic polymer used in a variety of applications. PP is sturdy can be used in a flexible or rigid form. PP can potentially be recycled.



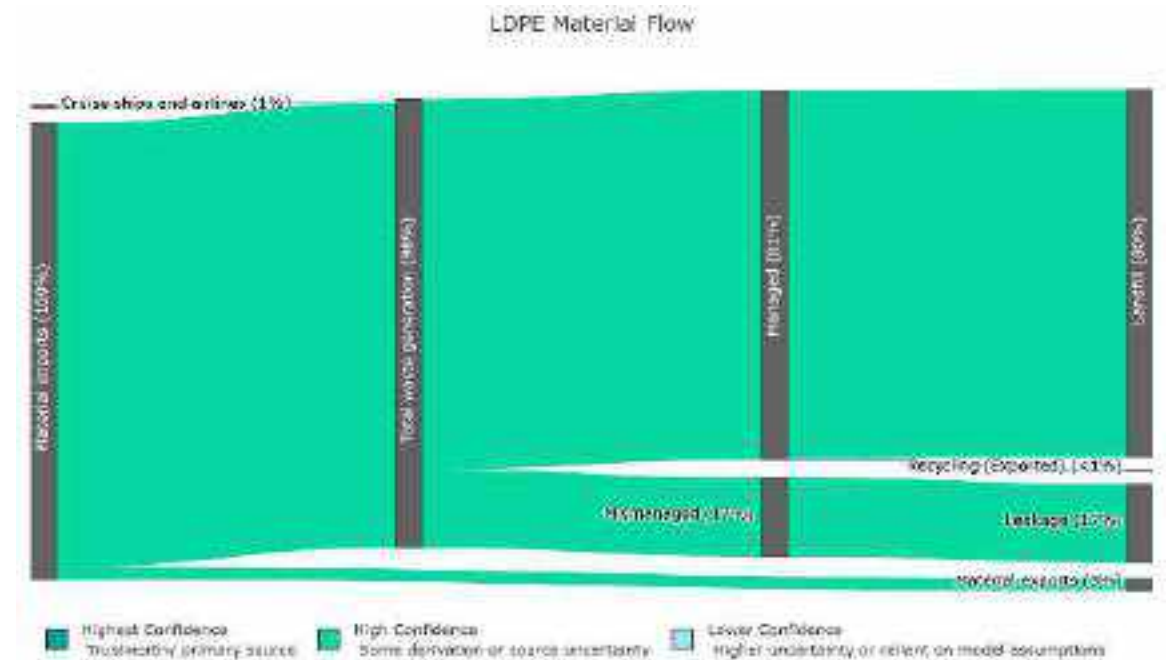
TARGETED MATERIAL(S)

LDPE – CURRENT VALUE CHAIN

Polymer type	Plastic Item	Household (T/y)	Commercial (T/y)	Tourism land (T/y)	Fisheries (T/y)	Total
LDPE 4	soft plastic packaging single use plastics	816.60	399.60	160.10	0.46	1376.76
LDPE 4	glossy shopping bags single use plastics	13.00	30.30	0.00	0.11	43.41
LDPE 4	food containers ldpe	1.70	0.00	0.00	0.00	1.70
						1,437.3

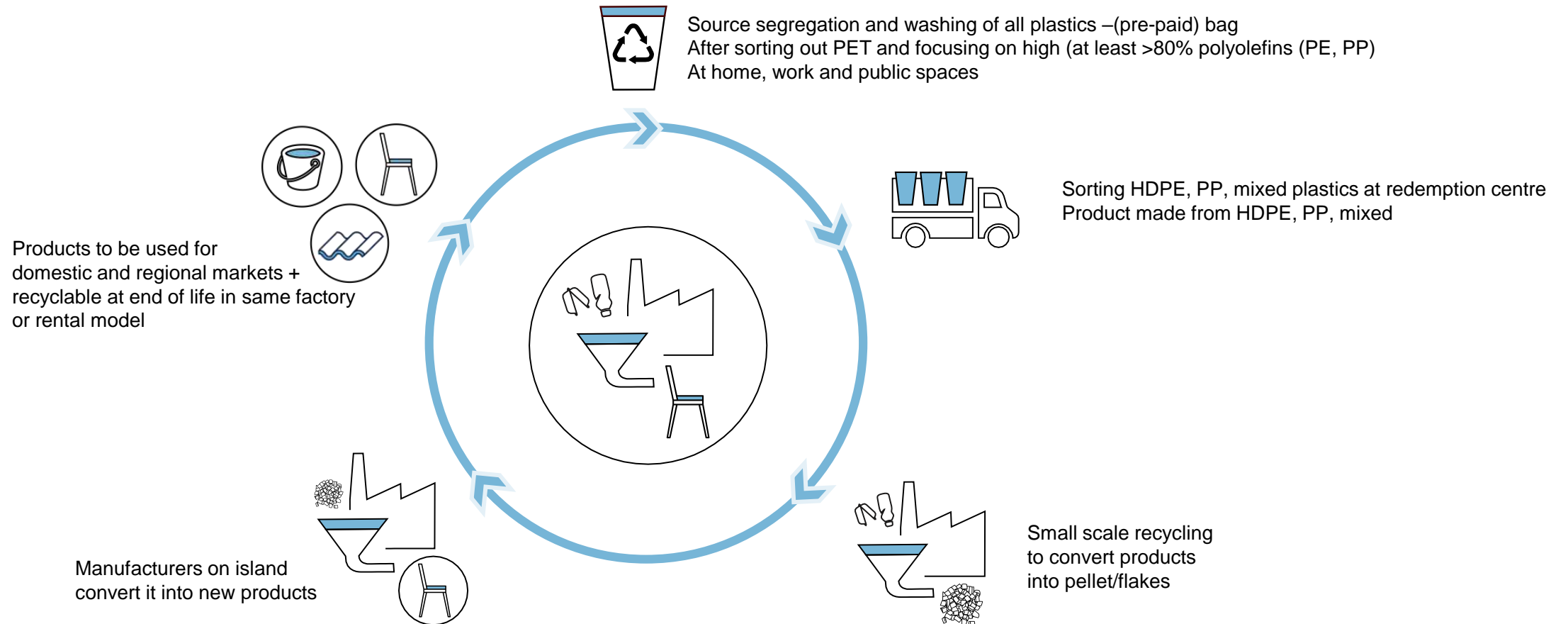
Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Low-density Polyethylene (LDPE): A thermoplastic polymer, which is a soft, flexible, lightweight plastic material, oftentimes used for plastic bags. LDPE is



OUTLINE WASTE TO PRODUCT

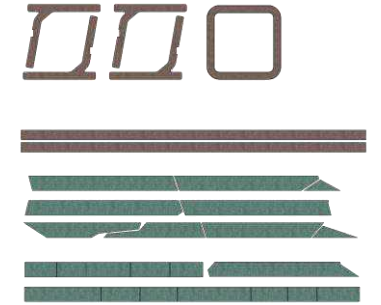
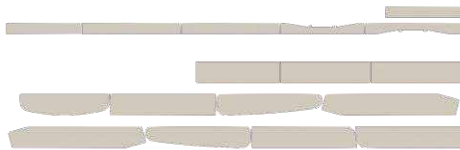
ALTERNATIVE VALUE CHAIN



PRODUCT CONCEPT

MIXED EXTRUSION PRODUCTS

- Beams, planks, tiles and parts (semi-finished product)
- Outdoor public and private furniture (end product)
- Example Prototypes:
 - Park bench (mainly polyolefins)
 - Dimensions: L650 x W1520 x H825 mm
 - Weight: 75 kg
 - Intended use: Garden, park, wharf, public space (outdoor)
 - Trash tree / trash nest (mixed plastics)
 - Dimensions: L1280 x W1320 x H1545 mm
 - Weight: 43 kg
 - Intended use: public space (central collection points (outdoor))
 - Lounge chair (recycled HDPE)
 - Dimensions: L 805 x W 733 x H 729 mm
 - Weight: 14 kg
 - Intended use: garden, park, wharf, public space (outdoor)



- Other potential products
 - Lumber/timber, planks, posts
 - Purlin, rubbing styles
 - Street furniture, benches, picnic tables
 - Decking, cladding, siding
 - Fencing, bollards, palisade, edging
 - Shed foundation blocks, water side sheeting
 - Bridges, wharfs
 - Signage, litter bins, planters, raised waste platforms
 - Pergola, doghouse
 - Garden, patio, terrace furniture
 - Exercise equipment
 - Traffic control: Wheel stops, speed humps, and rumble bars



USER SCENARIOS

Furniture

- Modular, repairable
- Produced locally
- Durable: Weather & climate-proof
- Comfortable



UNIQUE SELLING POINTS

SUSTAINABLE & DURABLE

Technology

- **Producibility:** can process flakes directly so no high machine investments needed
- **Scalability:** Semi-finished products can be stored, and once machines reach their maximum capacity, an extra machine can be added
- **Risk & compliance:** Quality performance, with health and safety compliant setup

Product performance

- **Sustainability – longer life:** material vs wood based sheet
 - Lifespan: 40+ years r-plastic lumber vs 20 years hardwood
- **Sustainability:** green image – local waste converted
- **Sustainability:** easily repaired / parts replaced / recyclable
 - Recyclable: r-plastic sheets 7x recyclable
- **Superior performance:** weather proof / termite proof / UV-resistant
- **Convenience:** easily cleaned
- **Superior Design:** high end product/ distinctive design / high quality surface finish

Market

- **Marketability:** Completely circular product
- **Marketability:** Different furniture for different markets; tourism (i.e. hotels, restaurants), public (schools), private
- **Marketability:** Locally made vs imported
- **Flexibility:** Semi-finished products which can be sold directly or made into different end products with existing wood working techniques

DIFFERENTIATION FROM COMPETITION

FURNITURE, TIMBER, CONSTRUCTION



Cheap plastic furniture



Hardwood lumber / timber



Fencing



Lounge furniture



Street furniture



Park/picnic furniture

- More durable and longer lasting than cheap plastic import patio chairs
- High-end design
- Lasting look
- Easy repair with local service and parts from producer
- Added sustainable image value

CONCEPT DESCRIPTION

MIXED PLASTIC EXTRUSION BASED

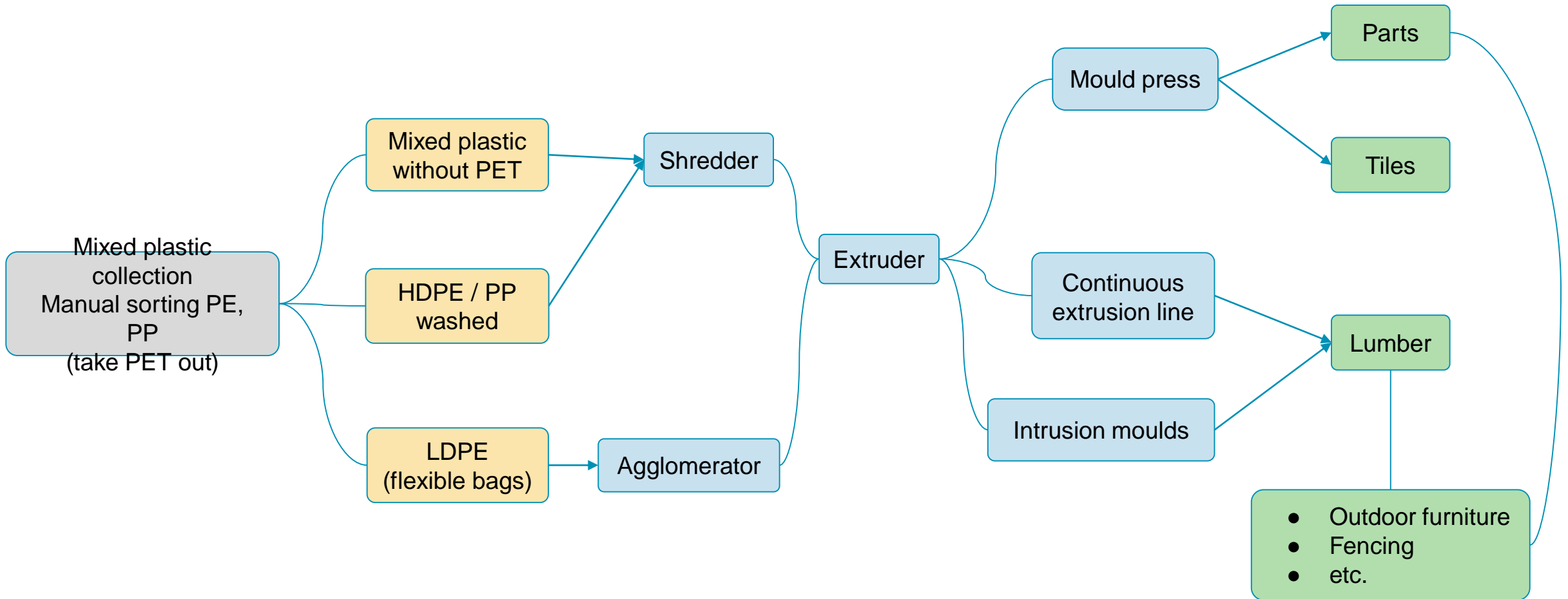
Technique: Extrusion based (setup around extruder) + add-on moulding options

- Machines: shredder and/or agglomerator, extruder, press + molds, intrusion moulds, or continuous extrusion line
- Woodworking equipment: Saw table / crosscut saw, mill, hand tools.
- Types of plastic converted:
 - High end product: HDPE sorted & washed
 - Lower end product: Mixed unwashed plastics with >70% PE/PP
- Comparison recycled plastic lumber vs (hardwood) lumber.
 - Lifespan: 40+ years r-plastic lumber vs 20 years hardwood
 - Recyclable: r-plastic lumber 7x recyclable
- Amount of plastics used: e.g. 8.53 kg per 40x80x2800 beam, or 4.59 kg per 18x130x2800mm HDPE plank, or 75 kg per Bench
- Source of input materials: Collection of HDPE, PP, LDPE or all mixed plastics
 - through (pre-paid) bag with all plastics collection and after sorting
 - Island wide stimulation through Advanced Recovery Fee scheme / Container deposit Legislation (CDL)
- Impact: up to 150t/y = 4% of total PE/PP stream, 1% of total plastic generated



EXTRUSION BASED

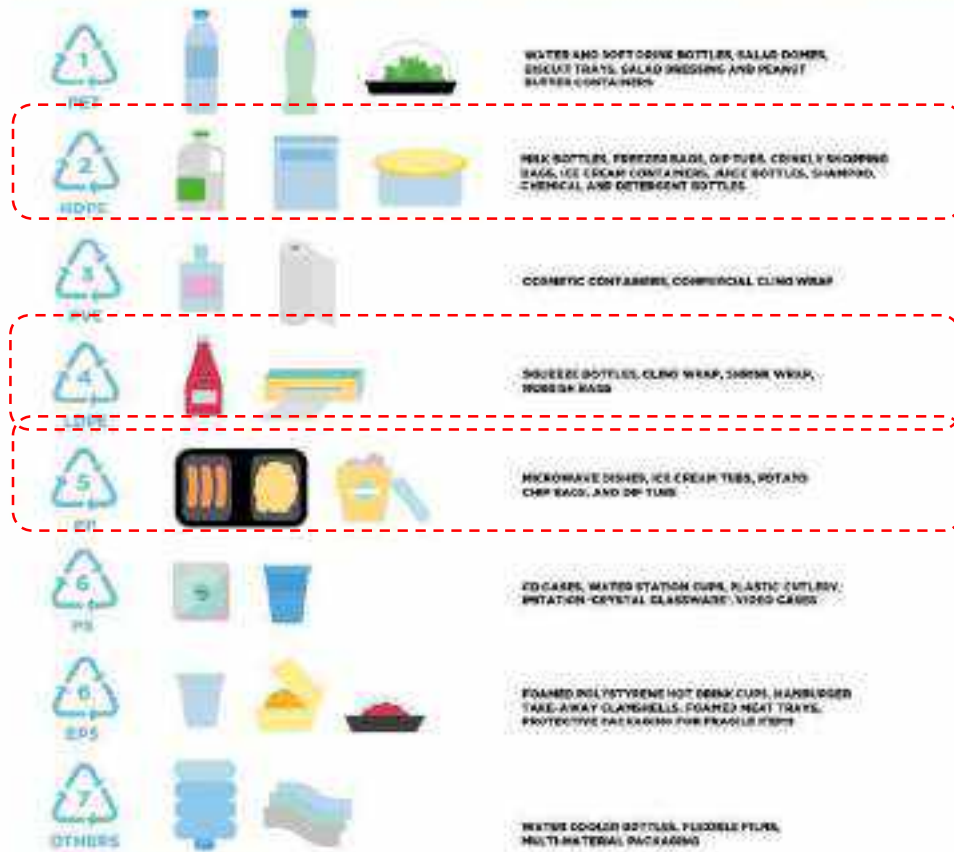
RECYCLING PROCESS



COLLECTION AND SORTING

IDENTIFYING

FIGURE 2: MAIN PLASTIC RESIN TYPES AND THEIR APPLICATIONS IN PACKAGING



Source: Project HornStream analysis.

Plastics have different properties
The focus in this business plan lays on:

- HDPE, PP and LDPE for their melting properties & easiness to recycle
- Slide 6-8 give an overview of what kind of applications are typically made of the targeted materials in the local context



COLLECTION AND SORTING

COLLECTION

While working towards public collection schemes for source-segregated plastic, strengthening and building on existing collection initiatives is recommended, including:

Drop off points

- E.g. schools, supermarkets, public buildings, redemption centers or resorts
- Incentives for consumers to sort and return plastic products
 - E.g. Discounts on end product
- Educational programmes and awareness campaign

Scale up collection of recyclables at commercial enterprises

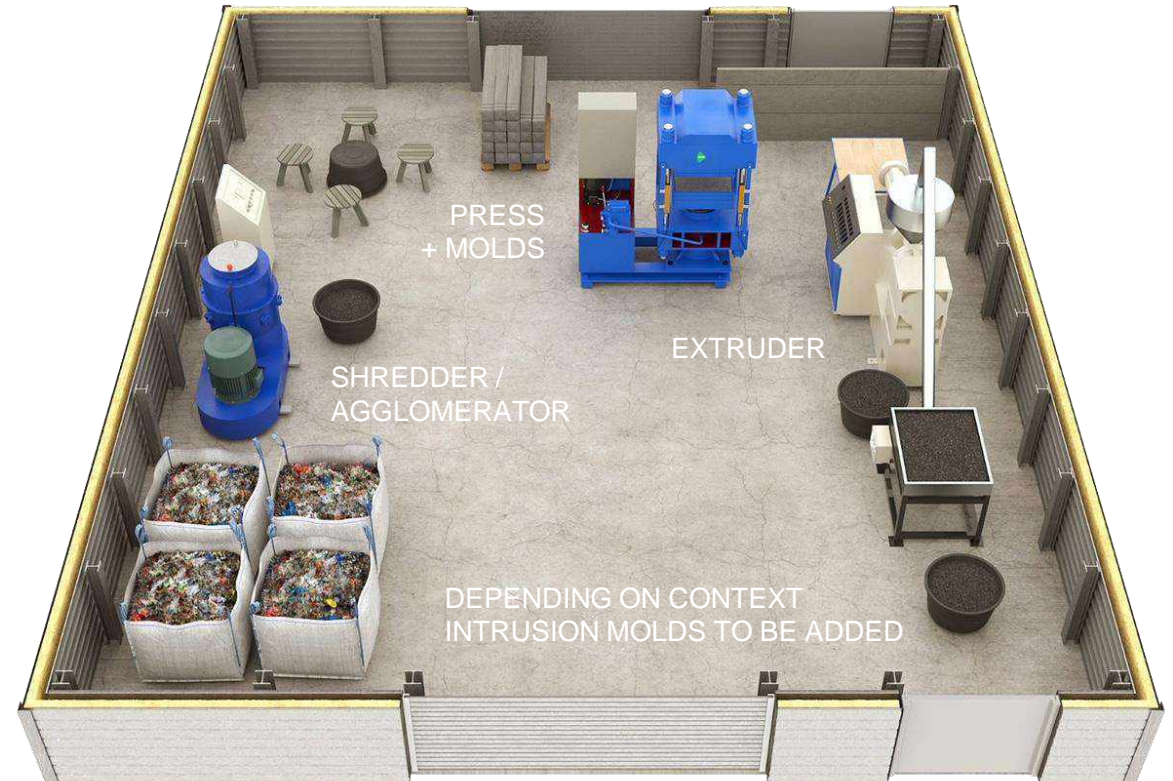
Collaboration with existing waste management structures is crucial

- E.g. partnership with municipal and private solid waste management
- Collaboration with ministries and government



MACHINERY

Machines	USD 49.000	
Shredder, 5 kW	USD 5.000	
Optional: shredder with washer		At a capacity of 250 kg/h 80kW is needed and will cost around 30.000 USD
Agglomerator	USD 5.000	
Extruder, 35 kW	USD 15.000	Spare parts like heating element and screw removal tool included
Intrusion moulds, on cart system	USD 10.000	
Press, 3 kW	USD 7.000	
Two moulds	USD 7.500	Mould costs are estimated because they depend on product design, and related production method (mill/laser/waterjet)
Optional: For 220V3P or 440V3P there will be extra costs (estimate) USD 2.00		Standard voltage of the machines is 380V, 50 or 60Hz.
Shipping (CIF) estimate	USD 14.000	Shipping cost are hard to predict due to fluctuations from china. Shipping costs of moulds not included; depends on local or remote production
Support at distance by Technical partner (3 years)	USD 10.000	
Detailed machine specification		
Support RFQ process		
Verification Factory acceptance test (FAT)		
Mould drawings		
Remote support for setting up facilities incl. unpacking and installing equipment		
Remote training and support machines start up		
Provide manuals, maintenance and user instructions		
Support on input mix and additives		
Total	USD 73.500	



Modular production hall layout example

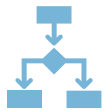
SELECTION FACTORS

TECHNIQUE AND PRODUCT



Impact

- (semi-) Industrial set-up and machinery to
 - Convert enough plastic to keep from landfill and (ocean) leakage
 - Get quality output that can compete with existing products
 - Create durable business
 - Create local employment



Flexibility

- Create different (mix of) semi-finished and end-products
- Create output material for different markets
- Enable sector-specific contribution to reduce waste
- Enable to convert different plastics



Viability

- Durable business plan / calculation
- Fitting the volumes on the island
- Ready for investors to step in
- Scalable: capacity aim is 150 tonnes / year



Complementarity to existing initiatives

- Utilizing local recycler's machinery, if compatible
- Tailor-made for local situation and market

TECHNOLOGY COMPARISON

MATRIX

This table provides a structured approach on how the recycling technology is selected. It is a general comparison example used for the technology selection, in which island specific factors have been considered.

PWFI - WASTE TO PRODUCT - TECHNOLOGY COMPARISON

Categories	Weighting factor	Sheet press	Intrusion	Mixed extrusion = moulding	Mould melting	Rotomoulding	Mixed extrusion additive	Injection moulding
Processing capacity - What volume of plastic can be converted (connect to volume on the island) - small: < 20 tonnes / year - Aim: medium: 20-500 tonnes / year - large: > 500 tonnes / year - In general the better the fit, high the score	3	★ ★ ★ ● ●	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ● ● ● ●	★ ★ ★ ● ●	★ ★ ★ ★ ●	★ ★ ★ ● ●
Marketability - Can the product compete with other products? - Will it replace a product for the better?	2	★ ★ ★ ● ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ● ● ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●
Costs - Investment to set up machinery - Energy consumption in use - Expected revenues	2	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ★ ★ ●	★ ● ● ● ●	★ ● ● ● ●	★ ● ● ● ●
Environmental safety during / after use - Non-toxic risk during production - No leakage (microplastics) - Recyclable at EOL	2	★ ★ ★ ★ ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ● ● ●	★ ★ ★ ★ ●
Ease of implementation - Preparation of the input material - less sorting - less influence of contamination - Complete and ready setup of the machinery - Low skill and easy learning	1	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ● ● ● ●	★ ● ● ● ●	★ ● ● ● ●
Product value - Product with long life-span - A high value end-product	1	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ● ● ●	★ ★ ★ ● ●
Overall score		★ ★ ★ ☆ ☆	★ ★ ★ ★ ☆	★ ★ ★ ★ ☆	★ ★ ☆ ☆ ☆	★ ★ ☆ ☆ ☆	★ ★ ☆ ☆ ☆	★ ★ ★ ☆ ☆

MARKET ANALYSIS

HOSPITALITY

Primary market

- Tourism - Hospitality Outdoor furniture and Construction, i.e. dinner chairs, fencing, plastic lumber

Secondary markets

- B2C: High-end consumer design furniture has similar product characteristics and demands (overlap villas and apartments)
- B2B: semi-finished products, i.e. Timber, lumber, Sheets for furniture makers. i.e. countertop
- Public: governmental, school furniture
- Public works, Infrastructure + construction: governmental, public furniture, e.g. park bench, picnic table, signage, fencing

Market size hospitality furniture

- ±300 hotels, resort, with over 7600 apartments and rooms

Estimated annual expenditure on furniture

- USD 532,000 (7600 rooms and accommodations with a average spending of \$70/year/room on outdoor furniture)

Global expected CAGR (Compound Annual Growth Rate) tourism after Covid-pandemic

- 3.1% (2021-2026)

Longer term market fundamentals

- Shorter supply chains decrease need for imports
- Less pressure on landfill

Demand-drivers

- Showing green/sustainable focus
- Longer lasting alternatives
- Locally produced

MARKET ANALYSIS

HOSPITALITY

Market needs

- Durable furniture
- Easy to maintain / high quality
- Indoors and outdoors application
- Sustainable/green
- High end design

Buying patterns

- Current yearly renew due to poor quality and extreme weather conditions (market research)

Locations of potential customers

- Mostly coastal area

Specify domestic vs export markets

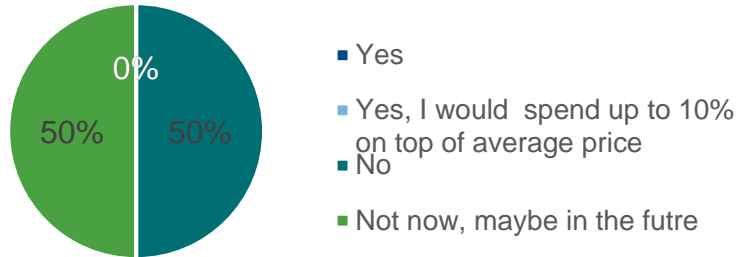
- Domestic: Local distribution network (stores, DIY markets, furniture makers)
- Export potential:
 - Pacific region: local furniture production for tourism based on recycled plastic lumber

Launching customers:

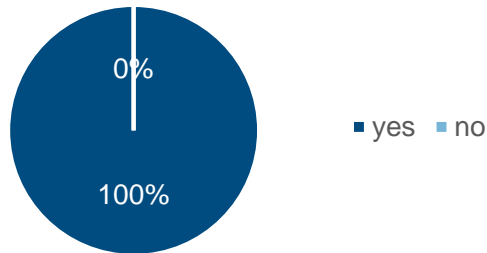
- Accommodations who collect material themselves
- Governmental bodies

BUSINESS DRIVERS

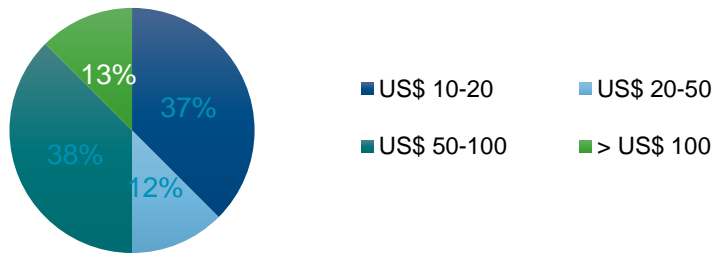
COMMERCIAL MARKET ANALYSIS HOSPITALITY



50% willingness to purchase recycled plastic furniture made from own waste
+ 50% considering to procure in the future



100% willingness to source-segregate recyclable plastics - place a separate bin for collecting HDPE/PP shampoo, body wash and detergent bottles at hotel/resort



Current budget for outdoor furniture (e.g x1 plastic chair)?*

Saint Lucia survey results: 75% willingness to spend ±10% > average price

*This question was not part of the Fiji survey

BUSINESS DRIVERS

INDUSTRY SUPPORT – INNOVATION AWARDS

rHDPE dining chair made from Caribbean plastic waste streams:

shortlisted for the prestigious **Plastics Recycling Awards Europe 2021**

- Household and Leisure products category



MARKET INTRODUCTION PLAN

FROM FUNCTIONAL PROTOTYPE TO MARKET INTRODUCTION

Timeline for key milestones of product development

PHASE 1- has been completed

- Extrusion testing
- Feedstock preparations
- Product interest inventory
- Design concept for products
- Engineering
- Prototyping
 - assembly testing
 - impression and use testing
- Improving based on feedback

PHASE 2

- Securing finances; procurement of machinery; staff recruitment

PHASE 3

- Production testing
- Production procedures development
- Packaging development
- Commercial production based on staged approach

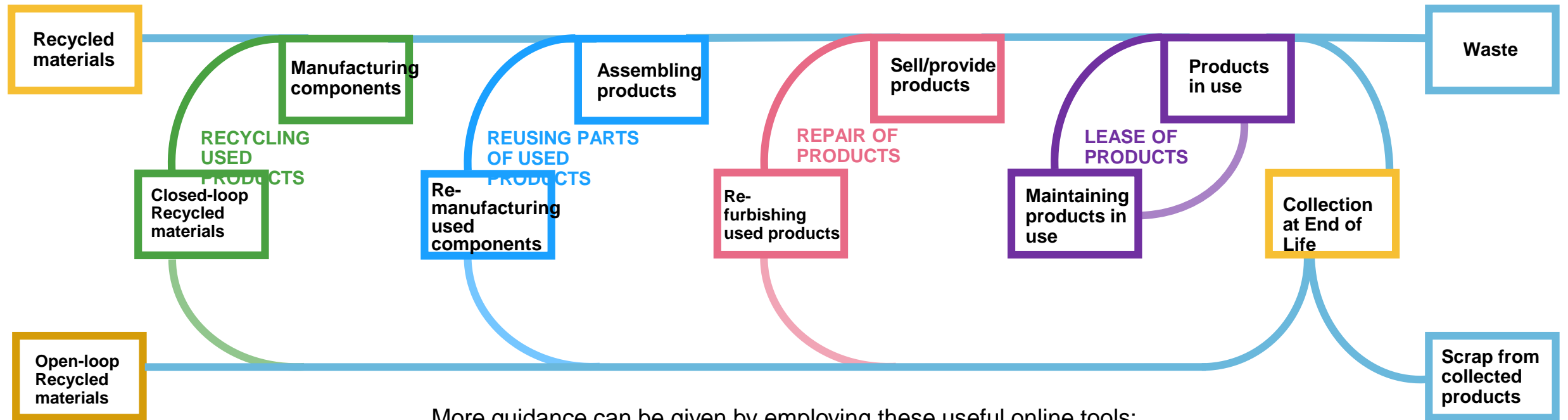
Engagement & Sales

- Sales approach
 - Personal sales contact
 - Online order and service website
- Sales channels
 - Sales person
 - Web shop
 - Furniture stores
 - Do-It-Yourself stores
 - Workshop showroom/store
- Engagement (communication with target groups)
 - Sales person
 - Website
 - Showroom
 - Exhibition

POTENTIAL FOR CIRCULARITY

INCREASING CIRCULARITY

The below graph guides you on how to achieve maximum circularity for your product – on every step of the value chain!



More guidance can be given by employing these useful online tools:

[Circularity Calculator](#) and [Circularity Pathfinder](#)

OPERATIONS

KEY RESOURCES, ACTIVITIES, PEOPLE

Tools & Machines

- Shredder
- Optional agglomerator if collection is expanded for flexibles processing
- Extruder
- Intrusion moulds
- Press + press moulds
- CNC mill
- Woodworking tools
- Pick up truck

Space & Permits

- 20 sqm stock
- 50 sqm production
- 20 sqm wood workshop

Key Tasks /activities

- Feedstock preparation
 - Collection
 - Washing
 - Shredding / agglomeration
- Production
 - Extrusion + intrusion + press moulding
 - Machine maintenance
- End product making
 - Cutting
 - Edge routing
 - CNC milling
 - Finishing
 - Packing
 - Servicing and repairs
- Sales and Distribution
 - Sales contact
 - Transportation: pick up and delivery

People

- Personnel: 7.5 up to 11 FTE
 - Sales person
 - Technician
 - Admin + online
 - Collection & Distribution - Transport
- Collaborators
 - Retailers, stores
 - Tourism sector
 - Government
 - IUCN/Searious Business

Running costs

- Space rent
- Electricity, water
- Staff costs
- Transport

FINANCIALS

SUMMARY AND SALES OVERVIEW

Diversifying the product portfolio is necessary to build a sustainable business model. The sales overview example provides ideas for possible other products.

Sales Overview				
Products & Services	Selling Price Per Unit	Number of Expected Sales Per Month	Total Product Cost	Profit Margin
50 kgs of Medium Shredded Plastic	0.00	166.7	8.41	-100.00%
mixed Beam 2800 x 40 x 80 mm	15.00	300.0	13.63	10.09%
mixed Plank 2800 x 28 x 130 mm	16.90	180.0	15.29	10.54%
Pavement tile	9.40	460.0	8.53	10.15%
wide HDPE plank 2800 x 18 x 130 mm	12.00	180.0	10.96	9.51%
narrow HDPE plank 2800 x 18 x 65 mm	7.70	90.0	7.01	9.88%
Bench parts	0.00	12.0	32.69	-100.00%
Park bench	160.00	12.0	87.63	82.59%
Trash nest	230.00	30.0	125.47	83.31%
Lounge chair	45.00	30.0	25.09	79.33%
Side table / foot bench	29.00	15.0	16.46	76.15%
Dining chair	35.00	60.0	18.97	84.51%
Dining table	65.00	15.0	36.61	77.54%

Summary

Starting capital	178,452.62
Months to Pay Back Investment	30
Full Time Employees Needed	7.5
Revenue Earned Per Month	28,399.00
Fixed Costs Per Month	1,560.00
Material Costs Per Month	17,639.83
Total Wages Paid Per Month	2,915.80
Total Profit Earned Per Month	6,283.38

FINANCIALS

CASH FLOW

Cash Flow

A cash flow analysis shows that you have enough money throughout your first year to buy materials, pay your employees, or make an investment into a new machine.

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Money In Bank (Beginning of Month)	178,452.62	29,266.27	36,416.92	43,567.57	50,718.21	57,868.86	65,019.51	72,170.16	79,320.80	86,471.45	93,622.10	100,772.75
Initial Investment	178,452.62											
Revenue	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00
Total Cash In	206,851.62	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00	28,399.00
Investment Costs	(156,337.00)											
Variable Costs	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)	(19,688.35)
Fixed Costs	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)
Total Cash Out	(177,585.35)	(21,248.35)	(21,248.35)	(21,248.35)	(21,248.35)	(21,248.35)	(21,248.35)	(21,248.35)	(21,248.35)	(21,248.35)	(21,248.35)	(21,248.35)
Net Cashflow	29,266.27	7,150.65	7,150.65	7,150.65	7,150.65	7,150.65	7,150.65	7,150.65	7,150.65	7,150.65	7,150.65	7,150.65
Money In Bank (End of Month)	29,266.27	36,416.92	43,567.57	50,718.21	57,868.86	65,019.51	72,170.16	79,320.80	86,471.45	93,622.10	100,772.75	107,923.39

FINANCIALS

PROFIT, LOSS

Profit and Loss

This table is to show how much money the company is projected to make each year. It assumes that you paid yourself for the hours you worked, so the "Net Income" at the bottom is the remaining profit made by your company. It is greatly influenced by the "Monthly Sales Improvement Rate" on the Dashboard page. This table is also useful to show your bank or include in grant applications.

	Year 1	Year 2	Year 3
Revenue	340,788.00	374,866.80	412,353.48
Cost of Sales	236,260.23	259,886.25	285,874.88
Net Revenue	104,527.77	114,980.55	126,478.60
Fixed Costs	18,720.00	18,720.00	18,720.00
Gross Income from Operations	85,807.77	96,260.55	107,758.60
Business Taxes	17,161.55	19,252.11	21,551.72
Net Income	68,646.22	77,008.44	86,206.88

Yearly Growth Rate

10%

(conservative scenario)

Business Tax Rate

20.00%

FINANCIALS

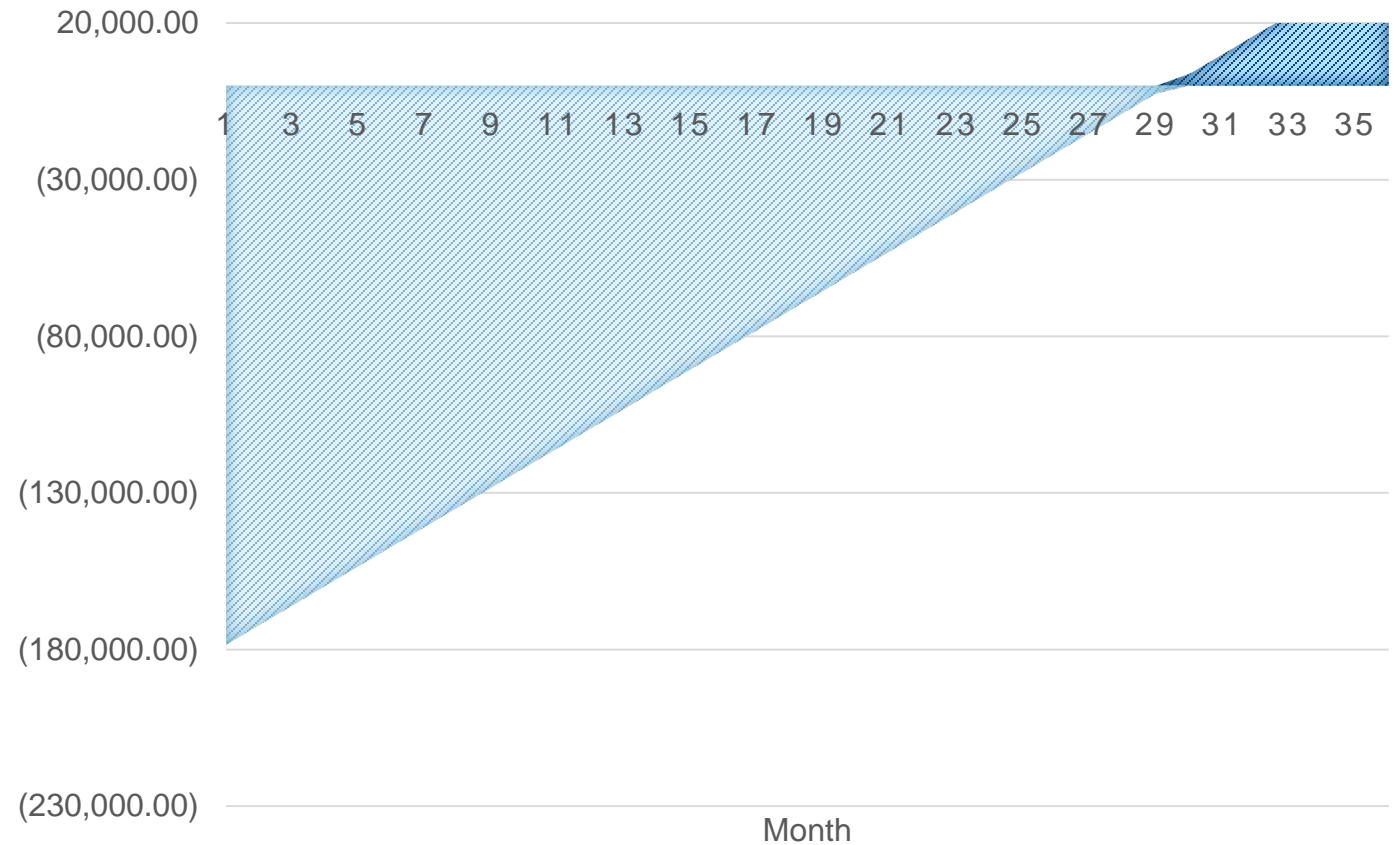
FUNDING & ROI

Starting capital: US \$ 178,452

ROI 30 months

- Mostly machines and personnel

PAYBACK ANALYSIS






FINANCIALS

FUNDING PLAN

- Private money
- (Development) Bank loans: de-risking partner, e.g. offering loan guarantees)
Incl. ADB, IFC, CEB
- Investors/business accelerators ((pre)-seed, angel investment, early stage)
 - Blue Bio Value
 - Blue Natural Capital Finance Facility
 - Ennovent
 - For Good Venture
 - Matanataki
 - SAGANA
 - Sky ocean ventures
- (Governmental) grants
 - Development Cooperation partners, incl. UK, Norway, Italy, US, Germany, Swiss, France, China, Japan,
 - UNDP Innovation Fund
 - World Bank - ProBlue. NGOs could become a third party within a governmental program
 - IUCN
 - WWF
- Alliance to End Plastic Waste
- Sustainable Ocean Fund
- Ocean Foundation
- Plastic Solutions Fund
- Bill & Melinda Gates Foundation
- Minderoo, no 'Plastic Waste'-programme
- Australian National Product Stewardship fund
- Commonwealth Clean Ocean Alliance
- Dow Business Impact Fund
- Handelens Miljofond
- Plastics Solutions Fund
- Gallifrey foundation
- Oak Foundation
- PRIMAT (Didier and Martine Primat Foundation)
- The Fondation SUEZ
- Waitt Foundation
- For Good Foundation
- Onepercentfortheplanet

FACTSHEET

BENEFITS

Financial benefits 	Environmental benefits 	Social benefits 
ROI – 33 months	Lower landfill pressure for government: up to 150 tonnes / year or 4% of HDPE/PP/LDPE waste diverted from landfill/dumping sites	Develop recycling market - Create more jobs in island in collection, sorting, cleaning, recycling – 7.5-11 FTE when converting 1% of all plastic waste generated
Better license to operate for construction and furniture market. And allows for green/circular public procurement	Approx. 164 tonnes of CO2 emissions saved by redirecting plastic waste into products	Contribution to cleaner island and attractiveness for local population and visitors
Customer loyalty for producers	Reduced amount of plastic waste that might leak into the environment. 150 tonnes / year diverted from potential leakage	
Lower waste disposal and clean-up costs for government: Approx. savings FJD 20,272		

FOR MORE INFORMATION

IUCN



IUCN_Plastics



plastics@iucn.org



<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



#CloseThePlasticTap

Searious Business



SeariousBusiness



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<https://www.seariousbusiness.com/islands>



#PlasticWasteFreeIslands #CloseThePlasticTap





PLASTIC WASTE FREE ISLANDS

SAINT LUCIA

BUSINESS PLAN

WASTE-TO-PRODUCT

An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



Norad



ACKNOWLEDGMENTS

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This work could not have been accomplished, first and foremost, without the partners and stakeholders who supported the data collection efforts within each country. Above all, the PWFI team acknowledges the generous support of the Norwegian Agency for Development Cooperation (NORAD), and the cooperation of Searious Business.

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AUTHORSHIP

To be cited as

Searious Business, (2021). Report to IUCN Plastic Waste Free Islands, Waste-to-Product Business Plan, Saint Lucia, Gland, Switzerland, IUCN

Support and Funding



Technical Lead Authors



Implementing Agency



Design

Ludovic Di Donato

WASTE-TO-PRODUCT

BUSINESS PLAN

PLASTIC WASTE FREE ISLANDS



The **Plastic Waste Free Islands (PWFI) Project** is part of the *Close the Plastic Tap* Program of IUCN. PWFI is a three-year project working in six islands in the Caribbean and Pacific.

Implemented in Fiji, Vanuatu and Samoa in Oceania and Antigua and Barbuda, Saint Lucia and Grenada in the Caribbean, the project seeks to promote island circular economy and to demonstrate effective, quantifiable solutions to addressing plastic leakage from Small Island Developing States (SIDS).

This business plan focusses on the **“Waste-to-product”** solution, in the geographic context of Saint Lucia. It demonstrates how the solution can be realized, allowing for the creation of an alternative value chain.

MISSION

WHAT & WHY

What

- A successful business in Furniture and semi-finished products
 - Made from recycled plastic
 - Locally sourced and locally produced

Why

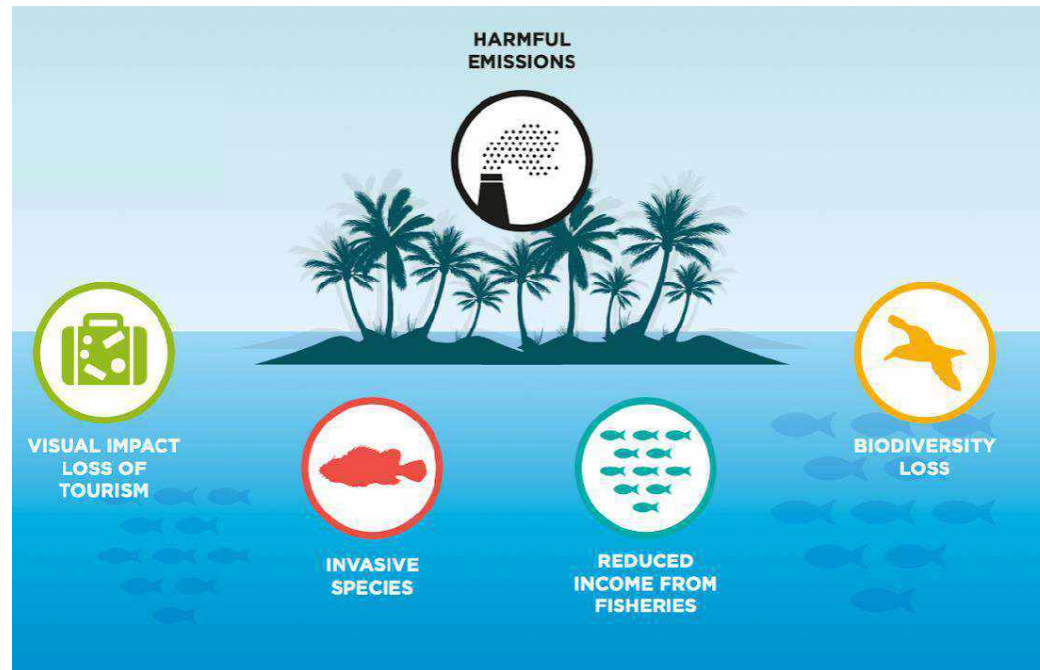
- Local business opportunity
 - Reduce Import-dependency
 - Enhance resource recovery options on-island
 - Job creation
- Reduce overfull landfills and high plastic leakage prevalence
 - Improved waste management
 - Lower environmental impact
- Supporting this venture means supporting the green economy



WHY START THIS BUSINESS

REDUCE PLASTIC WASTE GENERATION & LEAKAGE

Plastic Waste Generation: The total amount of plastic waste that is produced on an annual basis, per plastic material type



Financial and environmental impacts of plastic leakage

Plastic Waste Leakage: The amount of unaccounted waste that is calculated by the difference between plastic material imported and plastic waste disposed.

Polymer	Annual Imports 2018–2019 (T/y)	Total waste disposed 2019 (T/y)	Total recycled 2019 (T/y)	Leakage (T/y) – model based estimate (95% credible interval)
PET (1)	1505.92	1437.39	14.07	187 (0–482)
HDPE (2)	584.85	540.66	3.93	70 (0–275)
PVC (3)	86.58	50.59	0.00	37 (0–71)
LDPE (4)	372.55	367.73	0.00	52.4 (0–245)
PP (5)	514.52	426.86	0.00	105 (0–348)
PS (6)	397.31	356.17	0.00	43 (0–224)
Other (7)	2157.43	1891.18	0.00	341 (0–955)
Overall	5619.17	5070.58	18.00	836 (132–1391)

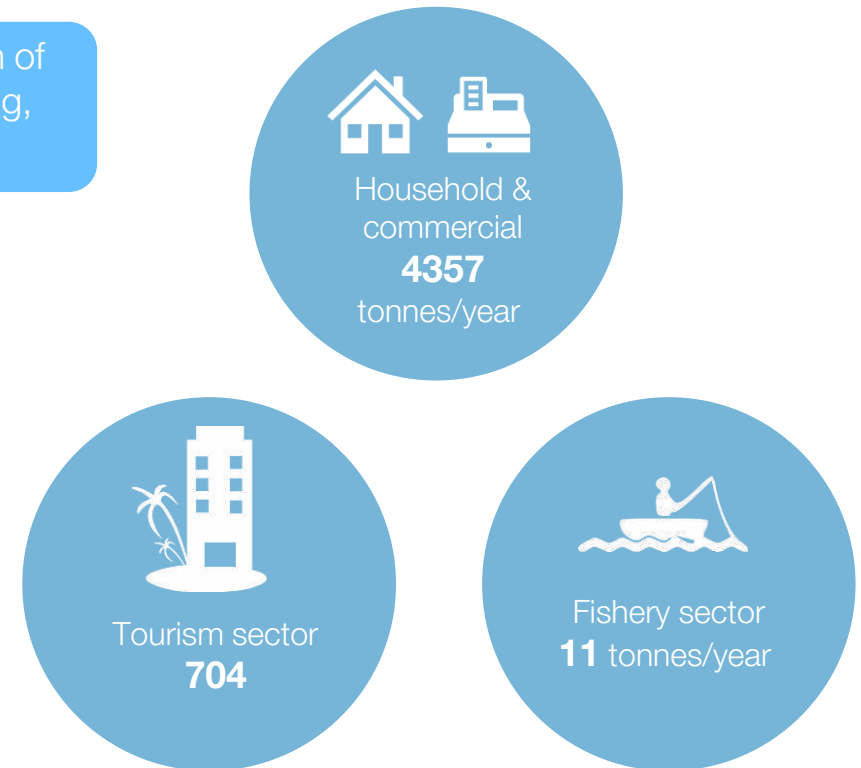
National plastic waste generation & leakage data Saint Lucia with polyolefins in blue.
Source: Final quantification report – Executive summary APWC July 2021

WHY START THIS BUSINESS

CONTEXTUAL ANALYSIS OF WASTE MANAGEMENT PRACTICES

The contextual analysis of waste management practices summarizes the current situation of waste management in Saint Lucia. It evaluates actions like collection, sorting and recycling, as well as future ambitions.

- ❖ No central collection at source or segregation at landfill, no local plastics recyclers
 - ❑ landfill, or leakage
 - Except for PET❑ Incentivised collection and export of PET beverage bottles through RePlast Project
 - Large volumes of rigid HDPE and PP waste that could be diverted quite easily from landfill
- ❖ National ambitions/initiatives/pipeline:
 - Incentivised PET bottle return program of PET beverage bottles through RePlast Project (OECS, Unite Caribbean)
 - The Department of Environment is considering introduction of CDL for PET beverage containers
 - SLSWMA purchased 20 pyrolysis machines in 2020 to incinerate household waste (not enough impact yet on plastic waste reduction)
 - The Government of Saint Lucia has substantially increased the funding they provide to the SLSWMA in recent years



5072 tonnes plastic waste generated/year

Source: Quantification report, Executive summary, APWC July 2021

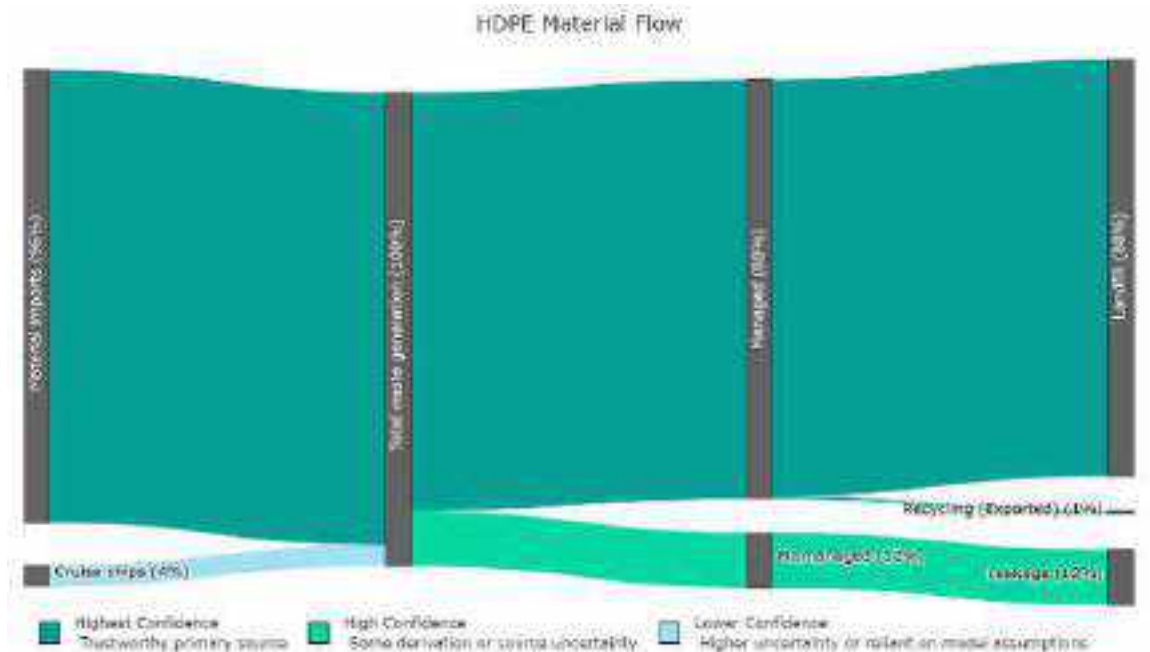
TARGETED MATERIAL(S)

HDPE –CURRENT VALUE CHAIN

Class	Item	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (T/y)	Total (T/y)
HDPE 2	garbage bags single use	132.0	76.0	ND	0.8	208.8
HDPE 2	light shopping plastic bags single use	115.1	51.5	ND	0.4	167.0
HDPE 2	beauty and personal care hdpe	20.5	0.3	ND	0.0	20.8
HDPE 2	other hdpe	19.0	0.0	ND	0.0	19.0
HDPE 2	cleaning agent products hdpe	18.8	1.4	ND	0.0	20.2
HDPE 2	food containers hdpe	14.4	9.8	ND	0.1	24.3
HDPE 2	home care hdpe	13.7	0.0	ND	0.0	13.7
HDPE 2	laundry detergents bottles hdpe	4.2	0.0	ND	0.1	4.3
HDPE 2	shampoo body wash hdpe	3.7	0.0	ND	0.0	3.7
HDPE 2	beverage containers pvc hdpe	3.3	0.0	ND	0.0	3.3
HDPE 2	medicine 500ml weight	0.9	0.0	ND	0.0	0.9
HDPE 2	lightweight plastic bags single use	0.0	0.0	ND	0.0	0.0
HDPE 2	shopping carrier bags hdpe	0.0	0.0	ND	0.0	0.0
	total including tourism					540.7

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

High-density Polyethylene (HDPE): A thermoplastic polymer used in a wide variety of applications, e.g. shampoo bottles and milk containers. HDPE is easily recyclable.



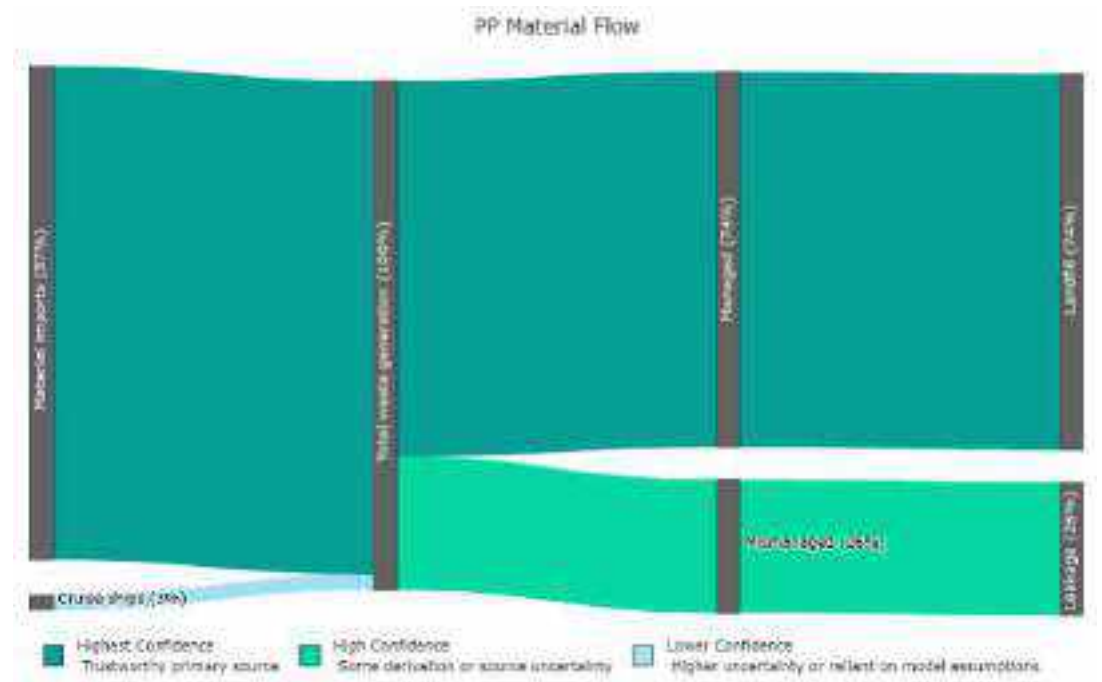
TARGETED MATERIAL(S)

PP – CURRENT VALUE CHAIN

Class	Item	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (T/y)	Total (T/y)
PP 5	other pp	47.5	0.0	ND	0.0	47.5
PP 5	container lids pp	47.1	37.2	ND	0.0	84.3
PP 5	food semi rigid containers e.g trays pp	46.0	88.7	ND	0.0	134.7
PP 5	glossy shopping bags single use plastics	39.9	3.5	ND	0.0	43.4
PP 5	food containers pp	18.3	4.3	ND	1.6	24.2
PP 5	rope pp	16.3	1.0	ND	0.0	17.3
PP 5	straws single use	9.5	17.9	ND	0.0	27.4
PP 5	single use take away food containers pp single use	5.6	11.9	ND	0.0	17.5
PP 5	food flexible packaging pp	0	0	ND	0	
PP 5	medicine bottles pp	0	0	ND	0	
PP 5	bags reusable supermarket bags pp	0	0	ND	0	
PP 5	furniture houseware pp	0	0	ND	0	
PP 5	automobile parts pp	0	0	ND	0	
	total including tourism					426.9

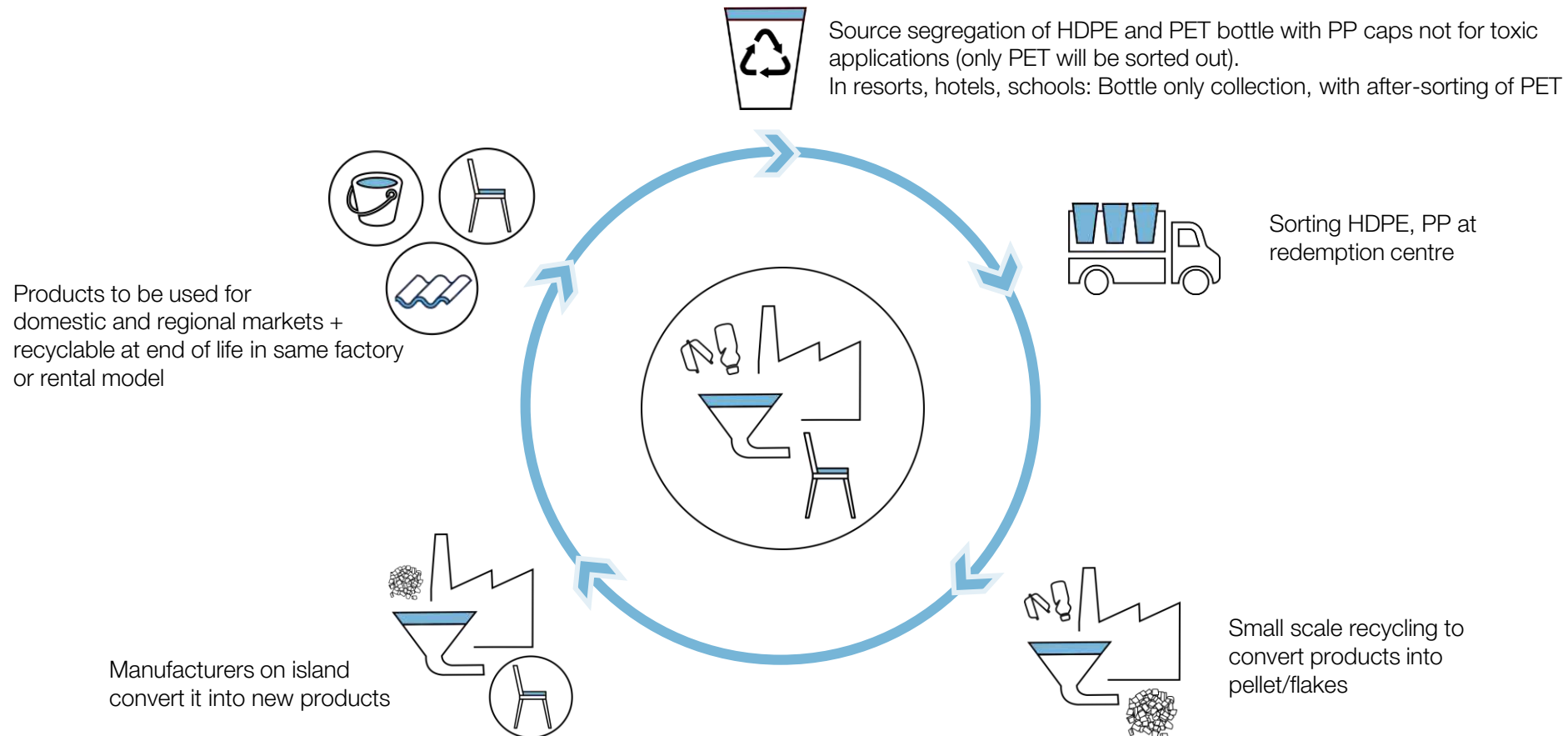
Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Polypropylene (PP): A thermoplastic polymer used in a variety of applications. PP is sturdy can be used in a flexible or rigid form. PP can potentially be recycled.



WASTE TO PRODUCT

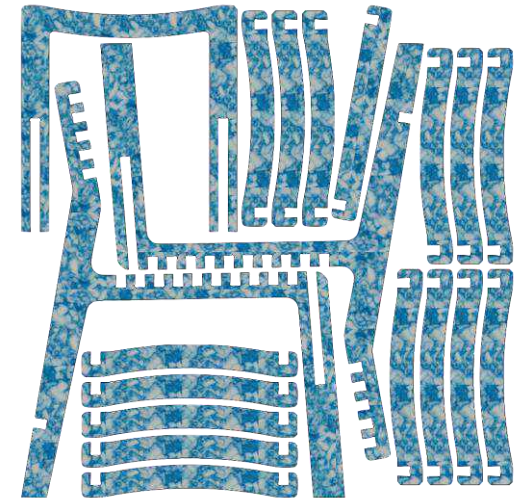
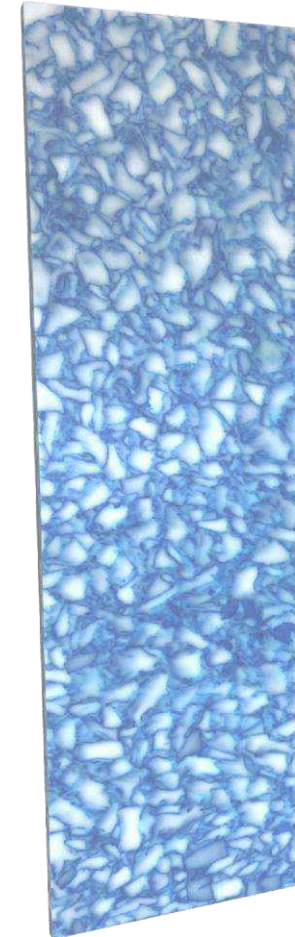
ALTERNATIVE VALUE CHAIN



PRODUCT CONCEPT

SHEET PRESS FURNITURE

- Furniture (end product)
- Sheets of different thickness (semi-finished product)
- Example Prototype: Dining chair recycled HDPE
 - Dimensions: L 645 x W 430 x H 830 mm
 - Weight: 10 kg
 - Intended use: patio, restaurant, (outdoor), school, home
- Other potential products
 - Table
 - Lounge chair
 - Side table
 - Park bench
 - Patio furniture



USER SCENARIOS

FURNITURE

- Modular, repairable
- Produced locally
- Weather & climate-proof
- Comfortable
- Durable



UNIQUE SELLING POINTS

SUSTAINABLE & DURABLE

Technology

- Producibility: can process flakes directly so no high machine investments needed
- Scalability: Semi-finished products can be stored, and once machines reach their maximum capacity, an extra machine can be added
- Risk & compliance: Quality performance, with health and safety compliant setup

Product performance

- Sustainability – longer life: material vs wood based sheet
 - Lifespan: 40+ years r-plastic lumber vs 20 years hardwood
- Sustainability: green image – local waste converted
- Sustainability: easily repaired / parts replaced / recyclable
 - Recyclable: r-plastic sheets 7x recyclable
- Superior performance: weather proof / termite proof / UV-resistant
- Convenience: easily cleaned
- Superior Design: high end product/ distinctive design / high quality surface finish

Market

- Marketability: Completely circular product
- Marketability: Different furniture for different markets; tourism (i.e. hotels, restaurants), public (schools), private
- Marketability: Locally made vs imported
- Flexibility: Semi-finished products which can be sold directly or made into different end products with existing wood working techniques

DIFFERENTIATION FROM COMPETITION

HOSPITALITY SECTOR



Low end plastic furniture



Low end metal



Wicker and metal



Pool lounge furniture



Picnic furniture



Hardwood furniture

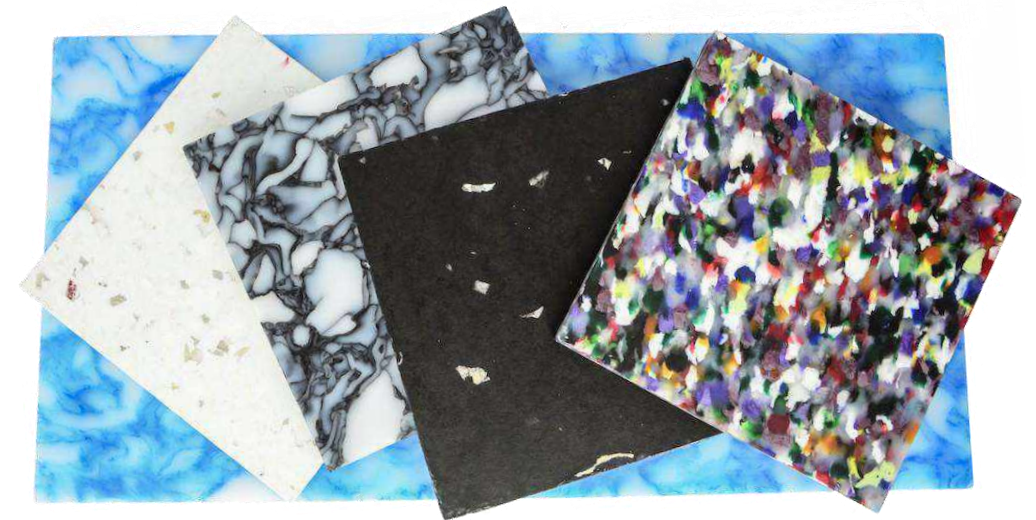
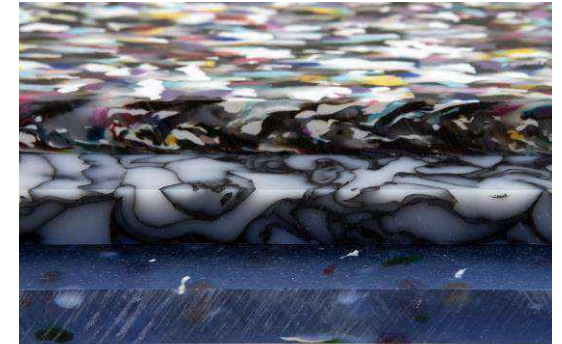
- More durable and longer lasting than cheap plastic import patio chairs
- High-end design
- Quality surface finish
- Lasting look
- Easy repair with local service and parts from producer
- Added sustainable image value

RECYCLING TECHNOLOGY SPECS

SHEET PRESS BASED

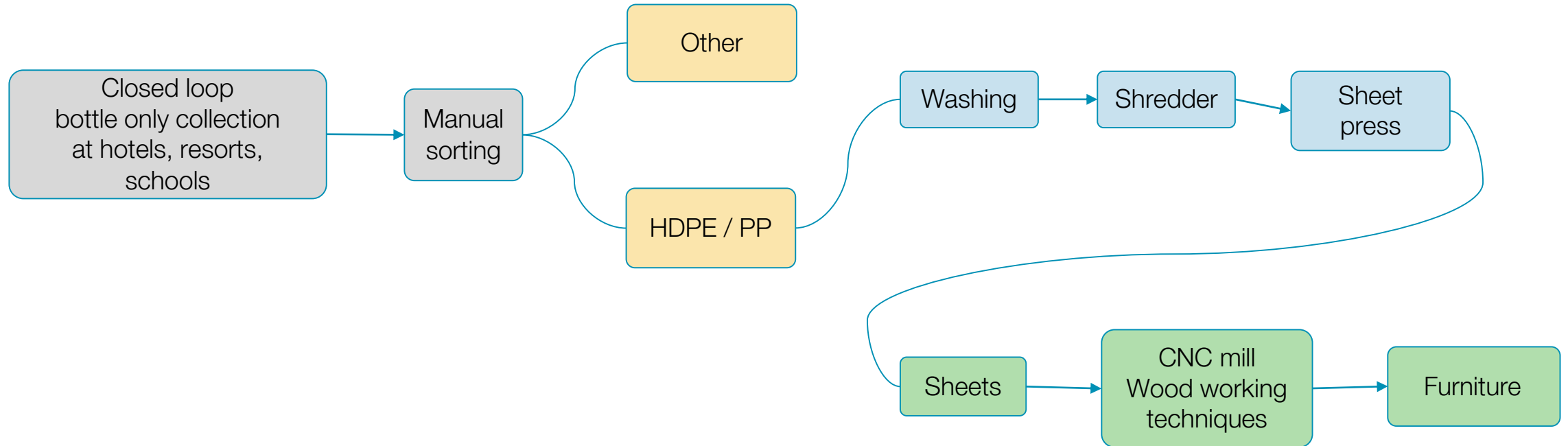
Technique: Sheet press

- Machines: Shredder, Sheet press + molds,
- Woodworking equipment: Saw table / crosscut saw, CNC-mill, hand tools.
- Types of plastic converted:
 - High end product: HDPE or PP sorted & washed (PS is very suitable to convert with this technique but is not suitable for collection in just hotels and resorts, because of lower volumes.
- Amount of plastics used: e.g. 19 kg per 1000x1000x20 mm sheet, 10 kg per Dining chair
- Source of input materials: Collection of HDPE, PP (later all plastics)
 - first through collection points at hotels, resorts, schools
 - Expanding option: (pre-paid) bag, or through Advanced Recovery Fee scheme (CDL)
- Impact: up to 80t/y = 8% of total HDPE + PP stream



SHEET PRESS

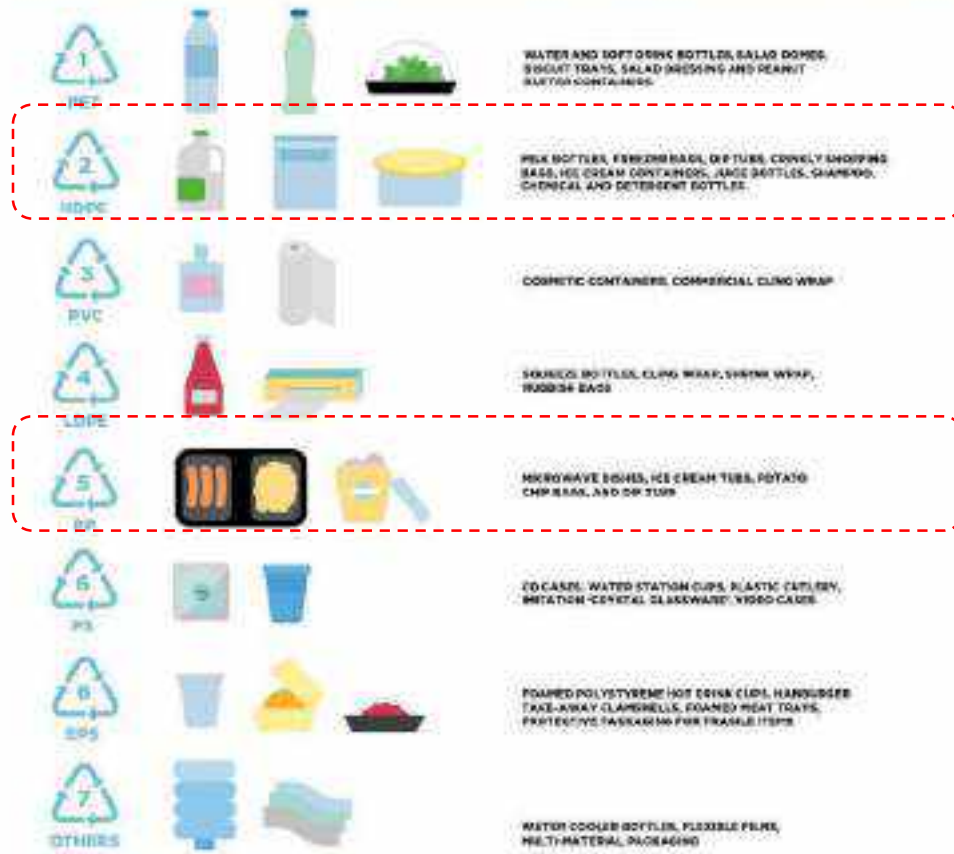
RECYCLING PROCESS



COLLECTION AND SORTING

IDENTIFYING

FIGURE 2: MAIN PLASTIC RESIN TYPES AND THEIR APPLICATIONS IN PACKAGING



Source: Protona Plastics.com analysis

Plastics have different properties
The focus in this business plan lays on:

- HDPE and PP for their melting properties & easiness to recycle
- Slide 6-8 give an overview of what kind of applications are typically made of the targeted materials in the local context



COLLECTION AND SORTING

COLLECTION

While working towards public collection schemes for source-segregated plastic, strengthening and building on existing collection initiatives is recommended, including:

Drop off points

- E.g. schools, supermarkets, public buildings, or resorts
- Incentives for consumers to sort and return plastic products
 - E.g. Discounts on end product
- Educational programmes and awareness campaign

Collaboration with existing waste management structures is crucial

- E.g. partnership with municipal and private solid waste management
- Collaboration with ministries and government



COLLECTION AND SORTING

COLLECTION

Drop off points

- E.g. schools, supermarkets, public buildings, or resorts
- Incentives for consumers to sort and return plastic products
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Collaboration with existing waste management structures is crucial

- E.g. partnership with municipal solid waste management
- Collaboration with ministries and government



SELECTION FACTORS

TECHNIQUE AND PRODUCT



Impact

- (semi-) Industrial setup and machinery
 - Converting plastic to keep from landfill and ocean leakage
 - Offering quality output that can compete with existing products
 - Creating durable business
 - Creating local employment



Viability

- Durable business plan / calculation
- Fitting the volumes on the island
- Ready for investors to step in
- Scalable: capacity aim 80 tonnes / year



Flexibility

- Creating different (mix of) semi-finished and end-products
- Producing output material for different markets
- Enabling sector-specific contribution to reduce waste
- Being able to convert different plastic



Complementarity to existing initiatives

- Utilizing local recycler's machinery, if compatible
- Tailor made for local situation and market

TECHNOLOGY COMPARISON

MATRIX

This table provides a structured approach on how the recycling technology is selected. It is a general comparison example used for the technology selection, in which island specific factors have been considered.

PWFI - WASTE TO PRODUCT - TECHNOLOGY COMPARISON

Categories	Weight factor	Sheet press	Intrusion	Mixed extrusion + moulding	Wound melting	Blow moulding	Mixed extrusion additive	Injection moulding
Processing capacity What volume of plastic can be converted (related to volume of the island) small: < 20 tonnes / year Mid: medium: 20-500 tonnes / year large: > 500 tonnes / year In general the better the fit, high the score	1	★★★★●●	★★★★★★	★★★★★★	★★●●●●	★★★★●●	★★★★★★●	★★★★★★●●
Marketability Can the product compete with other products? Will it replace a product for the better?	1	★★★★●●	★★★★★★	★★★★★★	★★●●●●	★★★★★★	★★★★★★	★★★★★★
Costs Investment to set up machinery Energy consumption in use Expected revenue	-2	★★★★●●	★★★★●●	★★★★●●	★★★★★★	★★●●●●	★★●●●●	★★●●●●
Environmental safety during / after use Non-toxic risk during production No leakage (microplastic) Recyclable at EOL	1	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●
Ease of implementation Preparation of the input material - less sorting - less influence of contamination Complete and ready setup of the machinery Low skill and easy learning	1	★★★★●●	★★★★★★	★★★★●●	★★★★●●	★★●●●●	★★●●●●	★★●●●●
Product value Product with long life-span A high value end-product	1	★★★★●●	★★★★★★	★★★★★★	★★★★★★	★★★★★★	★★★★●●	★★★★★★
Overall score		★★★☆☆	★★★★☆	★★★★☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆

MARKET ANALYSIS

HOSPITALITY

Primary market

- Tourism - Hospitality Outdoor furniture and Construction, i.e. dinner chairs, fencing, plastic lumber

Secondary markets

- B2C: High-end consumer design furniture has similar product characteristics and demands (overlap villas and apartments)
- B2B: semi-finished products, i.e. Sheets for furniture makers. i.e. countertop
- Public: governmental, school furniture

Market size hospitality furniture

- ±50 predominantly high-end and luxury boutique hotels & resorts with ± 500 rooms and 251 villas and apartments

Estimated total annual expenditure on furniture

- USD 52,570 (751 rooms and accommodations with a average spending of \$70/year/room on outdoor furniture)

Global expected CAGR (Compound Annual Growth Rate) tourism after Covid-pandemic

- 3.1% (2021-2026)

Longer term market fundamentals

- Shorter supply chains decrease need for imports
- Less pressure on landfill

Demand-drivers

- Showing green/sustainable focus
- durable products
- Locally produced

MARKET ANALYSIS

HOSPITALITY

Market needs

- Durable furniture
- Easy to maintain / high quality
- Indoors and outdoors application
- Sustainable/green
- High end design

Buying patterns

- current yearly renew due to poor quality and extreme weather conditions (market research)

Locations of potential customers

- Mostly coastal area

Specify domestic vs export markets

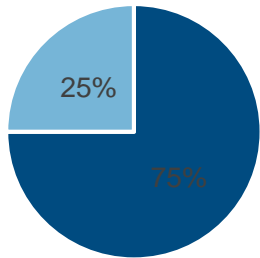
- Domestic: Local distribution network (stores, DIY markets, furniture makers)
- Export potential:
 - Caribbean region with the option of expending for processing waste locally

Launching customers:

- Accommodations who collect material themselves
- Governmental bodies

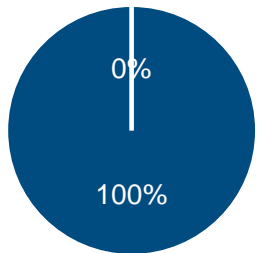
BUSINESS DRIVERS

COMMERCIAL MARKET ANALYSIS HOSPITALITY



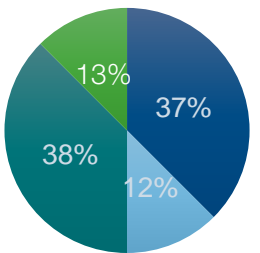
- Yes, I would spend up to 10% on top of average price
- Not now, maybe in the future

75% willingness to purchase recycled plastic furniture made from own waste



- yes
- no

100% willingness to source-segregate recyclable plastics - place a separate bin for collecting HDPE/PP shampoo, body wash and detergent bottles at hotel/resort



- US\$ 10-20
- US\$ 20-50
- US\$ 50-100
- > US\$ 100

Current budget for outdoor furniture (e.g x1 plastic chair)?

75% willingness to spend $\pm 10%$ > average price

BUSINESS DRIVERS

INDUSTRY SUPPORT – INNOVATION AWARDS

rHDPE dining chair made from Caribbean plastic waste streams:

shortlisted for the prestigious **Plastics Recycling Awards Europe 2021**

- Household and Leisure products category



MARKET INTRODUCTION PLAN

FROM FUNCTIONAL PROTOTYPE TO MARKET INTRODUCTION

Timeline for key milestones of product development

PHASE 1- has been completed

- Sheet press testing
- Feedstock preparations
- Product interest inventory
- Design concept for products
- Engineering
- Prototyping
 - assembly testing
 - impression and use testing
- Improving based on feedback

PHASE 2

- Securing finances; procurement of machinery; staff recruitment

PHASE 3

- Production testing
- Production procedures development
- Packaging development
- Commercial production based on staged approach

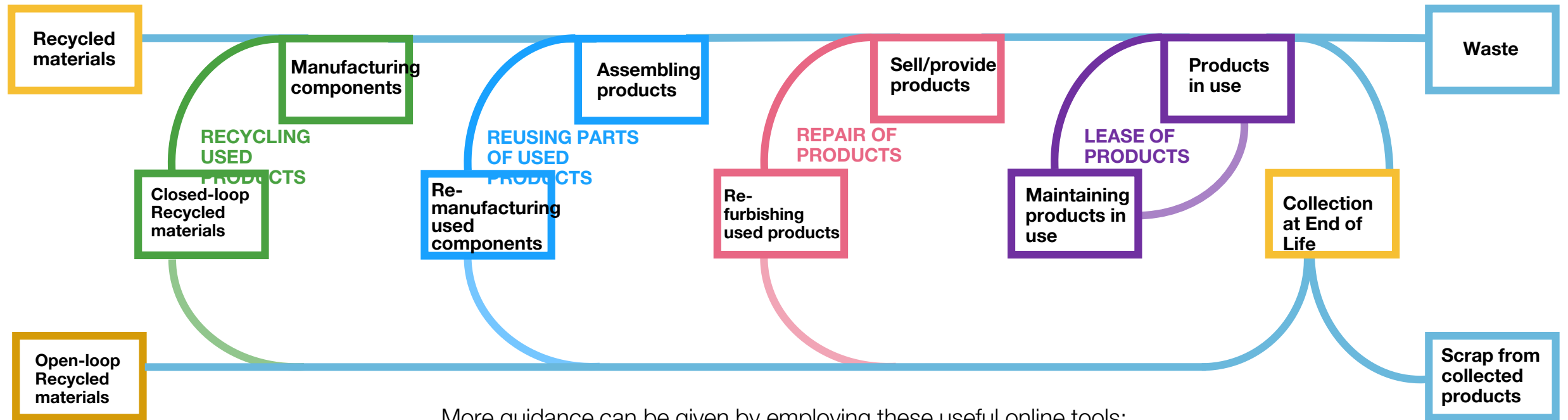
Sales & Communication

- Sales approach
 - Personal sales contact
 - Online order and service website
- Sales channels
 - Sales person
 - Web shop
 - Furniture Stores
 - DIY stores
 - Workshop showroom/store
- Communication with target groups
 - Sales person
 - Website
 - Showroom
 - Exhibition

POTENTIAL FOR CIRCULARITY

INCREASING CIRCULARITY

The below graph guides you on how to achieve maximum circularity for your product – on every step of the value chain!



More guidance can be given by employing these useful online tools:

[Circularity Calculator](#) and [Circularity Pathfinder](#)

OPERATIONS

KEY RESOURCES, ACTIVITIES, PEOPLE

Tools & Machines

- Shredder
- Sheet press
- CNC mill
- Woodworking tools
- Pick up truck (waste collection & product distribution)

Space

- 20 sqm stock
- 20 sqm production
- 20 sqm wood workshop

Key Tasks /activities

- Feedstock preparation
 - Collection
 - Washing
 - Shredding
- Production
 - Sheet pressing
 - Machine maintenance
- End product making
 - CNC milling
 - Finishing
 - Packing
 - Servicing and repairs
- Sales and Distribution
 - Sales contact
 - Transportation: pick up and delivery

People

- Personnel: 4 up to 5 FTE
 - Sales person
 - Technician
 - Admin + online
 - Collection & Distribution - Transport
- Collaborators
 - Retailers, stores
 - Tourism sector
 - Government
 - IUCN/Searious Business

Running costs

- Space rent
- Electricity, water
- Staff costs
- Transport

FINANCIALS

SUMMARY AND SALES OVERVIEW

Diversifying the product portfolio is necessary to build a sustainable business model. The sales overview example provides ideas for possible other products.

Sales Overview				
Products & Services	Selling Price Per Unit	Number of Expected Sales Per Month	Total Product Cost	Profit Margin
50 kgs of Medium Shredded Plastic	0.00	133.3	30.75	-100.00%
20 mm Sheet (1m x 1m)	41.00	190.0	37.09	10.54%
8mm sheet (1mx1 m)	20.00	70.0	18.16	10.14%
Dining chair	74.00	40.0	40.82	81.29%
Table	114.00	10.0	62.87	81.33%
Lounge chair	119.00	10.0	66.02	80.25%
Side table	62.00	10.0	34.00	82.33%
stool	59.00	20.0	32.65	80.68%
chest	213.00	20.0	117.10	81.89%

Summary	
Starting capital	45,803.00
Months to Pay Back Investment	26
Full Time Employees Needed	4.4
Revenue Earned Per Month	20,540.00
Fixed Costs Per Month	1,850.00
Material Costs Per Month	12,222.00
Total Wages Paid Per Month	4,603.00
Total Profit Earned Per Month	1,865.00

FINANCIALS

CASH FLOW

Cash Flow

A cash flow analysis shows that you have enough money throughout your first year to buy materials, pay your employees, or make an investment into a new machine.

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Money In Bank (Beginning of Month)	45,803.00	22,918.48	27,161.96	31,405.43	35,648.91	39,892.39	44,135.86	48,379.34	52,622.82	56,866.29	61,109.77	65,353.25
Initial Investment	45,803.00											
Revenue	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00
Total Cash In	66,343.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00	20,540.00
Investment Costs	(27,128.00)											
Variable Costs	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)	(14,446.52)
Fixed Costs	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)	(1,850.00)
Total Cash Out	(43,424.52)	(16,296.52)	(16,296.52)	(16,296.52)	(16,296.52)	(16,296.52)	(16,296.52)	(16,296.52)	(16,296.52)	(16,296.52)	(16,296.52)	(16,296.52)
Net Cashflow	22,918.48	4,243.48	4,243.48	4,243.48	4,243.48	4,243.48	4,243.48	4,243.48	4,243.48	4,243.48	4,243.48	4,243.48
Money In Bank (End of Month)	22,918.48	27,161.96	31,405.43	35,648.91	39,892.39	44,135.86	48,379.34	52,622.82	56,866.29	61,109.77	65,353.25	69,596.73

FINANCIALS

PROFIT, LOSS

Profit and Loss

This table is to show how much money the company is projected to make each year. It assumes that you paid yourself for the hours you worked, so the "Net Income" at the bottom is the remaining profit made by your company. It is greatly influenced by the "Monthly Sales Improvement Rate" on the Dashboard page. This table is also useful to show your bank or include in grant applications.

	Year 1	Year 2	Year 3
Revenue	246,480.00	271,128.00	298,240.80
Cost of Sales	173,358.28	190,694.10	209,763.51
Net Revenue	73,121.72	80,433.90	88,477.29
Fixed Costs	22,200.00	22,200.00	22,200.00
Gross Income from Operations	50,921.72	58,233.90	66,277.29
Business Taxes	15,276.52	17,470.17	19,883.19
Net Income	35,645.21	40,763.73	46,394.10

Yearly Growth Rate

10%

(conservative scenario)

Business Tax Rate

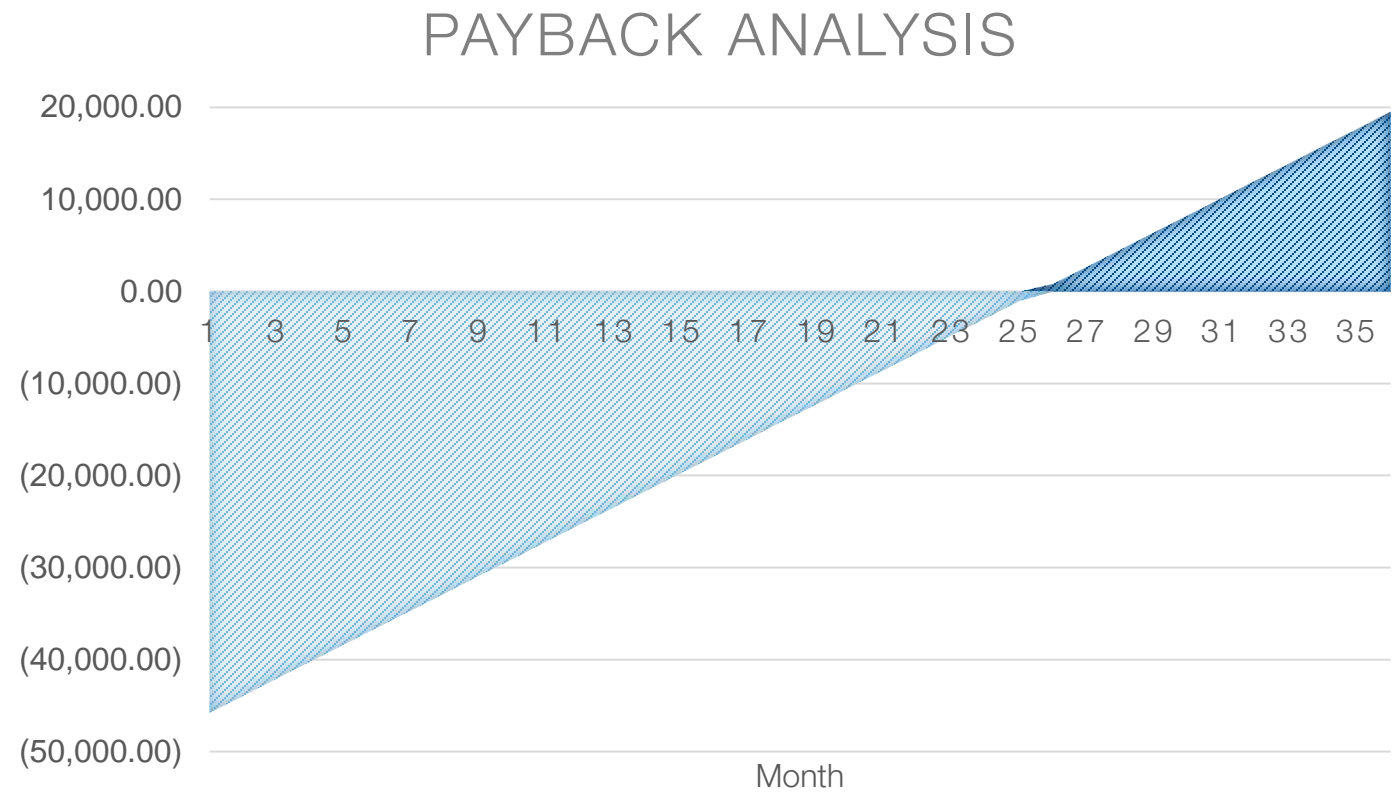
30.00%

FINANCIALS

ROI

Starting capital:
US \$ 46.000, ROI 26 months

- Mostly machines and personnel






FINANCIALS

FUNDING PLAN

- Private money
- (Development) Bank loans: de-risking partner, e.g. offering loan guarantees)
Incl. IADB, ADB, IFC, CEB
- Investors/business accelerators ((pre)-seed, angel investment, early stage)
 - Caribbean Export Development Agency
 - Caribbean Business Angels Network
 - Blue Bio Value
 - Blue Natural Capital Finance Facility
 - Ennovent
 - For Good Venture
 - LatitudR (the extension of the Inclusive Regional Recycling Initiative (IRR))
 - SAGANA
 - Sky ocean ventures
- (Governmental) grants
 - Development Cooperation partners, incl. UK, Norway, Italy, US, Germany, Swiss, France, China, Japan,
 - UNDP Innovation Fund
 - IUCN
 - World Bank - ProBlue. NGOs could become a third party within a governmental program

FACTSHEET

OVERALL BENEFITS

Financial benefits 	Environmental benefits 	Social benefits 
ROI – 26 months	Lower landfill pressure for government: 80 tonnes / year or 8% HDPE/PP waste diverted from landfill	Develop recycling market - Create more jobs in island in collection, sorting, cleaning, recycling – 5 FTE when converting 3% of all plastic waste generated
Better license to operate for construction and furniture market. And allows for green/circular public procurement	Approx. 87.6 tonnes of CO2 emissions saved by redirecting plastic waste into products	Contribution to cleaner island and attractiveness for local population and visitors
Customer loyalty for producers	Reduced amount of plastic waste that might leak into the environment. up to 80 tonnes / year diverted from potential leakage	
Lower waste disposal and clean-up costs for government: Approx. savings XCD 20.465 /year		

FOR MORE INFORMATION

IUCN



IUCN_Plastics



plastics@iucn.org



<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



#CloseThePlasticTap

Searious Business



SeariousBusiness



connect@seariousbusiness.com



<https://www.seariousbusiness.com/islands>



#PlasticWasteFreeIslands #CloseThePlasticTap





PLASTIC WASTE FREE ISLANDS

SAMOA

BUSINESS PLAN

WASTE-TO-PRODUCT



An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



Norad



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AUTHORSHIP

To be cited as

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Support and Funding



Technical Lead Authors



Implementing Agency



Design

Ludovic Di Donato

WASTE-TO-PRODUCT

BUSINESS PLAN

PLASTIC WASTE FREE ISLANDS



The **Plastic Waste Free Islands (PWFI) Project** is part of the *Close the Plastic Tap* Program of IUCN. PWFI is a three-year project working in six islands in the Caribbean and Pacific.

Implemented in Fiji, Vanuatu and Samoa in Oceania and Antigua and Barbuda, Saint Lucia and Grenada in the Caribbean, the project seeks to promote island circular economy and to demonstrate effective, quantifiable solutions to addressing plastic leakage from Small Island Developing States (SIDS).

This business plan focusses on the “**Waste-to-product**” solution, in the geographic context of Samoa. It demonstrates how the solution can be realized, allowing for the creation of an alternative value chain.

MISSION

WHAT & WHY

What

- A successful business in Furniture and semi-finished products
 - Made from recycled plastic
 - Locally sourced and locally produced

Why

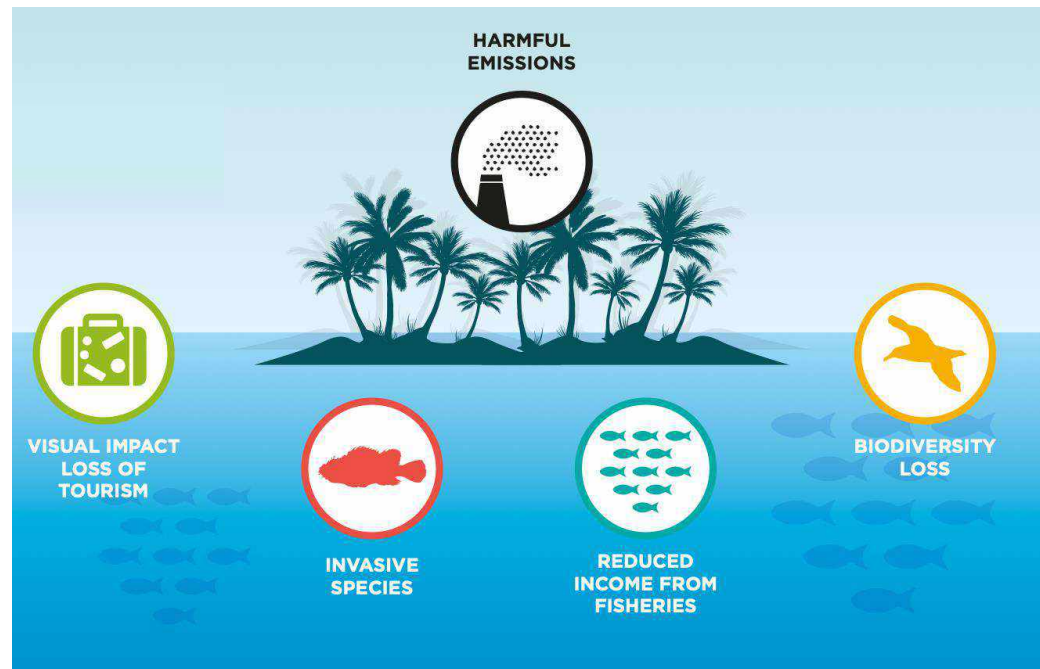
- Local business opportunity
 - Reduce Import-dependency
 - Enhance resource recovery options on-island
 - Job creation
- Reduce overfull landfills and high plastic leakage prevalence
 - Improved waste management
 - Lower environmental impact



WHY START THIS BUSINESS

PLASTIC WASTE GENERATION & LEAKAGE

Plastic Waste Generation: The total amount of plastic waste that is produced on an annual basis, per plastic material type



Financial and environmental impacts of plastic leakage

Plastic Waste Leakage: The amount of unaccounted waste that is calculated by the difference of plastic material imported and plastic waste disposed.

Polymer types	Annual imports 2018–2019 (T/y)	Total Disposed (T/y)	Recycled (T/y)	Leakage (t/y) – model-based estimate (95% credible interval)
PET (1)	549.31	465.27	11.2	90 (0-261)
HDPE (2)	492.37	353.82	0	140 (0-357)
PVC (3)	312.24	2.75	0	309 (85-312)
LDPE (4)	474.02	392.2	0	83 (0-383)
PP (5)	548.03	488.68	0	60 (0-242)
PS (6)	343.5	278.1	0	65 (0-282)
Other (7)	1501.3	389.75	0	1113 (94-1500)
Total	4242.77	1786.42	11.2	1862 (1473-2241)

National plastic waste generation & leakage data Samoa with polyolefins in blue.
Source: Final quantification report – Executive summary APWC July 2021

CONTEXTUAL ANALYSIS OF WASTE MANAGEMENT PRACTICES

The contextual analysis of waste management practices summarizes the current situation of waste management in Samoa. It evaluates actions like collection, sorting and recycling, as well as future ambitions.

- ❖ No central collection at source or segregation at landfill, no local plastics recyclers → landfill, or leakage
 - Except for PET → small scale collection for stockpiling
 - Large volumes of rigid HDPE, PP and flexible LDPE waste that could be diverted quite easily from landfill
- ❖ Recyclers & businesses united in Samoa Waste Recyclers Management Association (SWMRA)
- ❖ National ambitions/initiatives/pipeline:
 - Collection of PET bottles by Manino Water/Samoa Pure Water, Waste Management Co. Ltd, and SWMRA
 - Advanced Recovery Fee system for recyclables, incl. PET and possibly HDPE
 - SWMRA and PWFII PET export trial to Visy, Australia
 - Prepaid bag system for source separation plastics and general waste, MNRE
 - Recycling of mixed plastics into concrete aggregate (UNDP, CDRC/Resin8)
 - PRESS-Recycling of plastics into products – educational (Precious Plastics)
 - Recycling of plastics into bricks and beams – SWMRA, regional support from JPRISMII, JICA within the 3R-programme



2371.1 tonnes plastic waste generated/year

Source: Quantification report, Executive summary, APWC July 2021

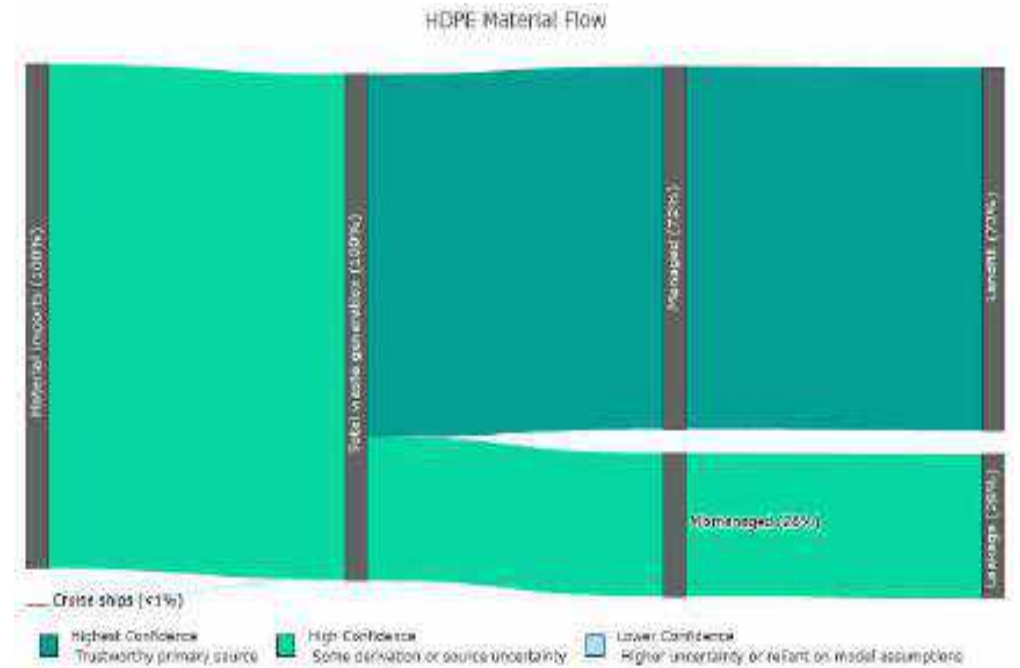
TARGETED MATERIAL(S)

HDPE – CURRENT VALUE CHAIN

Class	Item name	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (T/y)	Total
HDPE 2	food containers hdpe	55.14	22.53	0.03	0.11	77.80
HDPE 2	beauty and personal care hdpe	17.56	0.00	5.82	0.00	23.38
HDPE 2	cleaning agent products hdpe	10.70	41.11	0.05	0.00	51.87
HDPE 2	shampoo body wash hdpe	8.04	40.89	0.04	0.00	48.98
HDPE 2	laundry detergents bottles hdpe	12.41	40.89	0.00	0.00	53.31
HDPE 2	other hdpe	24.40	18.15	0.00	0.00	42.55
HDPE 2	home care hdpe	31.00	0.00	0.00	0.00	31.00
HDPE 2	beverage containers pvc hdpe	23.29	0.00	0.00	0.00	23.29
						352.16

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

High-density Polyethylene (HDPE): A thermoplastic polymer used in a wide variety of applications, e.g. shampoo bottles and milk containers. HDPE is easily recyclable.



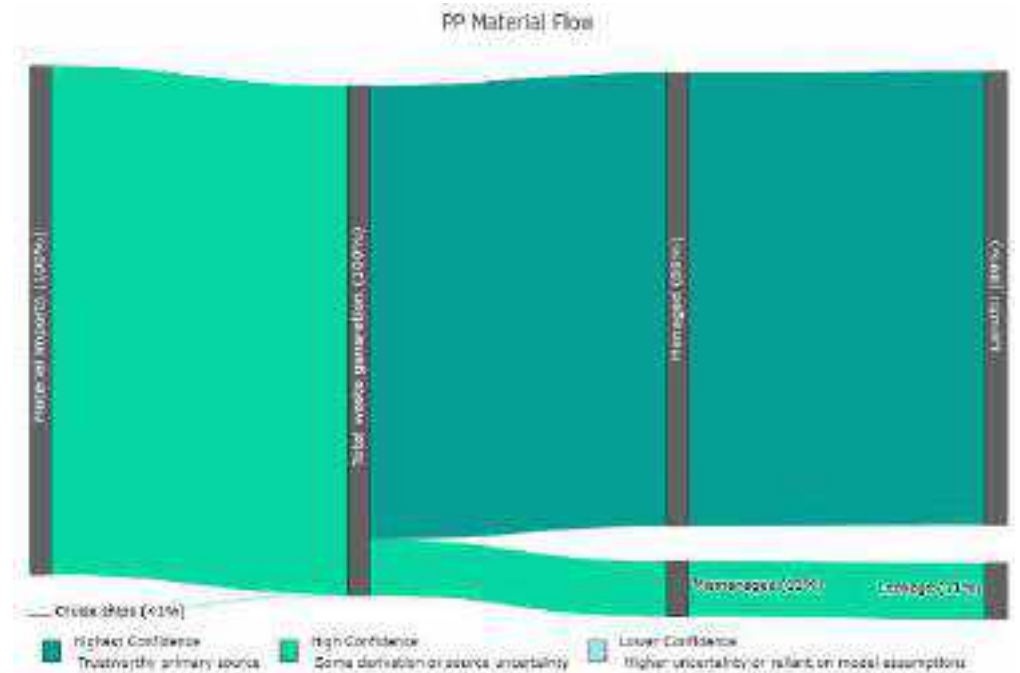
TARGETED MATERIAL(S)

PP – CURRENT VALUE CHAIN

Class	Item	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (T/y)	Total
PP 5	food containers pp	1.60	0.00	3.36	0.00	4.96
PP 5	other pp	2.62	143.07	0.00	0.00	145.68
PP 5	medicine bottles pp	0.94	143.07	0.00	0.00	144.01
PP 5	bags reusable supermarket bags pp	4.87	125.81	0.00	0.00	130.68
PP 5	food semi rigid containers e.g. trays pp	2.36	17.25	0.00	0.00	19.61
PP 5	food flexible packaging pp	22.05	0.00	0.00	0.00	22.05
PP 5	container lids pp	3.96	0.00	0.00	0.00	3.96
						470.96

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Polypropylene (PP): A thermoplastic polymer used in a variety of applications. PP is sturdy can be used in a flexible or rigid form. PP can potentially be recycled.



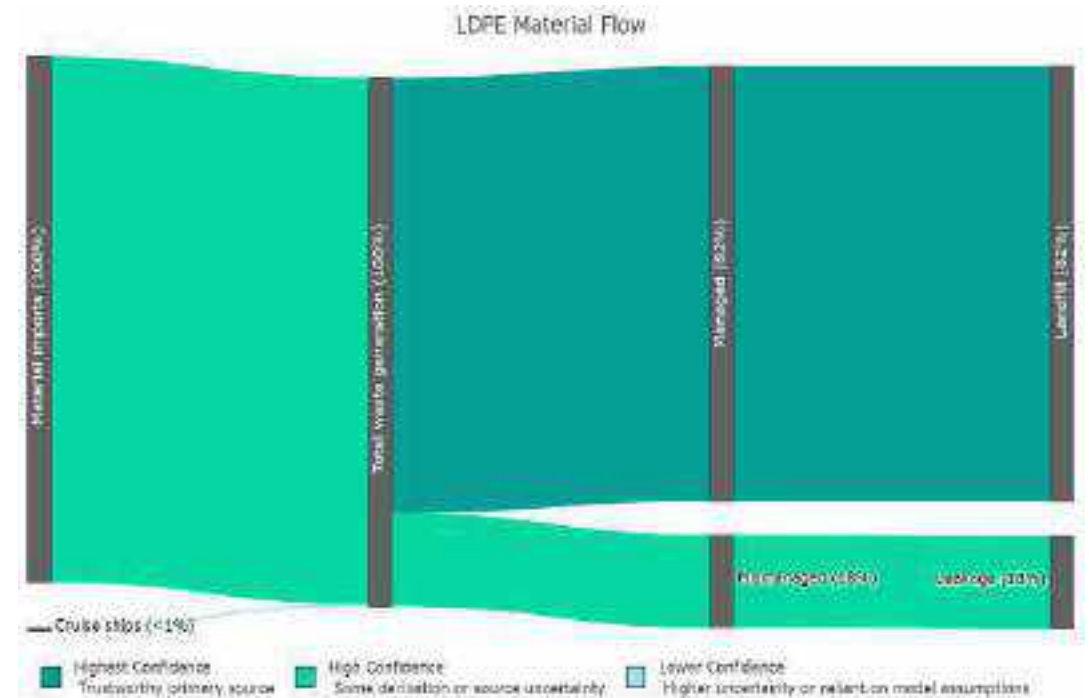
TARGETED MATERIAL(S)

LDPE – CURRENT VALUE CHAIN

Class	Item	Household (T/y)	Commercial (T/y)	Tourism (T/y)	Fisheries (T/y)	Total
LDPE 4	container lids ldpe	2.83	0.00	0.00	0.02	2.84
LDPE 4	wrap foils cling films ldpe	184.55	144.25	31.64	0.00	360.45
LDPE 4	food containers ldpe	11.67	0.00	0.00	0.00	11.67
LDPE 4	bin bags ldpe	8.37	0.00	0.00	0.00	8.37
LDPE 4	bubble wraps foils ldpe	5.52	0.00	0.00	0.00	5.52
LDPE 4	other ldpe	2.47	0.00	0.00	0.00	2.47
						391.32

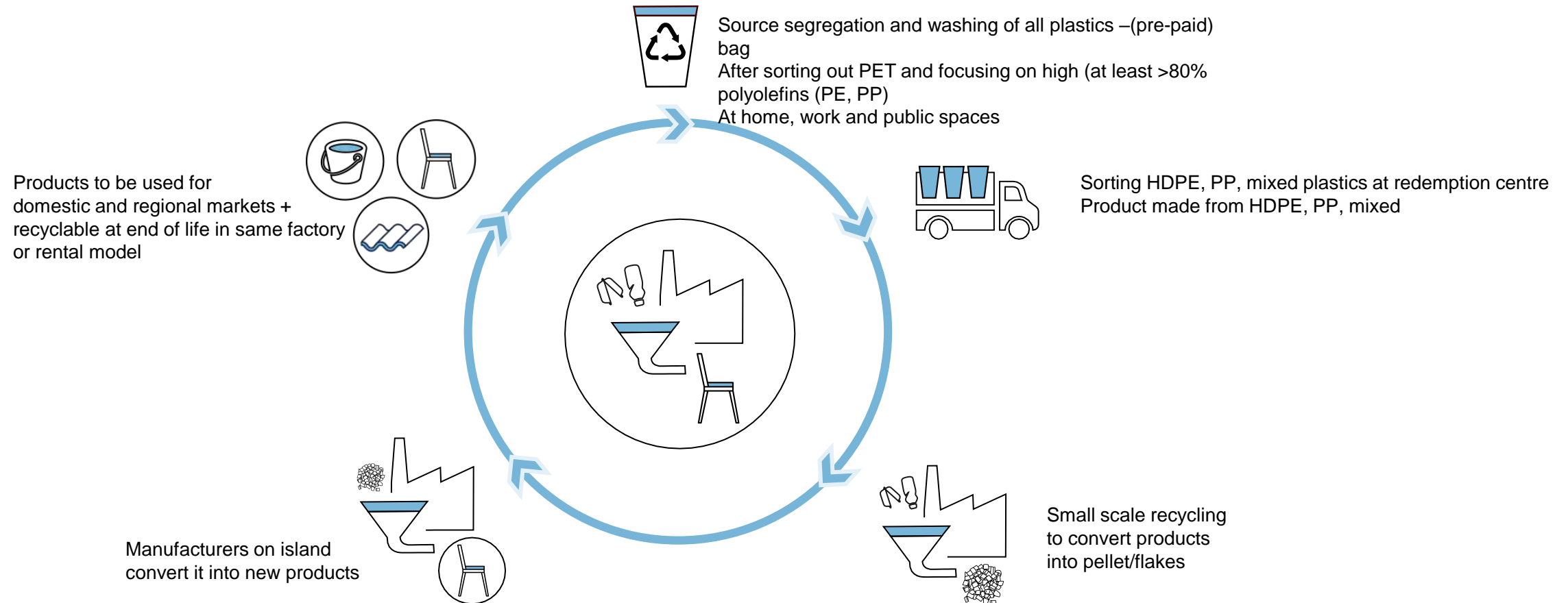
Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Low-density Polyethylene (LDPE): A thermoplastic polymer, which is a soft, flexible, lightweight plastic material, oftentimes used for plastic bags. LDPE is recyclable.



OUTLINE WASTE TO PRODUCT

ALTERNATIVE VALUE CHAIN



CONCEPT DESCRIPTION

MIXED EXTRUSION PRODUCTS

- Beams, planks, tiles and parts (semi-finished product)
- Outdoor furniture (end product)
- Example Prototype: Park bench (mainly polyolefins)
 - Dimensions: L650 x W1520 x H825 mm
 - Weight: 75 kg
 - Intended use: Garden, park, wharf, public space (outdoor)
- Other potential products
 - Lumber/timber, planks, posts
 - Purlin, rubbing styles
 - Street furniture, benches, picnic tables
 - Decking, cladding, siding
 - Fencing, bollards, palisade, edging
 - Shed foundation blocks, water side sheeting
 - Bridges, wharfs
 - Signage, litter bins, planters, raised waste platforms
 - Pergola, dog house
 - Garden, patio, terrace furniture
 - Exercise equipment
 - Traffic control: Wheel stops, speed humps, and rumble bars



USER SCENARIOS

EXAMPLES



Park bench

- Modular, repairable
- Produced locally
- Durable: Weather & climate-proof
- Comfortable



Wharf bench

UNIQUE SELLING POINTS

SUSTAINABLE & DURABLE

Technology

- **Producibility:** can process flakes directly so no high machine investments needed
- **Scalability:** Semi-finished products can be stored, and once machines reach their maximum capacity, an extra machine can be added
- **Risk & compliance:** Quality performance, with health and safety compliant setup

Product performance

- **Sustainability – longer life:** material vs wood based sheet
 - Lifespan: 40+ years r-plastic lumber vs 20 years hardwood
- **Sustainability:** green image – local waste converted
- **Sustainability:** easily repaired / parts replaced / recyclable
 - Recyclable: r-plastic sheets 7x recyclable
- **Superior performance:** weather proof / termite proof / UV-resistant
- **Convenience:** easily cleaned
- **Superior Design:** high end product/ distinctive design / high quality surface finish

Market

- **Marketability:** Completely circular product
- **Marketability:** Different furniture for different markets; tourism (i.e. hotels, restaurants), public (schools), private
- **Marketability:** Locally made vs imported
- **Flexibility:** Semi-finished products which can be sold directly or made into different end products with existing wood working techniques

DIFFERENTIATION FROM COMPETITION

CHEAP AND HARDWOOD CONSTRUCTION SECTOR



Hardwood lumber / timber



Stilt builds



Patio furniture

- More durable and longer lasting than wooden alternatives
- Easy repair with local service and parts from producer
- Added sustainable image value



Street furniture



In/outdoor furniture



Park/picnic furniture

CONCEPT DESCRIPTION

MIXED PLASTIC EXTRUSION BASED

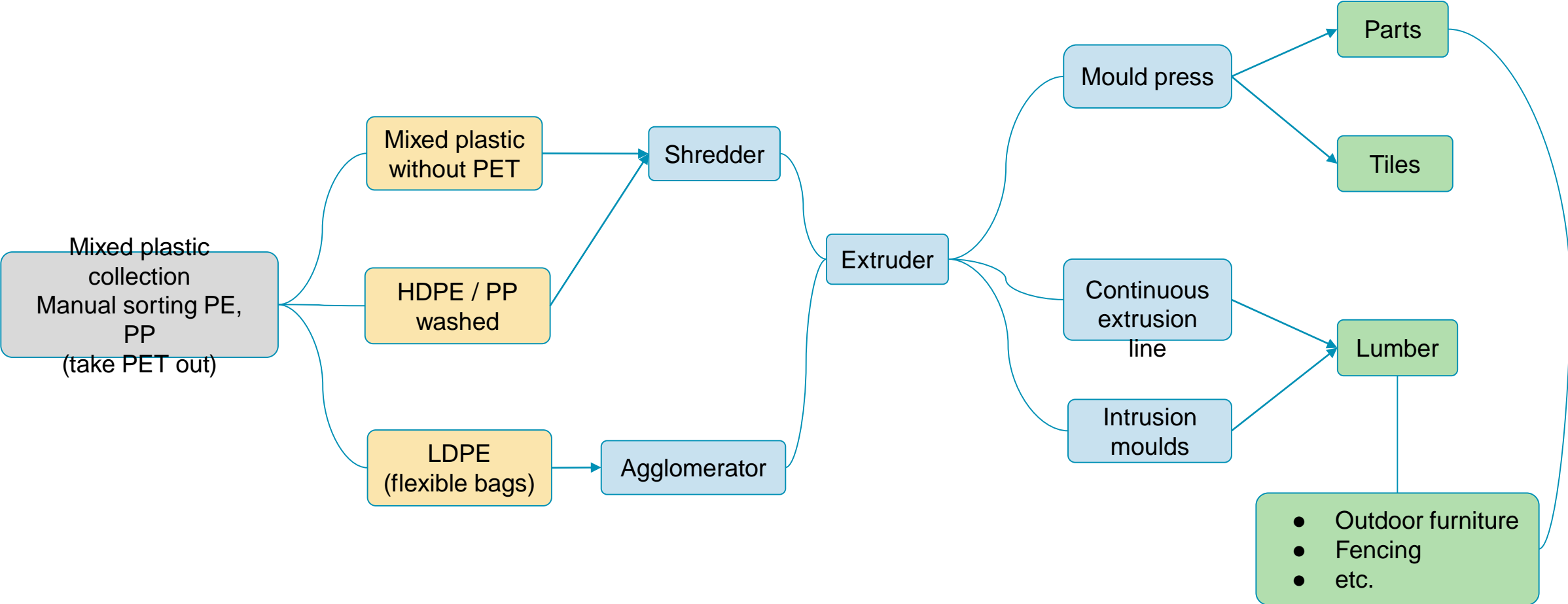
Technique: Extrusion based (setup around extruder) + add-on moulding options

- Machines: shredder and/or agglomerator, extruder, press + molds, intrusion moulds, or continuous extrusion line
- Woodworking equipment: Saw table / crosscut saw, mill, hand tools.
- Types of plastic converted:
 - High end product: HDPE sorted & washed
 - Lower end product: Mixed unwashed plastics with >70% PE/PP
- Amount of plastics used: e.g. 8.53 kg per 40x80x2800 beam, or 4.59 kg per 18x130x2800mm HDPE plank, or 75 kg per Bench
- Source of input materials: Collection of HDPE, PP, LDPE or all mixed plastics
 - through (pre-paid) bag with all plastics collection and after sorting
 - Island wide stimulation through Advanced Recovery Fee scheme / Container deposit Legislation (CDL)
- Impact: up to 150t/y = 12.35% of total PE/PP stream, 6.33% of total plastic generated



EXTRUSION BASED

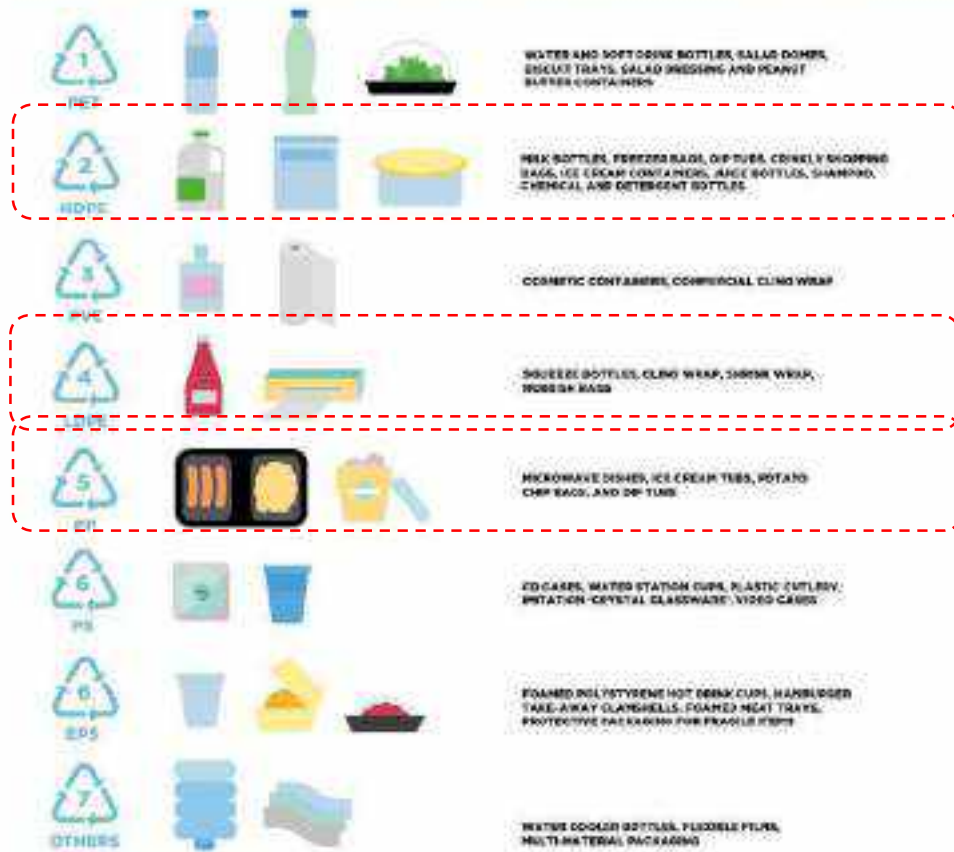
RECYCLING PROCESS



COLLECTION AND SORTING

IDENTIFYING

FIGURE 2: MAIN PLASTIC RESIN TYPES AND THEIR APPLICATIONS IN PACKAGING



Source: Project HotStream analysis.

Plastics have different properties
The focus in this business plan lays on:

- HDPE, PP and LDPE for their melting properties & easiness to recycle
- Slide 6-8 give an overview of what kind of applications are typically made of the targeted materials in the local context



COLLECTION AND SORTING

COLLECTION

While working towards public collection schemes for source-segregated plastic, strengthening and building on existing collection initiatives is recommended, including:

Drop off points

- E.g. schools, supermarkets, public buildings, redemption centers or resorts
- Incentives for consumers to sort and return plastic products
 - E.g. Discounts on end product
- Educational programmes and awareness campaign

Scale up collection of recyclables at commercial enterprises

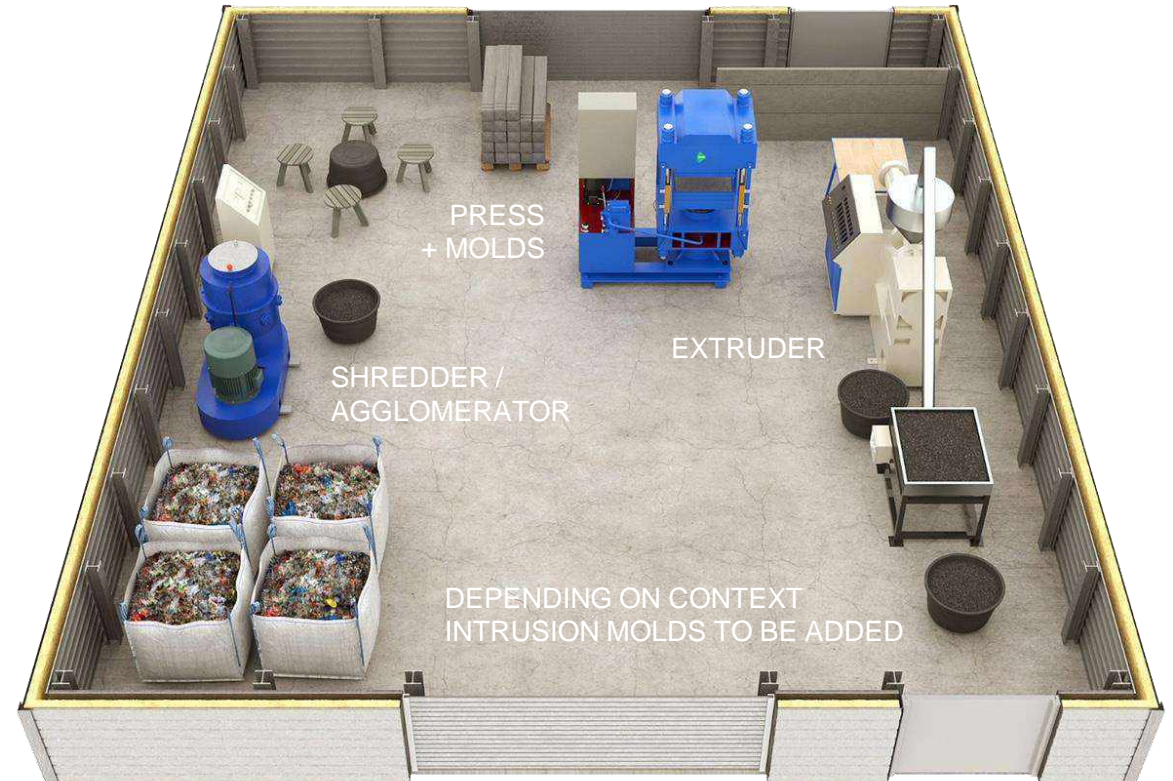
Collaboration with existing waste management structures is crucial

- E.g. partnership with municipal and private solid waste management
- Collaboration with ministries and government



MACHINERY

Machines	USD 49.000	
Shredder, 5 kW	USD 5.000	
Optional: shredder with washer		At a capacity of 250 kg/h 80kW is needed and will cost around 30.000 USD
Agglomerator	USD 5.000	
Extruder, 35 kW	USD 15.000	Spare parts like heating element and screw removal tool included
Intrusion moulds, on cart system	USD 10.000	
Press, 3 kW	USD 7.000	
Two moulds	USD 7.500	Mould costs are estimated because they depend on product design, and related production method (mill/laser/waterjet)
Optional: For 220V3P or 440V3P there will be extra costs (estimate) USD 2.00		Standard voltage of the machines is 380V, 50 or 60Hz.
Shipping (CIF) estimate	USD 14.000	Shipping cost are hard to predict due to fluctuations from china. Shipping costs of moulds not included; depends on local or remote production
Support at distance by Technical partner (3 years)	USD 10.000	
Detailed machine specification		
Support RFQ process		
Verification Factory acceptance test (FAT)		
Mould drawings		
Remote support for setting up facilities incl. unpacking and installing equipment		
Remote training and support machines start up		
Provide manuals, maintenance and user instructions		
Support on input mix and additives		
Total	USD 73.500	



Modular production hall layout example

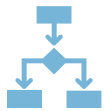
SELECTION FACTORS

TECHNIQUE AND PRODUCT



Impact

- (semi-) Industrial set-up and machinery to
 - Convert enough plastic to keep from landfill and (ocean) leakage
 - Get quality output that can compete with existing products
 - Create durable business
 - Create local employment



Flexibility

- Create different (mix of) semi-finished and end-products
- Create output material for different markets
- Enable sector-specific contribution to reduce waste
- Enable to convert different plastics



Viability

- Durable business plan / calculation
- Fitting the volumes on the island
- Ready for investors to step in
- Scalable: capacity aim is 150 tonnes / year



Complementarity to existing initiatives

- Utilizing local recycler's machinery, if compatible
- Tailor-made for local situation and market

TECHNOLOGY COMPARISON

MATRIX

This table provides a structured approach on how the recycling technology is selected. It is a general comparison example used for the technology selection, in which island specific factors have been considered.

PWF1 - WASTE TO PRODUCT - TECHNOLOGY COMPARISON

Categories	Weighting factor	Sheet press	Intrusion	Mixed extrusion + moulding	Mould melting	Rotomoulding	Mixed extrusion additive	Injection moulding
Processing capacity - What volume of plastic can be converted (connect to volume on the island) small: < 20 tonnes / year Aim: medium: 20-500 tonnes / year large: > 500 tonnes / year in general the better the fit, high the score	3	★★★★●●	★★★★★	★★★★★	★★●●●●	★★★★●●	★★★★★●	★★★★●●
Marketability - Can the product compete with other products? - Will it replace a product for the better?	2	★★★★●●	★★★★★	★★★★★	★★●●●●	★★★★★	★★★★★	★★★★★
Costs - Investment to set up machinery - Energy consumption in use - Expected revenue	2	★★★★●●	★★★★●●	★★★★●●	★★★★★	★★●●●●	★★●●●●	★★●●●●
Environmental safety during / after use - Non-toxic risk during production - No leakage (microplastics) - Recyclable at EOL	2	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★●●	★★★★★
Ease of implementation - Preparation of the input material - less sorting - less influence of contamination - Complete and ready setup of the machinery - Low skill and easy learning	1	★★★★●●	★★★★★	★★★★●●	★★★★●●	★★●●●●	★★●●●●	★★●●●●
Product value - Product with long life-span - A high value end-product	1	★★★★●●	★★★★★	★★★★★	★★★★★	★★★★★	★★★★●●	★★★★★
Overall score		★★★☆☆	★★★★☆	★★★★☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★★☆

MARKET ANALYSIS

HOSPITALITY

Primary market

- Tourism - Hospitality Outdoor furniture and Construction, i.e. dinner chairs, fencing, plastic lumber

Secondary markets

- B2C: High-end consumer design furniture has similar product characteristics and demands (overlap villas and apartments)
- B2B: semi-finished products, i.e. Timber, lumber, Sheets for furniture makers. i.e. countertop
- Public: governmental, school furniture
- Public works, Infrastructure + construction: governmental, public furniture, e.g. park bench, picnic table, signage, fencing

Market size hospitality furniture

- ±130 hotels, resort, with over 3000 apartments and rooms

Estimated annual expenditure on furniture

- USD 210,000 (3,000 rooms and accommodations with a average spending of \$70/year/room on outdoor furniture)

Global expected CAGR (Compound Annual Growth Rate) tourism after Covid-pandemic

- 3.1% (2021-2026)

Longer term market fundamentals

- Shorter supply chains decrease need for imports
- Less pressure on landfill

Demand-drivers

- Showing green/sustainable focus
- durable products
- Locally produced

MARKET ANALYSIS

HOSPITALITY

Market needs

- Durable furniture
- Easy to maintain / high quality
- Indoors and outdoors application
- Sustainable/green
- High end design

Buying patterns

- current yearly renew due to poor quality and extreme weather conditions (market research)

Locations of potential customers

- Mostly coastal area

Specify domestic vs export markets

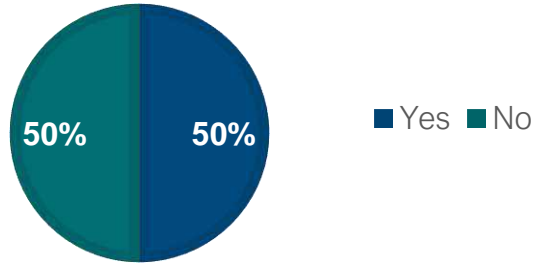
- Domestic: Local distribution network (stores, DIY markets, furniture makers)
- Export potential:
 - Caribbean region with the option of expending for processing waste locally

Launching customers:

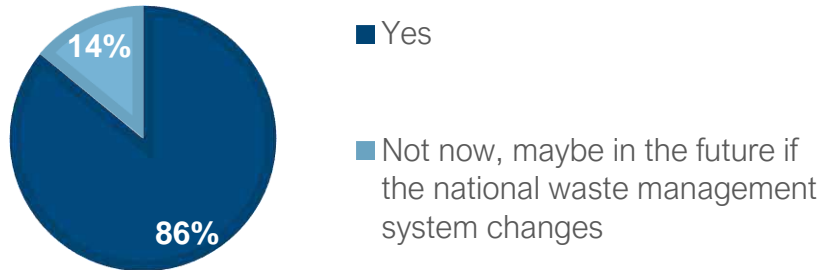
- Accommodations who collect material themselves
- Governmental bodies

BUSINESS DRIVERS

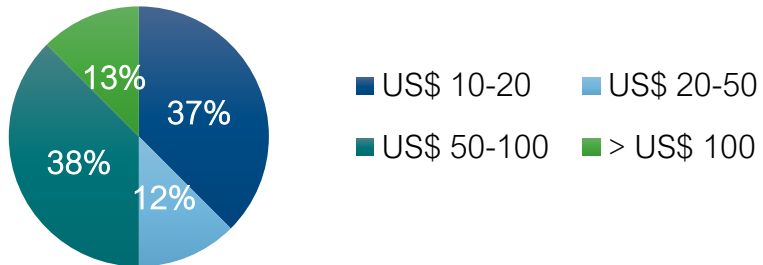
HOSPITALITY



50% willingness to purchase
recycled plastic furniture made from own waste



86% willingness to source-segregate recyclables
place a separate bin for collecting HDPE/PP shampoo, body wash and detergent bottles at hotel/resort



Current budget for outdoor furniture (e.g x1 plastic chair)?*
Saint Lucia survey results: **75% willingness to spend ±10% > average price**
*This question was not part of the Samoa survey

BUSINESS DRIVERS

INDUSTRY SUPPORT – INNOVATION AWARDS

rHDPE dining chair made from Caribbean plastic waste streams:

shortlisted for the prestigious **Plastics Recycling Awards Europe 2021**

- Household and Leisure products category



MARKET INTRODUCTION PLAN

FROM FUNCTIONAL PROTOTYPE TO MARKET INTRODUCTION

Timeline for key milestones of product development

PHASE 1- has been completed

- Extrusion testing
- Feedstock preparations
- Product interest inventory
- Design concept for products
- Engineering
- Prototyping
 - assembly testing
 - impression and use testing
- Improving based on feedback

PHASE 2

- Securing finances; procurement of machinery; staff recruitment

PHASE 3

- Production testing
- Production procedures development
- Packaging development
- Commercial production based on staged approach

Engagement & Sales

- Sales approach
 - Personal sales contact
 - Online order and service website
- Sales channels
 - Sales person
 - Web shop
 - Furniture Stores
 - DIY stores
 - Workshop showroom/store
- Engagement (communication with target groups)
 - Sales person
 - Website
 - Showroom
 - Exhibition

OPERATIONS

KEY RESOURCES, ACTIVITIES, PEOPLE

Tools & Machines

- Shredder
- Optional agglomerator if collection is expanded for flexibles processing
- Extruder
- Intrusion moulds
- Press + press moulds
- CNC mill
- Woodworking tools
- Pick up truck

Space & Permits

- 20 sqm stock
- 50 sqm production
- 20 sqm wood workshop

Key Tasks /activities

- Feedstock preparation
 - Collection
 - Washing
 - Shredding / agglomeration
- Production
 - Extrusion + intrusion + press moulding
 - Machine maintenance
- End product making
 - Cutting
 - Edge routing
 - CNC milling
 - Finishing
 - Packing
 - Servicing and repairs
- Sales and Distribution
 - Sales contact
 - Transportation: pick up and delivery

People

- Personnel: 7.5 up to 10 FTE
 - Sales person
 - Technician
 - Admin + online
 - Collection & Distribution - Transport
- Collaborators
 - Retailers, stores
 - Tourism sector
 - Government
 - IUCN/Searious Business

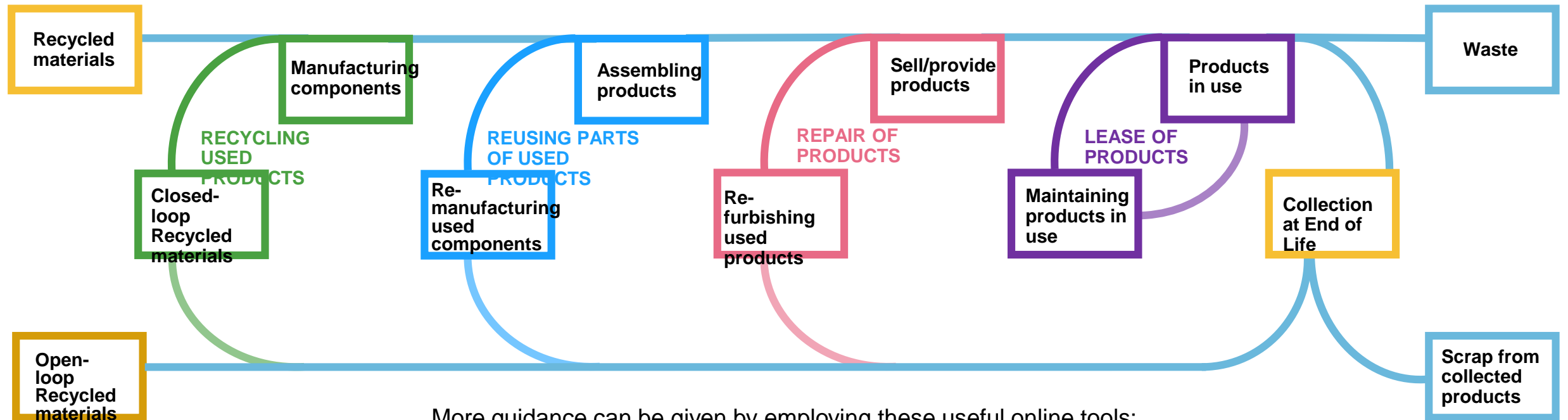
Running costs

- Space rent
- Electricity, water
- Staff costs
- Transport

POTENTIAL FOR CIRCULARITY

INCREASING CIRCULARITY

The below graph guides you on how to achieve maximum circularity for your product – on every step of the value chain!



More guidance can be given by employing these useful online tools:

[Circularity Calculator](#) and [Circularity Pathfinder](#)

FINANCIALS

SUMMARY AND SALES OVERVIEW

Diversifying the product portfolio is necessary to build a sustainable business model. The sales overview example provides ideas for possible other products.

Sales Overview				
Products & Services	Selling Price Per Unit	Number of Expected Sales Per Month	Total Product Cost	Profit Margin
50 kgs of Medium Shredded Plastic	0.00	166.7	10.61	-100.00%
mixed Beam 2800 x 40 x 80 mm	15.50	300.0	14.02	10.52%
mixed Plank 2800 x 28 x 130 mm	17.50	180.0	15.69	11.55%
Pavement tile	10.00	460.0	9.00	11.11%
wide HDPE plank 2800 x 18 x 130 mm	13.50	180.0	12.02	12.29%
narrow HDPE plank 2800 x 18 x 65 mm	9.00	90.0	7.94	13.35%
Bench parts	0.00	12.0	33.48	-100.00%
Park bench	160.00	12.0	88.56	80.67%
Trash nest	230.00	30.0	126.98	81.13%
Lounge chair	48.00	30.0	26.13	83.71%
Side table / foot bench	31.00	15.0	17.01	82.27%
Dining chair	36.00	60.0	19.70	82.78%
Dining table	68.00	15.0	37.52	81.24%

Summary	
Strating capital	179,649.43
Months to Pay Back Investment	30
Full Time Employees Needed	7.5
Revenue Earned Per Month	29,545.00
Fixed Costs Per Month	1,560.00
Material Costs Per Month	17,639.83
Total Wages Paid Per Month	4,112.60
Total Profit Earned Per Month	6,232.57

FINANCIALS

CASH FLOW

Cash Flow

A cash flow analysis shows that you have enough money throughout your first year to buy materials, pay your employees, or make an investment into a new machine.

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Money In Bank (Beginning of Month)	179,649.43	30,768.25	38,224.07	45,679.89	53,135.71	60,591.53	68,047.35	75,503.17	82,958.99	90,414.81	97,870.63	105,326.45
Initial Investment	179,649.43											
Revenue	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00
Total Cash In	209,194.43	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00	29,545.00
Investment Costs	(156,337.00)											
Variable Costs	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)	(20,529.18)
Fixed Costs	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)
Total Cash Out	(178,426.18)	(22,089.18)	(22,089.18)	(22,089.18)	(22,089.18)	(22,089.18)	(22,089.18)	(22,089.18)	(22,089.18)	(22,089.18)	(22,089.18)	(22,089.18)
Net Cashflow	30,768.25	7,455.82	7,455.82	7,455.82	7,455.82	7,455.82	7,455.82	7,455.82	7,455.82	7,455.82	7,455.82	7,455.82
Money In Bank (End of Month)	30,768.25	38,224.07	45,679.89	53,135.71	60,591.53	68,047.35	75,503.17	82,958.99	90,414.81	97,870.63	105,326.45	112,782.27

FINANCIALS

PROFIT, LOSS

Profit and Loss

This table is to show how much money the company is projected to make each year. It assumes that you paid yourself for the hours you worked. so the "Net Income" at the bottom is the remaining profit made by your company. It is greatly influenced by the "Monthly Sales Improvement Rate" on the Dashboard page. This table is also useful to show your bank or include in grant applications.

	Year 1	Year 2	Year 3
Revenue	354,540.00	389,994.00	428,993.40
Cost of Sales	246,350.15	270,985.17	298,083.68
Net Revenue	108,189.85	119,008.83	130,909.72
Fixed Costs	18,720.00	18,720.00	18,720.00
Gross Income from Operations	89,469.85	100,288.83	112,189.72
Business Taxes	24,156.86	27,077.99	30,291.22
Net Income	65,312.99	73,210.85	81,898.49

Yearly Growth Rate

10%

(conservative scenario)

Business Tax Rate

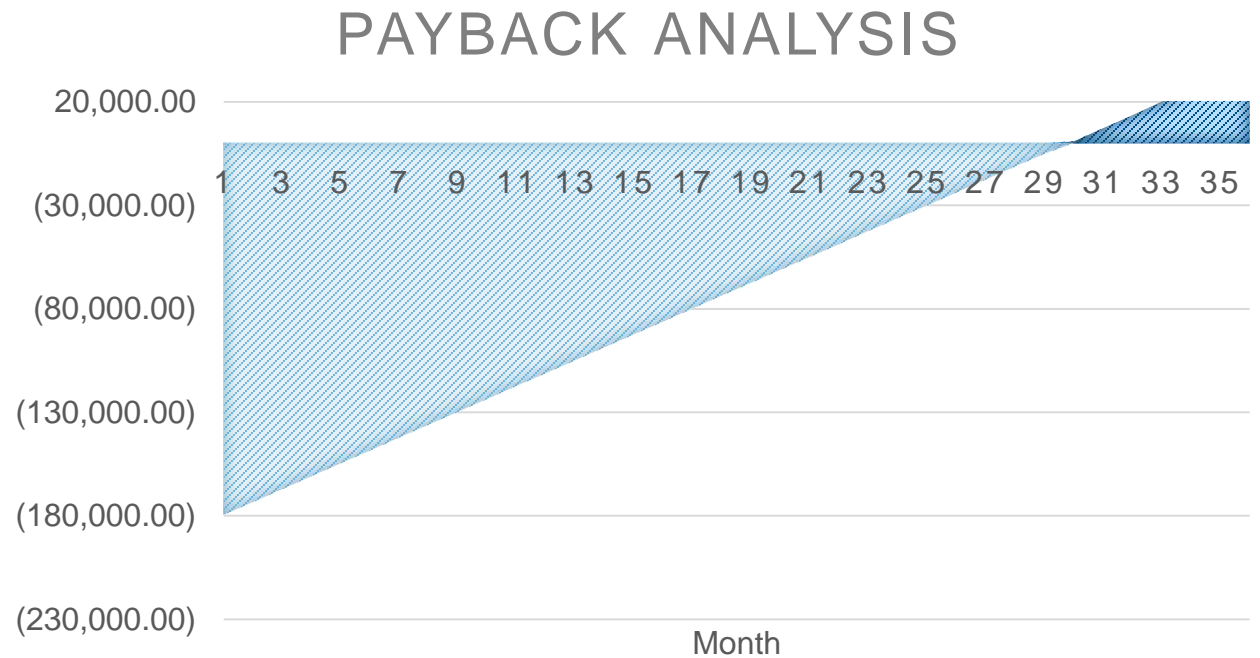
27.00%

FINANCIALS

FUNDING & ROI

Starting capital: US \$ 179,000
ROI 30 months

- Mostly machines and personnel






FINANCIALS

FUNDING PLAN

- Private money
- (Development) Bank loans: de-risking partner, e.g. offering loan guarantees)
Incl. ADB, IFC, CEB
- Investors/business accelerators ((pre)-seed, angel investment, early stage)
 - Blue Bio Value
 - Blue Natural Capital Finance Facility
 - Ennovent
 - For Good Venture
 - SAGANA
 - Sky ocean ventures
- (Governmental) grants
 - Development Cooperation partners, incl. UK, Norway, Italy, US, Germany, Swiss, France, China, Japan,
 - UNDP Innovation Fund
 - World Bank - ProBlue. NGOs could become a third party within a governmental program
 - IUCN
 - WWF
- Alliance to End Plastic Waste
- Ocean Foundation
- Plastic Solutions Fund
- Bill & Melinda Gates Foundation
- Minderoo, no 'Plastic Waste'-programme
- Australian National Product Stewardship fund
- Commonwealth Clean Ocean Alliance
- Dow Business Impact Fund
- Handelens Miljofond
- Plastics Solutions Fund
- Gallifrey foundation
- Oak Foundation
- PRIMAT (Didier and Martine Primat Foundation)
- The Fondation SUEZ
- Waitt Foundation
- For Good Foundation
- Onepercentfortheplanet

FACTSHEET

BENEFITS

Financial benefits 	Environmental benefits 	Social benefits 
ROI – 30 months	Lower landfill pressure for government: 150 tonnes / year or 12% of HDPE/PP/LDPE waste diverted from landfill/dumping sites	Develop recycling market - Create more jobs in island in collection, sorting, cleaning, recycling – 10 FTE when converting 6% of all plastic waste generated
Better license to operate for construction and furniture market. And allows for green/circular public procurement	Approx. 164.7 tonnes of CO2 emissions saved by redirecting plastic waste into products	Contribution to cleaner island and attractiveness for local population and visitors
Customer loyalty for producers	Reduced amount of plastic waste that might leak into the environment. 150 tonnes / year diverted from potential leakage	
Lower waste disposal and clean-up costs for government: Approx. savings WST 24,832		

FOR MORE INFORMATION

IUCN



IUCN_Plastics



plastics@iucn.org



<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



#CloseThePlasticTap

Searious Business



SeariousBusiness



connect@seariousbusiness.com



<https://www.seariousbusiness.com/islands>



#PlasticWasteFreeIslands #CloseThePlasticTap





PLASTIC WASTE FREE ISLANDS

VANUATU

BUSINESS PLAN

WASTE-TO-PRODUCT



An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



Norad



ACKNOWLEDGMENTS

IUCN Plastic Waste Free Islands (PWFI) project wishes to thank the various partners from government, private sector and industry, academia and research, civil society and nongovernmental organisations that contributed to this work through their participation in workshops, meetings, field excursions, and related consultations within the country.

This work could not have been accomplished, first and foremost, without the partners and stakeholders who supported the data collection efforts within each country. Above all, the PWFI team acknowledges the generous support of the Norwegian Agency for Development Cooperation (NORAD), and the cooperation of Searious Business.

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AUTHORSHIP

To be cited as

Searious Business, (2021). Report to IUCN Plastic Waste Free Islands, Waste-to-Product Business Plan, Vanuatu, Gland, Switzerland, IUCN

Support and Funding



Technical Lead Authors



Implementing Agency



Design

Ludovic Di Donato

WASTE-TO-PRODUCT

BUSINESS PLAN

PLASTIC WASTE FREE ISLANDS



The **Plastic Waste Free Islands (PWFI) Project** is part of the *Close the Plastic Tap* Program of IUCN. PWFI is a three-year project working in six islands in the Caribbean and Pacific.

Implemented in Fiji, Vanuatu and Samoa in Oceania and Antigua and Barbuda, Saint Lucia and Grenada in the Caribbean, the project seeks to promote island circular economy and to demonstrate effective, quantifiable solutions to addressing plastic leakage from Small Island Developing States (SIDS).

This business plan focusses on the **“Waste-to-product”** solution, in the geographic context of Vanuatu. It demonstrates how the solution can be realized, allowing for the creation of an alternative value chain.

MISSION

WHAT & WHY

What

- A successful business in Furniture and semi-finished products
 - Made from recycled plastic
 - Locally sourced and locally produced

Why

- Local business opportunity
 - Reduce Import-dependency
 - Enhance resource recovery options on-island
 - Job creation
- Reduce overfull landfills and high plastic leakage prevalence
 - Improved waste management
 - Lower environmental impact

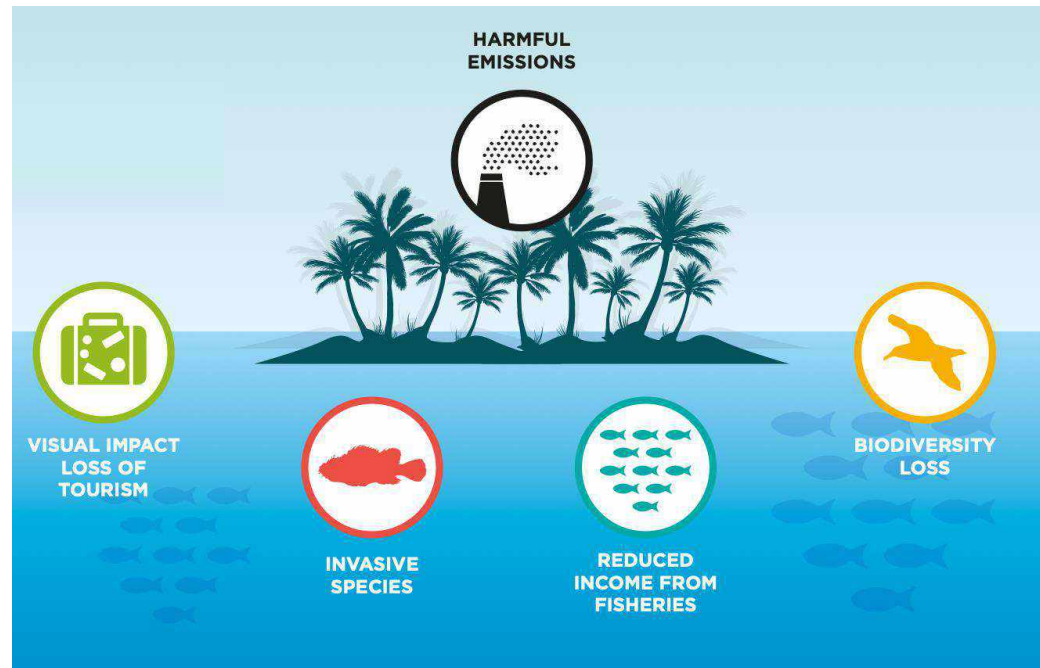


WHY START THIS BUSINESS

PLASTIC WASTE GENERATION & LEAKAGE

Plastic Waste Generation: The total amount of plastic waste that is produced on an annual basis, per plastic material type

Plastic Waste Leakage: The amount of unaccounted waste that is calculated by the difference of plastic material imported and plastic waste disposed.



Financial and environmental impacts of plastic leakage

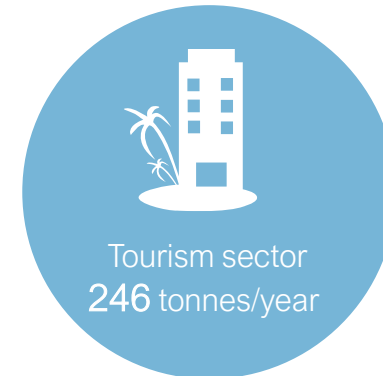
	Annual Imports 2018-2019 (T/y)	Total disposed 2019 - landfill (T/y)	Total disposed 2019 – dumpsite (T/y)	Total recycled 2019 (T/y)	Leakage (T/y) (95% credible interval)
PET (1)	868	347	113	0	454 (86-656)
HDPE (2)	686	173	49	0	468 (192-633)
PVC (3)	123	36	18	0	69 (16-107)
LDPE (4)	1106	494	154	0	463 (29-741)
PP (5)	438	129	33	0	296 (133-404)
PS (6)	534	214	27	0	296 (60-427)
Other (7)	1006	209	32	0	799 (439-960)
Overall	4760	1602	426	0	2846 (938-4018)

National plastic waste generation & leakage data Vanuatu with polyolefins in blue.
Source: Final quantification report – Executive summary APWC July 2021

CONTEXTUAL ANALYSIS OF WASTE MANAGEMENT PRACTICES

The contextual analysis of waste management practices summarizes the current situation of waste management in Vanuatu. It evaluates actions like collection, sorting and recycling, as well as future ambitions.

- Prepaid bag collection at source, no segregation at landfill, no local plastics recyclers → landfill, or leakage
 - Large volumes of rigid HDPE, PP and flexible LDPE waste that could be diverted quite easily from landfill
- Recyclers and relevant business partners united in the Vanuatu Recyclers Waste Management Association (VRWMA)
- Key developments:
 - Wan Smol Bag, No plastic bag, plis, Mama's Vanuatu, Pango Green Force and 300 Coconut bag.
 - The Department of Environmental Protection & Conservation (DEPC) is working with SPREP-PAC Waste Plus on exploring W2P solutions
 - Advanced Recovery Fee system policy paper is being developed by VRWMA for recyclables, incl PET and possibly HDPE
 - Vess/Recyclecorp/VRWMA in collaboration with World Vision Vanuatu clean up campaign June 2021
 - RecycleCorp and PWF I PET export trial to Visy, Australia
 - Waste to Product, PWF I



2,026 tonnes plastic waste generated/year

Source: Quantification report, Executive summary, APWC July 2021

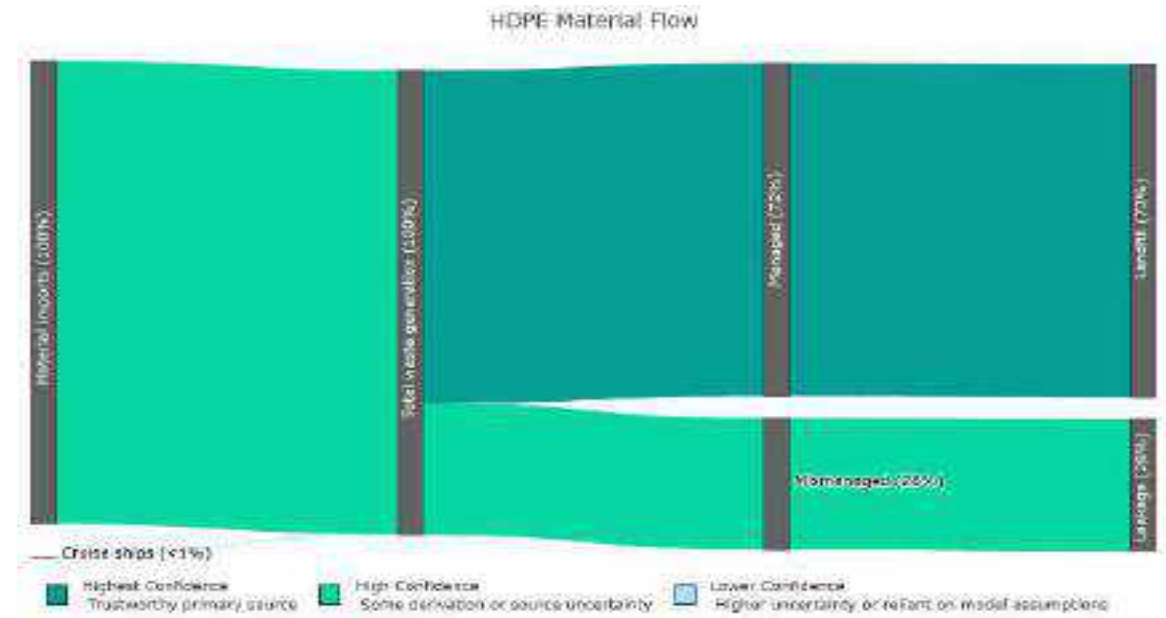
TARGETED MATERIAL(S)

HDPE – CURRENT VALUE CHAIN

Class	Item	House T/y	Commercial T/y	Tourism	Fishing T/y	TOTAL
HDPE 2	beverage containers pvc hdpe	135.8	27.98	No data	0.00	163.8
HDPE 2	home care hdpe	15.2	18.53		0.00	33.7
HDPE 2	beauty and personal care hdpe	35.2	15.59		0.00	50.8
HDPE 2	other hdpe	4.3	14.62		0.00	18.9
HDPE 2	garbage bags single use	7.1	13.77		0.00	20.9
HDPE 2	light shopping plastic bags single use	3.4	2.16		0.37	6.0
HDPE 2	food containers hdpe	24.2	0.00		7.02	31.2
HDPE 2	cleaning agent products hdpe	36.5	0.00		0.00	36.5
HDPE 2	shampoo body wash hdpe	4.0	0.00		0.00	4.0
HDPE 2	laundry detergents bottles hdpe	0.0	0.00		0.00	0.0
						365.8

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

High-density Polyethylene (HDPE): A thermoplastic polymer used in a wide variety of applications, e.g. shampoo bottles and milk containers. HDPE is easily recyclable.



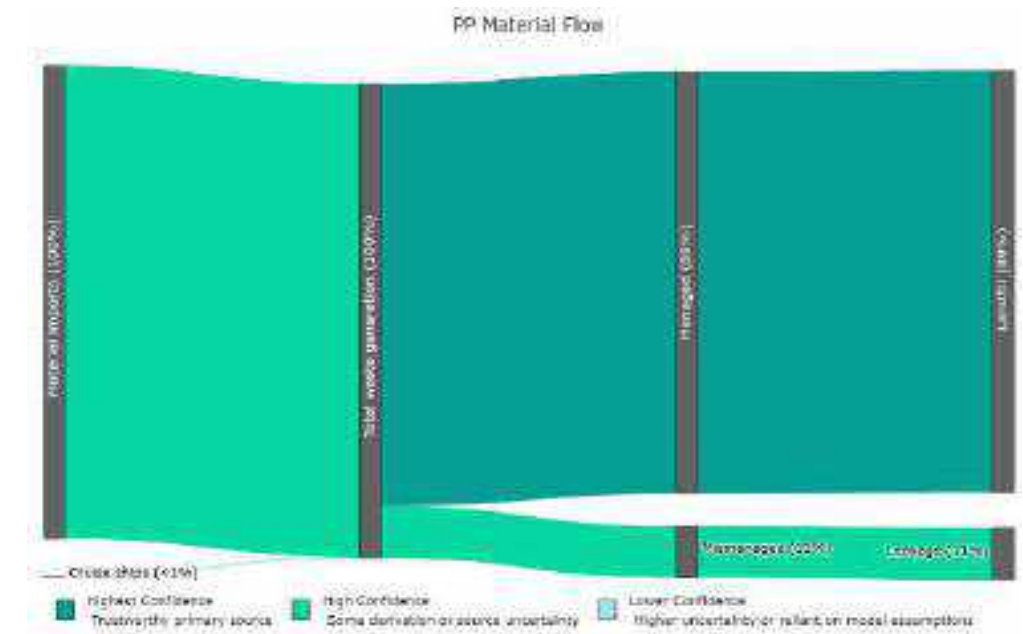
TARGETED MATERIAL(S)

PP – CURRENT VALUE CHAIN

Class	Item	House T/y	Commercial T/y	Tourism	Fishing T/y	TOTAL
PP 5	food semi rigid containers e.g. trays PP	5.7	15.50		0.00	21.2
PP 5	glossy shopping bags single use plastics	0.0	8.92		3.88	12.8
PP 5	single use take away food containers PP single use	19.6	7.04		0.46	27.1
PP 5	straws single use	0.6	5.48		0.00	6.1
PP 5	container lids pp	1.0	5.38		0.00	6.4
PP 5	other pp	9.6	2.77		5.22	17.6
PP 5	furniture houseware pp	0.0	0.00		1.87	1.9
PP 5	rope pp	6.2	0.00		1.63	7.8
PP 5	food containers pp	0.0	0.00		0.00	0.0
PP 5	medicine bottles pp	0.0	0.00		0.00	0.0
PP 5	automobile parts pp	30.9	0.00		0.00	30.9
						131.8

Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Polypropylene (PP): A thermoplastic polymer used in a variety of applications. PP is sturdy can be used in a flexible or rigid form. PP can potentially be recycled.



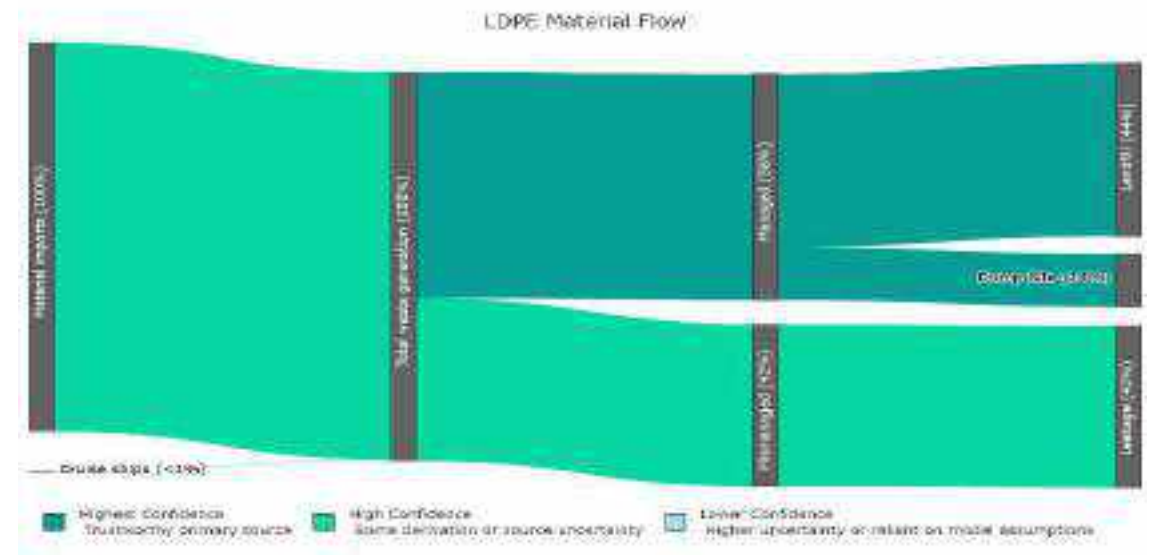
TARGETED MATERIAL(S)

LDPE – CURRENT VALUE CHAIN

Class	Item	House T/y	Commercial T/y	Tourism	Fishing T/y	TOTAL
LDPE 4	soft plastic packaging single use plastics	5.4	199.53		0.00	204.9
LDPE 4	other ldpe	9.2	99.76		0.00	108.9
LDPE 4	glossy shopping bags single use plastics	10.3	12.07		0.00	22.4
LDPE 4	food containers ldpe	4.0	9.18		0.00	13.2
						349.5

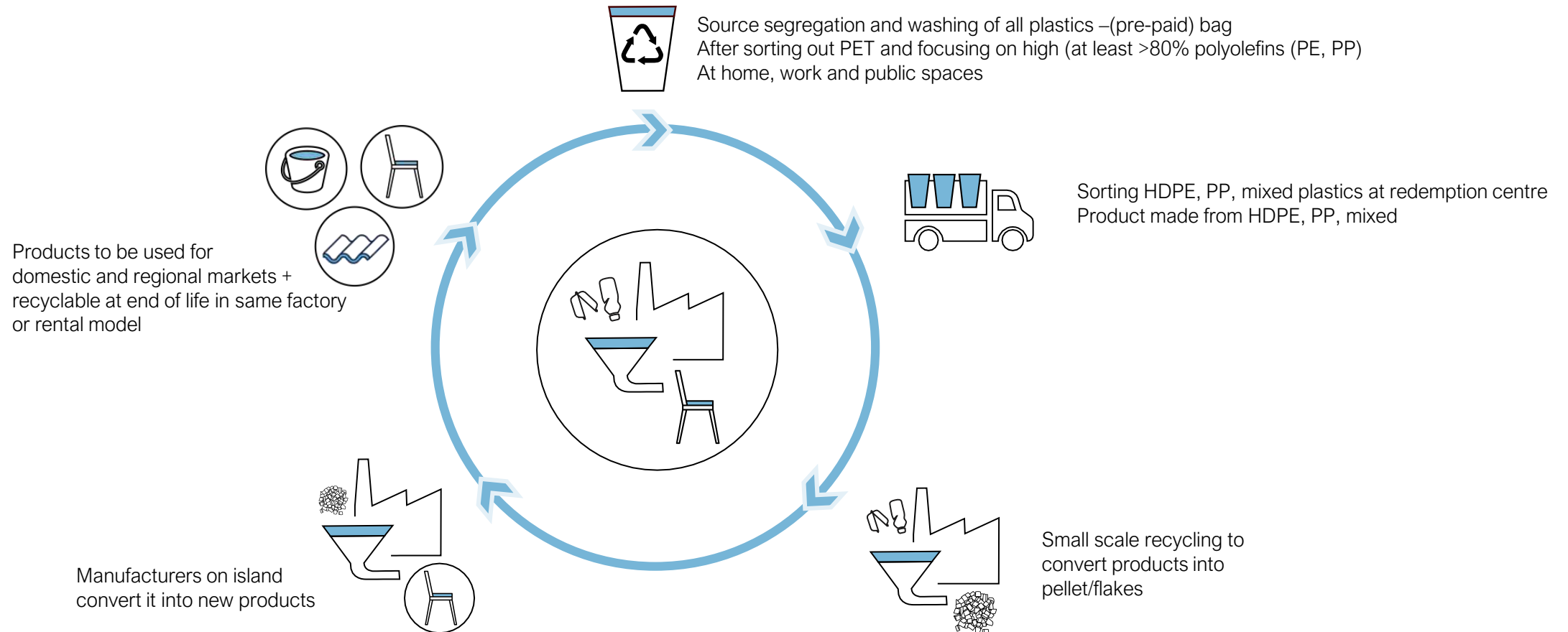
Source: Quantification report, Final data, All sectors plastics breakdown, APWC July 2021

Low-density Polyethylene (LDPE): A thermoplastic polymer, which is a soft, flexible, lightweight plastic material, oftentimes used for plastic bags. LDPE is recyclable.



OUTLINE WASTE TO PRODUCT

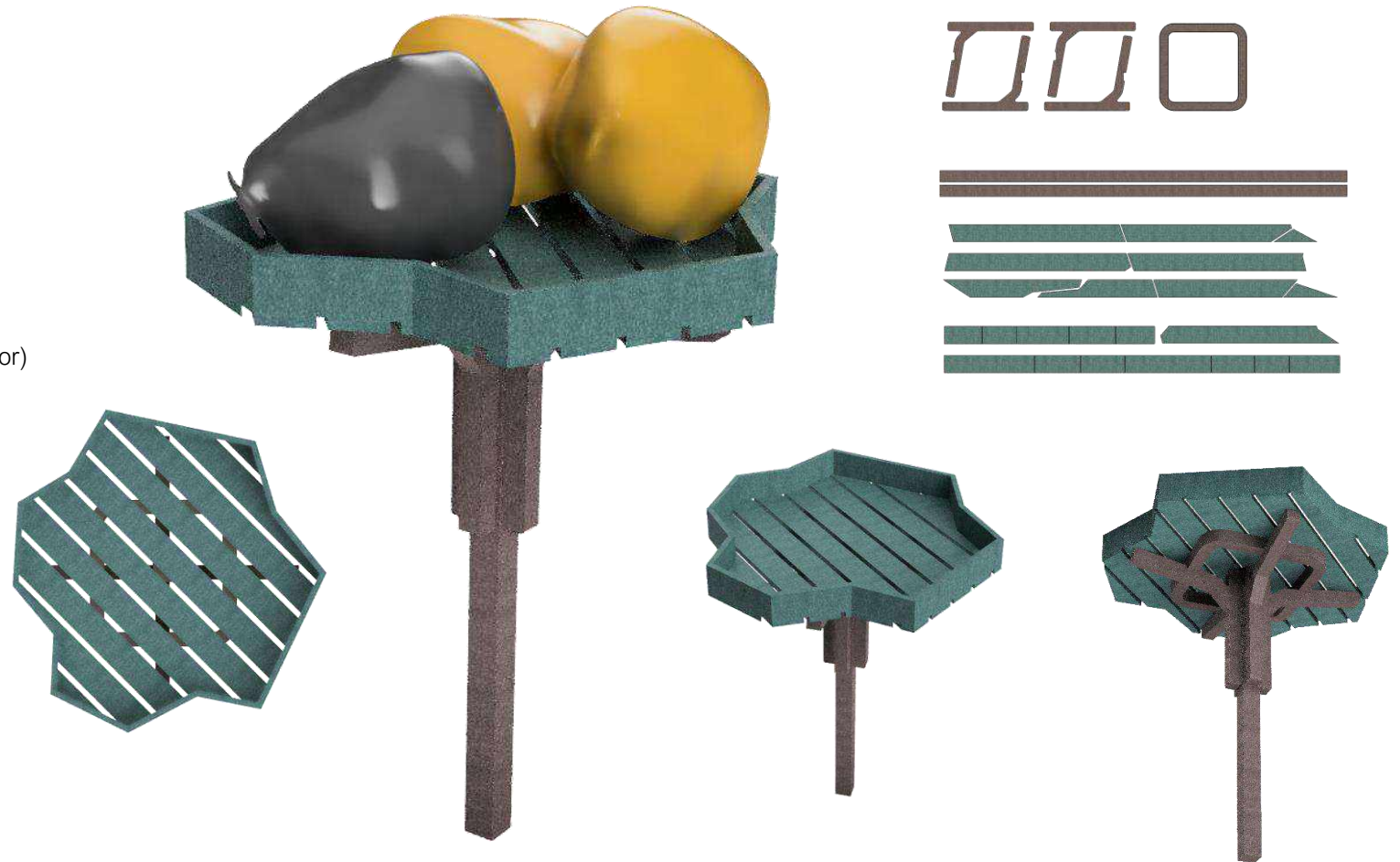
ALTERNATIVE VALUE CHAIN



PRODUCT CONCEPT

MIXED EXTRUSION PRODUCTS

- Beams, planks, tiles and parts (semi-finished product)
- Public furniture (end product)
- Example Prototype: raised waste platform (end product)
 - Trash tree / trash nest
 - Material: (mixed plastics)
 - Dimensions: L1280 x W1320 x H1545 mm
 - Weight: 43 kg
 - Intended use: public space (central collection points (outdoor))
- Other potential products
 - Lumber/timber, planks, posts
 - Purlin, rubbing styles
 - Street furniture, benches, picnic tables
 - Decking, cladding, siding
 - Fencing, bollards, palisade, edging
 - Shed foundation blocks, water side sheeting
 - Bridges, wharfs
 - Signage, litter bins, planters, raised waste platforms
 - Pergola, dog house
 - Garden, patio, terrace furniture
 - Exercise equipment
 - Traffic control: Wheel stops, speed humps, and rumble bars



USER SCENARIOS

TRASH TREE

Road-side, private, or public



- Modular, repairable
- Produced locally
- Durable: Weather & climate-proof
- Comfortable

UNIQUE SELLING POINTS

SUSTAINABLE & DURABLE

Technology

- Producibility: can process flakes directly so no high machine investments needed
- Scalability: Semi-finished products can be stored, and once machines reach their maximum capacity, an extra machine can be added
- Risk & compliance: Quality performance, with health and safety compliant setup

Product performance

- Sustainability – longer life: material vs wood based sheet
 - Lifespan: 40+ years r-plastic lumber vs 20 years hardwood
- Sustainability: green image – local waste converted
- Sustainability: easily repaired / parts replaced / recyclable
 - Recyclable: r-plastic sheets 7x recyclable
- Superior performance: weather proof / termite proof / UV-resistant
- Convenience: easily cleaned
- Superior Design: high end product/ distinctive design / high quality surface finish

Market

- Marketability: Completely circular product
- Marketability: Different furniture for different markets; tourism (i.e. hotels, restaurants), public (schools), private
- Marketability: Locally made vs imported
- Flexibility: Semi-finished products which can be sold directly or made into different end products with existing wood working techniques

DIFFERENTIATION FROM COMPETITION

CHEAP AND HARDWOOD CONSTRUCTION SECTOR



Hardwood lumber / timber



Stilt builds



Public raised waste platform

- More durable and longer lasting than wooden alternatives
- Easy repair with local service and parts from producer
- Added sustainable image value



Street furniture



Fencing



Private raised waste platform

CONCEPT DESCRIPTION

MIXED PLASTIC EXTRUSION BASED

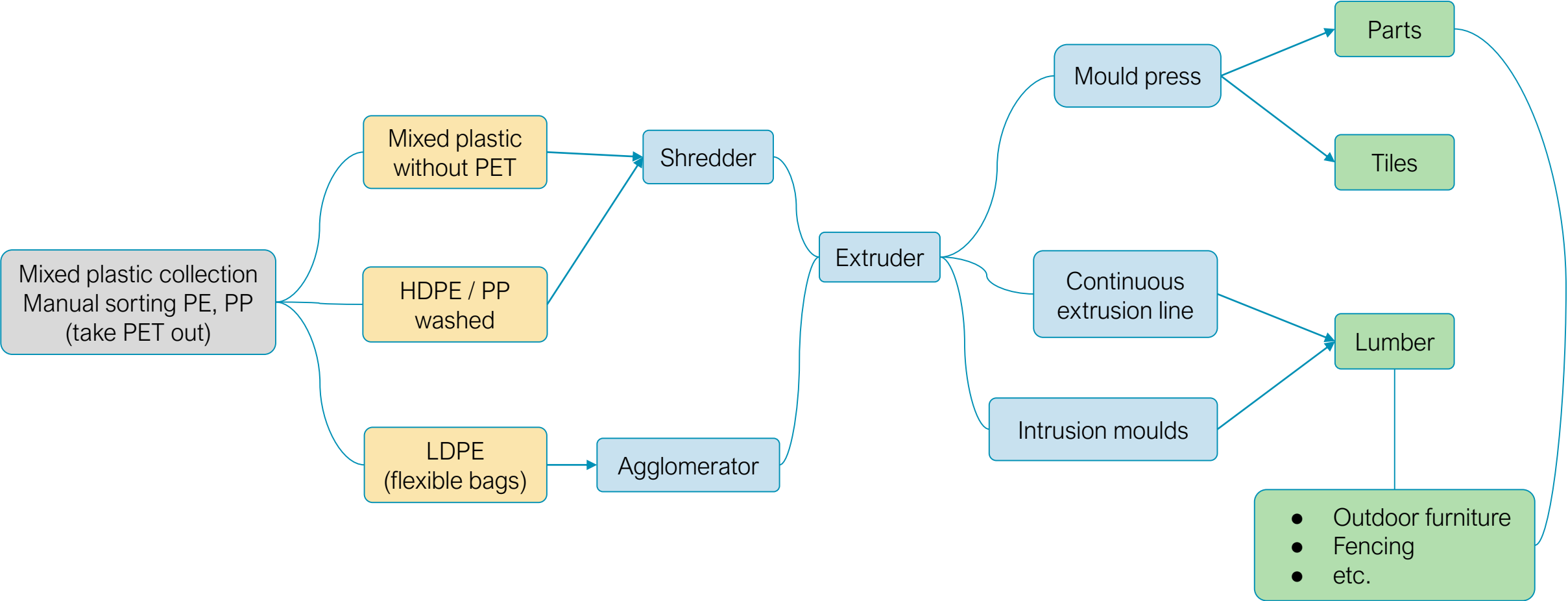
Technique: Extrusion based (setup around extruder) + add-on moulding options

- Machines: shredder and/or agglomerator, extruder, press + molds, intrusion moulds
- Woodworking equipment: Saw table / crosscut saw, mill, hand tools.
- Types of plastic converted:
 - High end product: HDPE sorted & washed
 - Lower end product: Mixed unwashed plastics with >70% PE/PP
- Amount of plastics used: e.g. 8.53 kg per 40x80x2800 beam, or 4.59 kg per 18x130x2800mm HDPE plank, or 65 kg per Trash Nest
- Source of input materials: Collection of HDPE, PP, LDPE or all mixed plastics
 - through (pre-paid) bag with all plastics collection and after sorting
 - Island wide stimulation through Advanced Recovery Fee scheme / Container deposit Legislation (CDL)
- Impact: up to 150t/y = 18% of total PE, PP stream, 7.32% of total plastic generated



EXTRUSION BASED

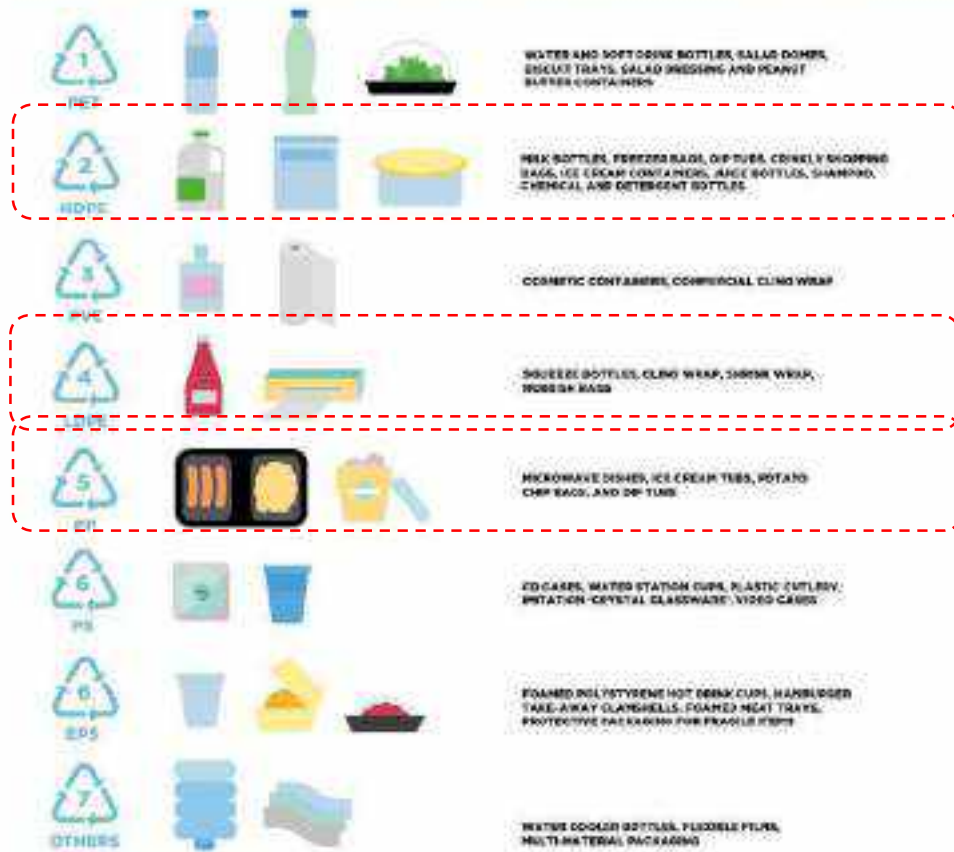
RECYCLING PROCESS



COLLECTION AND SORTING

IDENTIFYING

FIGURE 2: MAIN PLASTIC RESIN TYPES AND THEIR APPLICATIONS IN PACKAGING



Source: Project HornStream analysis.

Plastics have different properties
The focus in this business plan lays on:

- HDPE, PP and LDPE for their melting properties & easiness to recycle
- Slide 6-8 give an overview of what kind of applications are typically made of the targeted materials in the local context



COLLECTION AND SORTING

COLLECTION

While working towards public collection schemes for source-segregated plastic, strengthening and building on existing collection initiatives is recommended, including:

Drop off points

- E.g. schools, supermarkets, public buildings, redemption centers or resorts
- Incentives for consumers to sort and return plastic products
 - E.g. Discounts on end product
- Educational programmes and awareness campaign

Scale up collection of recyclables at commercial enterprises

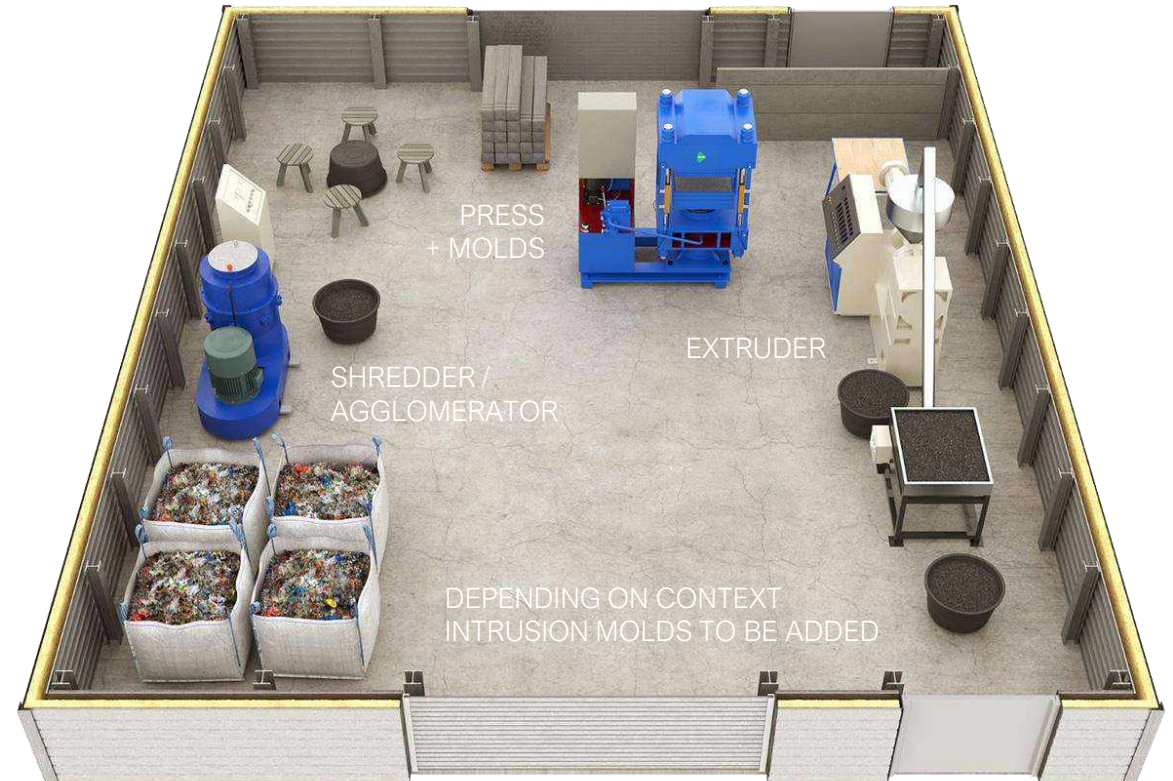
Collaboration with existing waste management structures is crucial

- E.g. partnership with municipal and private solid waste management
- Collaboration with ministries and government



MACHINERY

Machines	USD 49.000	
Shredder, 5 kW	USD 5.000	
Optional: shredder with washer		At a capacity of 250 kg/h 80kW is needed and will cost around 30.000 USD
Agglomerator	USD 5.000	
Extruder, 35 kW	USD 15.000	Spare parts like heating element and screw removal tool included
Intrusion moulds, on cart system	USD 10.000	
Press, 3 kW	USD 7.000	
Two moulds	USD 7.500	Mould costs are estimated because they depend on product design, and related production method (mill/laser/waterjet)
Optional: For 220V3P or 440V3P there will be extra costs (estimate) USD 2.00		Standard voltage of the machines is 380V, 50 or 60Hz.
Shipping (CIF) estimate	USD 14.000	Shipping cost are hard to predict due to fluctuations from china. Shipping costs of moulds not included; depends on local or remote production
Support at distance by Technical partner (3 years)	USD 10.000	
Detailed machine specification		
Support RFQ process		
Verification Factory acceptance test (FAT)		
Mould drawings		
Remote support for setting up facilities incl. unpacking and installing equipment		
Remote training and support machines start up		
Provide manuals, maintenance and user instructions		
Support on input mix and additives		
Total	USD 73.500	



Modular production hall layout example

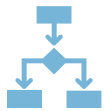
SELECTION FACTORS

TECHNIQUE AND PRODUCT



Impact

- (semi-) Industrial set-up and machinery to
 - Convert enough plastic to keep from landfill and (ocean) leakage
 - Get quality output that can compete with existing products
 - Create durable business
 - Create local employment



Flexibility

- Create different (mix of) semi-finished and end-products
- Create output material for different markets
- Enable sector-specific contribution to reduce waste
- Enable to convert different plastics



Viability

- Durable business plan / calculation
- Fitting the volumes on the island
- Ready for investors to step in
- Scalable: capacity aim is 150 tonnes / year



Complementarity to existing initiatives

- Utilizing local recycler's machinery, if compatible
- Tailor-made for local situation and market

TECHNOLOGY COMPARISON

MATRIX

This table provides a structured approach on how the recycling technology is selected. It is a general comparison example used for the technology selection, in which island specific factors have been considered.

PWFI - WASTE TO PRODUCT - TECHNOLOGY COMPARISON

Categories	Weighting factor	Sheet press	Intrusion	Mixed extrusion = moulding	Mould melting	Roto moulding	mixed extrusion additive	Injection moulding
Processing capacity - What volume of plastic can be converted (connect to volume on the island) - small: < 20 tonnes / year - Aim: medium: 20-500 tonnes / year - large: > 500 tonnes / year - In general the better the fit, high the score	3	★ ★ ★ ● ●	★ ★ ★ ★ ★	★ ★ ★ ★ ★	★ ● ● ● ●	★ ★ ★ ● ●	★ ★ ★ ★ ●	★ ★ ★ ● ●
Marketability - Can the product compete with other products? - Will it replace a product for the better?	2	★ ★ ★ ● ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ● ● ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●
Costs - Investment to set up machinery - Energy consumption in use - Expected revenue	2	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ★ ★ ●	★ ● ● ● ●	★ ● ● ● ●	★ ● ● ● ●
Environmental safety during / after use - Non-toxic risk during production - No leakage (microplastics) - Recyclable at EOL	2	★ ★ ★ ★ ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ★ ● ● ●	★ ★ ★ ★ ●
Ease of implementation - Preparation of the input material - less sorting - less influence of contamination - Complete and ready setup of the machinery - Low skill and easy learning	1	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ● ●	★ ★ ★ ● ●	★ ● ● ● ●	★ ● ● ● ●	★ ● ● ● ●
Product value - Product with long life-span - A high value end-product	1	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ★ ★ ●	★ ★ ● ● ●	★ ★ ★ ● ●
Overall score		★ ★ ★ ☆ ☆	★ ★ ★ ★ ☆	★ ★ ★ ★ ☆	★ ★ ☆ ☆ ☆	★ ★ ☆ ☆ ☆	★ ★ ☆ ☆ ☆	★ ★ ★ ☆ ☆

MARKET ANALYSIS

HOSPITALITY

Primary market

- Tourism - Hospitality Outdoor furniture and Construction, i.e. dinner chairs, fencing, plastic lumber
- Public works, Infrastructure + construction: governmental, public furniture, e.g. park bench, picnic table, signage, fencing

Secondary markets

- B2C: High-end consumer design furniture has similar product characteristics and demands (overlap villas and apartments)
- B2B: semi-finished products, i.e. Timber, lumber, Sheets for furniture makers. i.e. countertop
- Public: governmental, school furniture

Market size Public furniture

- 30+ Hotels, resorts and accommodations of different class
±1500 rooms

Estimated annual expenditure on furniture

- USD 105,000 (1500 rooms and accommodations with a average spending of \$70/year/room on outdoor furniture)

Global expected CAGR (Compound Annual Growth Rate) tourism after Covid-pandemic

- 3.1% (2021-2026)

Longer term market fundamentals

- Shorter supply chains decrease need for imports
- Less pressure on landfill

Demand-drivers

- Showing green/sustainable focus
- Longer lasting alternatives
- Locally produced

MARKET ANALYSIS

HOSPITALITY

Market needs

- Durable furniture
- Easy to maintain / high quality
- Indoors and outdoors application
- Sustainable/green
- High end design

Buying patterns

- current yearly renew due to poor quality and extreme weather conditions (market research)

Locations of potential customers

- Mostly coastal area

Specify domestic vs export markets

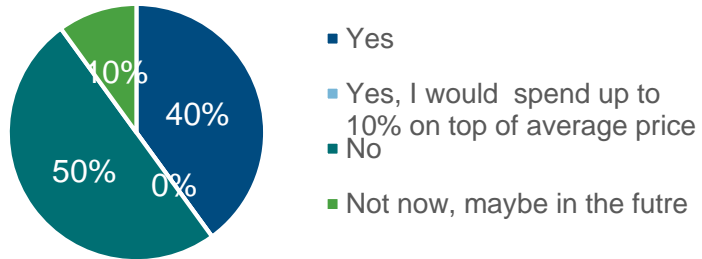
- Domestic: Local distribution network (stores, DIY markets, furniture makers)
- Export potential:
 - Caribbean region with the option of expending for processing waste locally

Launching customers:

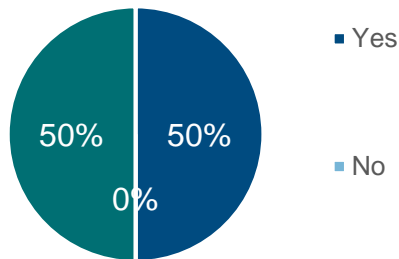
- Accommodations who collect material themselves
- Governmental bodies

BUSINESS DRIVERS

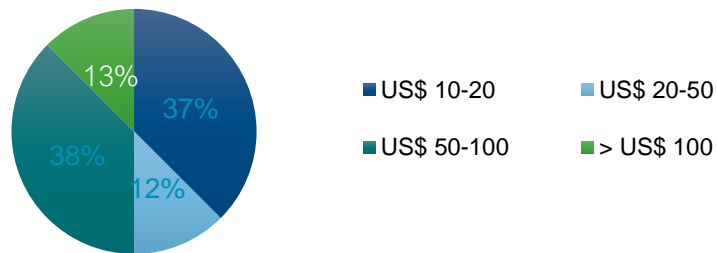
COMMERCIAL MARKET ANALYSIS HOSPITALITY



40% willingness to purchase recycled plastic furniture made from own waste _
10% considering to purchase in the future



50% willingness to source-segregate recyclable plastics - place a separate bin for collecting HDPE/PP shampoo, body wash and detergent bottles at hotel/resort



Current budget for outdoor furniture (e.g x1 plastic chair)?*
Saint Lucia survey results: 75% willingness to spend $\pm 10\%$ > average price
*This question was not part of the Vanuatu survey

BUSINESS DRIVERS

INDUSTRY SUPPORT – INNOVATION AWARDS

rHDPE dining chair made from Caribbean plastic waste streams:
shortlisted for the prestigious **Plastics Recycling Awards Europe 2021**
- Household and Leisure products category



MARKET INTRODUCTION PLAN

FROM FUNCTIONAL PROTOTYPE TO MARKET INTRODUCTION

Timeline for key milestones of product development

PHASE 1- has been completed

- Extrusion testing
- Feedstock preparations
- Product interest inventory
- Design concept for products
- Engineering
- Prototyping
 - assembly testing
 - impression and use testing
- Improving based on feedback

PHASE 2

- Securing finances; procurement of machinery; staff recruitment

PHASE 3

- Production testing
- Production procedures development
- Packaging development
- Commercial production based on staged approach

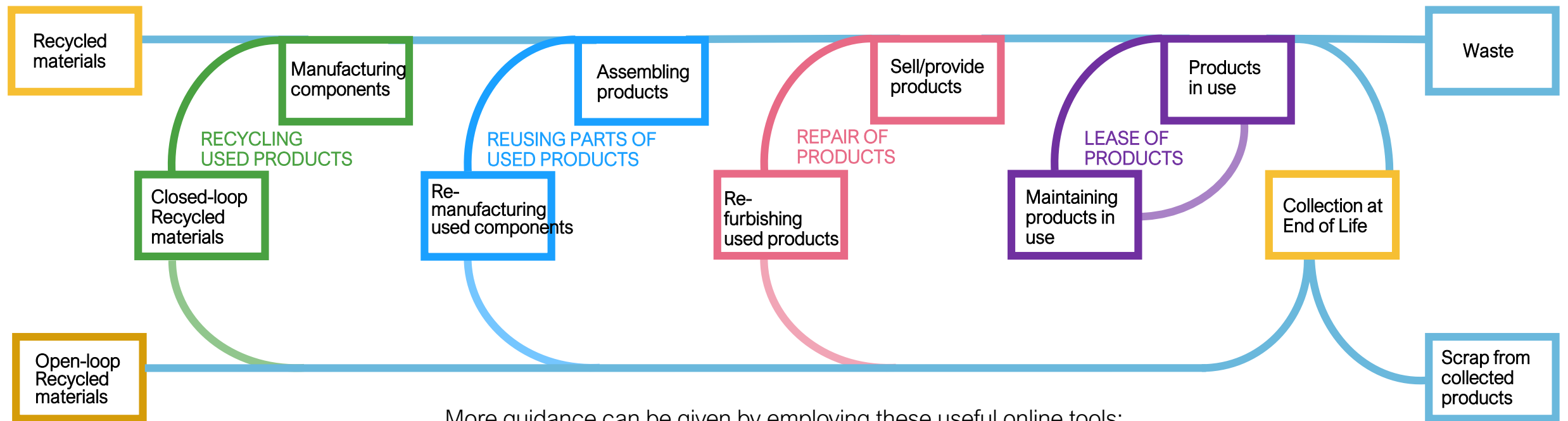
Engagement & Sales

- Sales approach
 - Personal sales contact
 - Online order and service website
- Sales channels
 - Sales person
 - Web shop
 - Furniture stores
 - Do-It-Yourself stores
 - Workshop showroom/store
- Engagement (communication with target groups)
 - Sales person
 - Website
 - Showroom
 - Exhibition

POTENTIAL FOR CIRCULARITY

INCREASING CIRCULARITY

The below graph guides you on how to achieve maximum circularity for your product – on every step of the value chain!



More guidance can be given by employing these useful online tools:

[Circularity Calculator](#) and [Circularity Pathfinder](#)

OPERATIONS

KEY RESOURCES, ACTIVITIES, PEOPLE

Tools & Machines

- Shredder
- Optional agglomerator if collection is expanded for flexibles processing
- Extruder
- Intrusion moulds
- Press + press moulds
- CNC mill
- Woodworking tools
- Pick up truck

Space & Permits

- 20 sqm stock
- 50 sqm production
- 20 sqm wood workshop

Key Tasks /activities

- Feedstock preparation
 - Collection
 - Washing
 - Shredding / agglomeration
- Production
 - Extrusion + intrusion + press moulding
 - Machine maintenance
- End product making
 - Cutting
 - Edge routing
 - CNC milling
 - Finishing
 - Packing
 - Servicing and repairs
- Sales and Distribution
 - Sales contact
 - Transportation: pick up and delivery

People

- Personnel: 7.5 up to 10 FTE
 - Sales person
 - Technician
 - Admin + online
 - Collection & Distribution - Transport
- Collaborators
 - Retailers, stores
 - Tourism sector
 - Government
 - IUCN/Searious Business

Running costs

- Space rent
- Electricity, water
- Staff costs
- Transport

FINANCIALS

SUMMARY AND SALES OVERVIEW

Diversifying the product portfolio is necessary to build a sustainable business model. The sales overview example provides ideas for possible other products.

Sales Overview				
Products & Services	Selling Price Per Unit	Number of Expected Sales Per Month	Total Product Cost	Profit Margin
50 kgs of Medium Shredded Plastic	0.00	166.7	12.90	-100.00%
mixed Beam 2800 x 40 x 80 mm	16.00	300.0	14.44	10.79%
mixed Plank 2800 x 28 x 130 mm	17.90	180.0	16.10	11.15%
Pavement tile	10.60	460.0	9.49	11.74%
wide HDPE plank 2800 x 18 x 130 mm	14.80	180.0	13.13	12.68%
narrow HDPE plank 2800 x 18 x 65 mm	10.10	90.0	8.91	13.32%
Bench parts	0.00	12.0	34.32	-100.00%
Park bench	162.00	12.0	89.53	80.94%
Trash nest	233.00	30.0	128.56	81.24%
Lounge chair	50.00	30.0	27.21	83.76%
Side table / foot bench	32.00	15.0	17.58	82.05%
Dining chair	37.00	60.0	20.46	80.88%
Dining table	70.00	15.0	38.47	81.97%

Summary	
Starting capital	180,898.91
Months to Pay Back Investment	31
Full Time Employees Needed	7.5
Revenue Earned Per Month	30,655.00
Fixed Costs Per Month	1,560.00
Material Costs Per Month	17,639.83
Total Wages Paid Per Month	5,362.08
Total Profit Earned Per Month	6,093.09

FINANCIALS

CASH FLOW

Cash Flow

A cash flow analysis shows that you have enough money throughout your first year to buy materials, pay your employees, or make an investment into a new machine.

	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Money In Bank (Beginning of Month)	180,898.91	32,249.89	39,937.87	47,625.85	55,313.84	63,001.82	70,689.80	78,377.78	86,065.76	93,753.74	101,441.73	109,129.71
Initial Investment	180,898.91											
Revenue	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00
Total Cash In	211,553.91	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00	30,655.00
Investment Costs	(156,337.00)											
Variable Costs	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)	(21,407.02)
Fixed Costs	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)	(1,560.00)
Total Cash Out	(179,304.02)	(22,967.02)	(22,967.02)	(22,967.02)	(22,967.02)	(22,967.02)	(22,967.02)	(22,967.02)	(22,967.02)	(22,967.02)	(22,967.02)	(22,967.02)
Net Cashflow	32,249.89	7,687.98	7,687.98	7,687.98	7,687.98	7,687.98	7,687.98	7,687.98	7,687.98	7,687.98	7,687.98	7,687.98
Money In Bank (End of Month)	32,249.89	39,937.87	47,625.85	55,313.84	63,001.82	70,689.80	78,377.78	86,065.76	93,753.74	101,441.73	109,129.71	116,817.69

FINANCIALS

PROFIT, LOSS

Profit and Loss

This table is to show how much money the company is projected to make each year. It assumes that you paid yourself for the hours you worked, so the "Net Income" at the bottom is the remaining profit made by your company. It is greatly influenced by the "Monthly Sales Improvement Rate" on the Dashboard page. This table is also useful to show your bank or include in grant applications.

	Year 1	Year 2	Year 3
Revenue	367,860.00	404,646.00	445,110.60
Cost of Sales	256,884.22	282,572.64	310,829.91
Net Revenue	110,975.78	122,073.36	134,280.69
Fixed Costs	18,720.00	18,720.00	18,720.00
Gross Income from Operations	92,255.78	103,353.36	115,560.69
Business Taxes	0.00	0.00	0.00
Net Income	92,255.78	103,353.36	115,560.69

Yearly Growth Rate

10%

(conservative scenario)

Business Tax Rate

0%

FINANCIALS

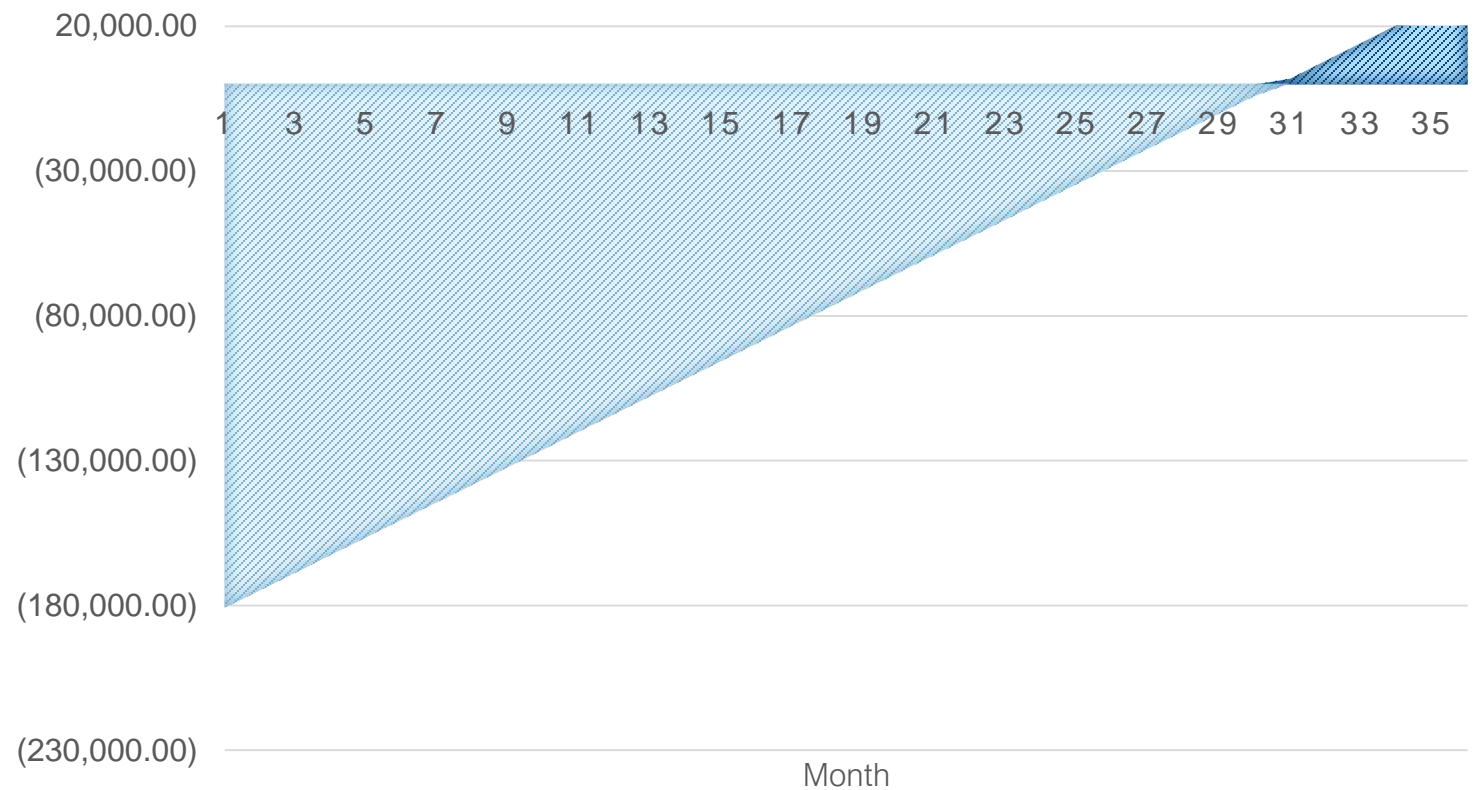
FUNDING & ROI

Starting capital: US \$ 180,899

ROI 31 months

- Mostly machines and personnel

PAYBACK ANALYSIS






FINANCIALS

FUNDING PLAN

- Private money
- (Development) Bank loans: de-risking partner, e.g. offering loan guarantees)
Incl. ADB, IFC, CEB
- Investors/business accelerators ((pre)-seed, angel investment, early stage)
 - Blue Bio Value
 - Blue Natural Capital Finance Facility
 - Ennovent
 - For Good Venture
 - SAGANA
 - Sky ocean ventures
- (Governmental) grants
 - Development Cooperation partners, incl. UK, Norway, Italy, US, Germany, Swiss, France, China, Japan,
 - UNDP Innovation Fund
 - World Bank - ProBlue. NGOs could become a third party within a governmental program
 - IUCN
 - WWF
- Alliance to End Plastic Waste
- Ocean Foundation
- Plastic Solutions Fund
- Bill & Melinda Gates Foundation
- Minderoo, no 'Plastic Waste'-programme
- Australian National Product Stewardship fund
- Commonwealth Clean Ocean Alliance
- Dow Business Impact Fund
- Handelens Miljofond
- Plastics Solutions Fund
- Gallifrey foundation
- Oak Foundation
- PRIMAT (Didier and Martine Primat Foundation)
- The Fondation SUEZ
- Waitt Foundation
- For Good Foundation
- Onepercentfortheplanet

FACTSHEET

BENEFITS

Financial benefits 	Environmental benefits 	Social benefits 
ROI – 31 months	Lower landfill pressure for government: 150 tonnes / year or 18% of PE/PPwaste diverted from landfill/dumping sites	Develop recycling market - Create more jobs in island in collection, sorting, cleaning, recycling – up to 11 FTE when converting 8% of all plastic waste generated
Better license to operate for construction and furniture market. And allows for green/circular public procurement	Approx. 164.7 tonnes of CO2 emissions saved by redirecting plastic waste into products	Contribution to cleaner island and attractiveness for local population and visitors
Customer loyalty for producers	Reduced amount of plastic waste that might leak into the environment. 150 tonnes / year diverted from potential leakage	
Lower waste disposal and clean-up costs for government: Approx. savings VUV 1,082,829		

FOR MORE INFORMATION

IUCN



IUCN_Plastics



plastics@iucn.org



<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



#CloseThePlasticTap

Searious Business



SeariousBusiness



connect@seariousbusiness.com



<https://www.seariousbusiness.com/islands>



#PlasticWasteFreeIslands #CloseThePlasticTap





PLASTIC WASTE FREE ISLANDS

SAINT LUCIA

BUSINESS PLAN

REUSABLE FOOD CONTAINERS



An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



Norad



ACKNOWLEDGMENTS

IUCN Plastic Waste Free Islands (PWFI) project wishes to thank the various partners from government, private sector and industry, academia and research, civil society and nongovernmental organisations that contributed to this work through their participation in workshops, meetings, field excursions, and related consultations within the country.

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Thanks also goes to colleagues in the IUCN regional and country teams for their continuous and invaluable support throughout the implementation of the assessment.

AUTHORSHIP

To be cited as

Searious Business, (2021). Report to IUCN Plastic Waste Free Islands, Reusable Food Containers Business Plan, Saint Lucia, Gland, Switzerland, IUCN

Support and Funding



Technical Lead Authors



Implementing Agency



Design

Ludovic Di Donato

REUSABLE FOOD CONTAINERS

BUSINESS PLAN

PLASTIC WASTE FREE ISLANDS



The **Plastic Waste Free Islands (PWFI) Project** is part of the *Close the Plastic Tap* Program of IUCN. PWFI is a three-year project working in six islands in the Caribbean and Pacific.

Implemented in Fiji, Vanuatu and Samoa in Oceania and Antigua and Barbuda, Saint Lucia and Grenada in the Caribbean, the project seeks to promote island circular economy and to demonstrate effective, quantifiable solutions to addressing plastic leakage from Small Island Developing States (SIDS).

This business plan focusses on the “**Reusable Food Containers**” solution, in the geographic context of Saint Lucia. It demonstrates how the solution can be realized, allowing for the creation of an alternative value chain.

MISSION

WHAT & WHY

What

- Innovating your take away operations through
 - The introduction of reusable food containers
 - Saving resources, money and preventing waste

Why

- Import-dependent economy, with limited resource recovery options on-island
- Enhanced customer loyalty
- Business innovation opportunity for
 - Restaurants/cafes/resorts owners and logistics partners owners
 - Income streams: Less import and dependency, more effective use of packaging
 - Job creation: Reuse services create infrastructure and jobs in the community that cannot be outsourced

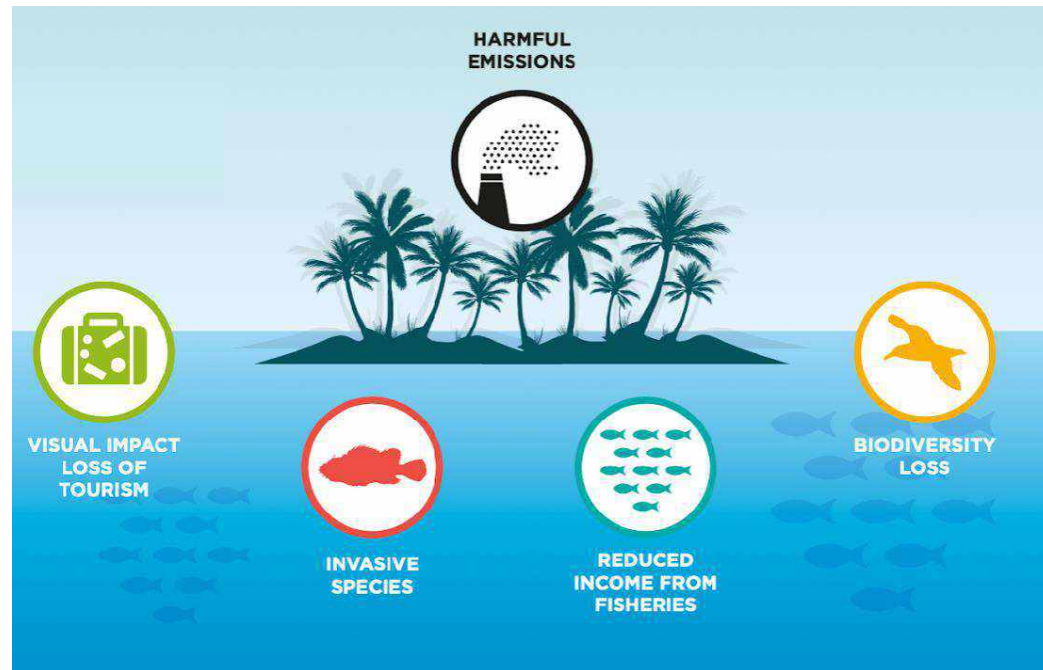


WHY REUSABLE FOOD CONTAINERS

PLASTIC WASTE GENERATION ON SAINT LUCIA

Plastic Waste Generation: The total amount of plastic waste that is produced on an annual basis, per plastic material type

Plastic Waste Leakage: The amount of unaccounted waste that is calculated by the difference of plastic material imported and plastic waste disposed.



Financial and environmental impacts of plastic leakage

Polymer	Annual Imports 2018–2019 (T/y)	Total waste disposed 2019 (T/y)	Total recycled 2019 (T/y)	Leakage (T/y) – model based estimate (95% credible interval)
PET (1)	1505.92	1437.39	14.07	187 (0–482)
HDPE (2)	584.85	540.66	3.93	70 (0–275)
PVC (3)	86.58	50.59	0.00	37 (0–71)
LDPE (4)	372.55	367.73	0.00	52.4 (0–245)
PP (5)	514.52	426.86	0.00	105 (0–348)
PS (6)	397.31	356.17	0.00	43 (0–224)
Other (7)	2157.43	1891.18	0.00	341 (0–955)
Overall	5619.17	5070.58	18.00	836 (132–1391)

National plastic waste generation & leakage data Saint Lucia with PET and PS in blue.
Source: Final quantification report – Executive summary APWC July 2021

WHY START THIS BUSINESS

CONTEXTUAL ANALYSIS WASTE MANAGEMENT

The contextual analysis of waste management practices summarizes the current situation of waste management on Saint Lucia. It evaluates actions like collection, sorting and recycling, as well as future ambitions.

- ❖ No central collection at source or segregation at landfill, no local plastics recyclers [?] landfill, or leakage
 - Except for PET [?] Incentivised collection and export of PET beverage bottles through RePlast Project
- ❖ No reuse/refill schemes on Saint Lucia yet, despite considerable economic and environmental potential
- ❖ National ambitions/initiatives/pipeline:
 - Incentivised PET bottle return program of PET beverage bottles through RePlast Project (OECS, Unite Caribbean)
 - The Department of Environment is considering introduction of CDL for PET beverage containers
 - SLSWMA purchased 20 pyrolysis machines in 2020 to incinerate household waste
 - Government of Saint Lucia substantially increased funding to SLSWMA
 - Ministry of Sustainable Development ambitions: promoting reuse



5071 tonnes plastic waste generated/year

Source: Quantification report, Executive summary, APWC July 2021

TARGETED MATERIALS

PET, PS, PP AND MATERIAL MIXES – CURRENT VALUE CHAIN

On Saint Lucia, food containers are made from different kinds of materials:

- Mono-material PET/PS/PP
- A combination of different plastic materials

Below, a short description of each material can be found.

Polyethylene terephthalate (PET): A thermoplastic polymer of the polyester family, which is commonly used for beverage bottles and food packaging. PET is easily recyclable.

Polystyrene (PS): A synthetic aromatic hydrocarbon polymer made from the monomer known as styrene. Can be solid or foamed. PS is currently not commercially recyclable.

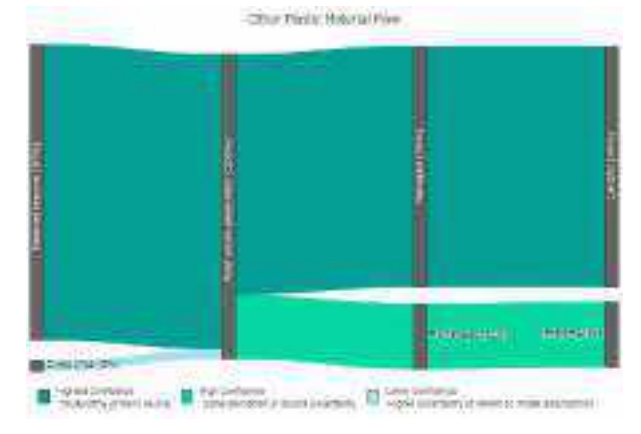
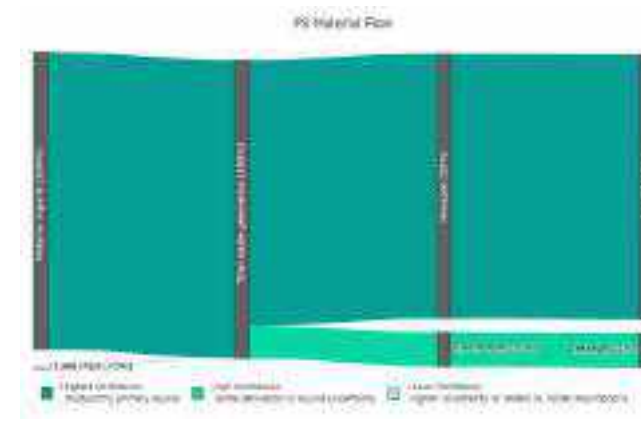
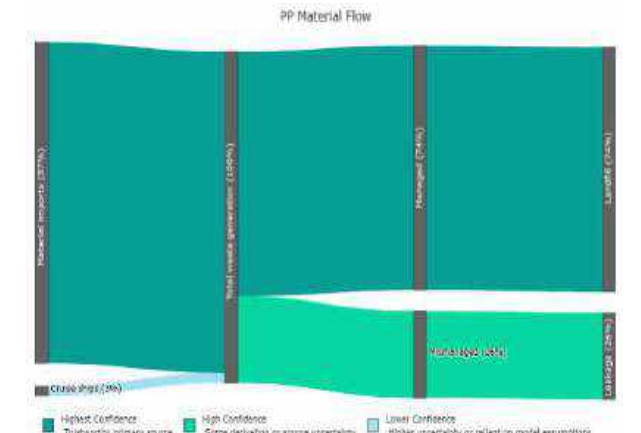
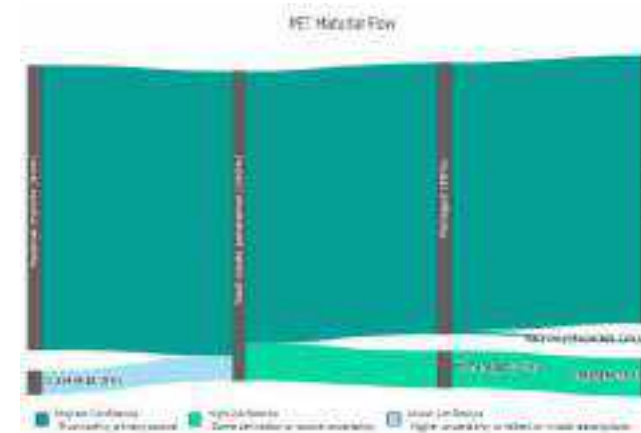
Polypropylene (PP): A thermoplastic polymer used in a variety of applications. PP is sturdy can be used in a flexible or rigid form. PP can potentially be recycled.

Material mixes: Different polymers, and/or other materials like paper and aluminum, combined through layering, printing, pressing or other combination techniques. Here recyclable.

TARGETED MATERIALS

PET, PS, PP AND MATERIAL MIXES – CURRENT VALUE CHAIN

z	Plastic Waste Generation	Household (t/y)	Commercial (t/y)	Tourism (t/y)	Fisheries (t/y)	Total (t/y)
PET 1	single use take away food containers pet single use	4,4	8,0	ND	0,0	12,4
PP 5	single use take away food containers pp single use	5,6	11,9	ND	0,0	17,5
PS 6	food containers eps ps	6,6	6,2	ND	0,0	12,8
HDPE 2	food containers hdpe	14,4	9,8	ND	0,1	24,3
PS 6	styrofoam takeaway food containers single use	15,0	5,4	ND	0,0	20,4
PS 6	food containers ps	17,1	0,3	ND	0,0	17,4
PP 5	food containers pp	18,3	4,3	ND	1,6	24,2
PET 1	food semi rigid containers e.g trays pet	20,9	5,1	ND	0,0	26,0
PP 5	food semi rigid containers e.g trays pp	46,0	88,7	ND	0,0	134,7
OTHER 7	multi layered containers for	281,1	27,3	ND	0,1	308,5
Total						598,2



REUSABLE FOOD CONTAINERS

ALTERNATIVE VALUE CHAIN

Concept

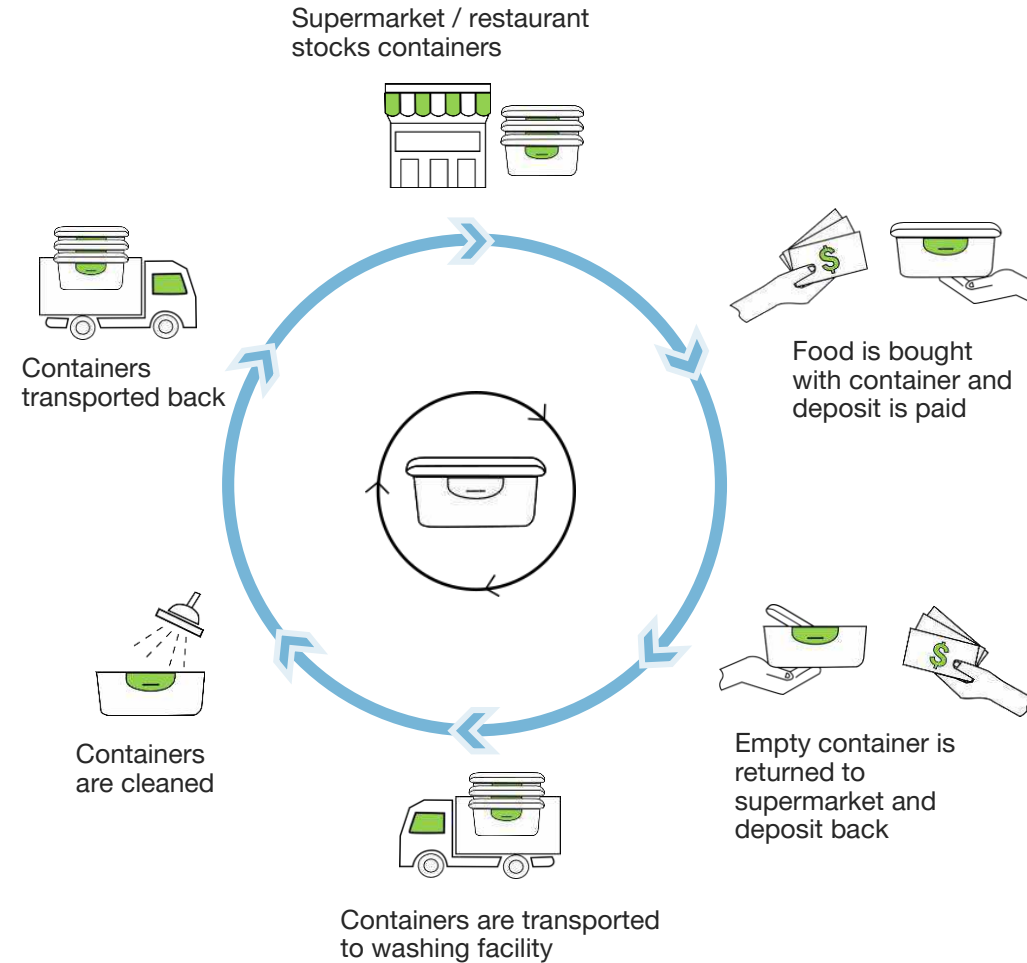
Customers avoid single-use plastic by using reusable containers for ready-meals, take-aways and any food in bulk. An incentive such as deposit or voucher encourages the return. The containers are then professionally cleaned and can be reused up to 500 times.

Target group:

- Hotels & restaurant guests
- Day-trippers
- Yacht owners

Stakeholders:

- Hotels & restaurants
- Supermarkets
- Yachts
- Food containers suppliers
- Logistics companies
- Washing facilities



OUTLINE REUSABLE FOOD CONTAINERS

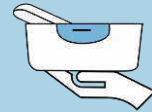
OVERVIEW

RENTAL



- Customers can rent a reusable container for their take-away meal
- Customers have to pay a small deposit, which they receive back when returning the container
- They can take the container out of the store, even though it belongs to the restaurant owner/supermarket
- Hygiene and Safety Standards: Completely safe to use reusables if handled correctly
- Optional: Tracking app for container traceability, accessing consumer data, customer engagement

RETURN



- Customers can drop off their reusable containers at drop off point in restaurant/store (manned/unmanned)
- Customers receive their deposit back (automated with digital app and scanning of QR Code or with staff person)
- Deposit can be received in form of voucher (to be spent in restaurant/store), digital payment or cash
- Important for hygiene and safety: Returned container must be handled separately from any clean dishes

WASHING



- Washing can happen in industrial dishwasher of restaurant/store with the other dishes
- Industrial washing process ensures proper, professional cleaning which is 100% safe and follows hygiene standards
- Optional: External washing through the establishment of a communal washing hub
- Washing hub is most efficient if multiple restaurants/stores use it together (reduced costs)

LOGISTICS



- Additional space required for storage of reusable containers
- Less dependency on the import cycles/purchase of single-use containers
- Reverse logistics only required if system depends on external washing

➔ KEY ENABLING FACTORS: Hygiene standards, standardized design, traceability, high-quality material, reverse logistics

REUSABLE CONTAINER SPECS

RECOMMENDATIONS FOOD CONTAINERS

Containers made from PolyPropylene (PP)

- Can be recycled
- Lightweight
- Nestable
- Not energy intensive production
- Leakage-proof
- Heatable in microwave
- Dishwasher-safe
- BPA/B-free
- Rectangular shape recommended for more effective storage space usability






Why PP?

Compared to reusable alternatives made from stainless steel, glass, and silicon, PP scored better in the following categories: weight, energy use during production, sturdiness, and on the go convenience



FACTSHEET

BENEFITS

Financial benefits 	Environmental benefits 	Social benefits 
Revenues through customer loyalty: USD 126 per month per restaurant	Lower landfill pressure for government. Amount of plastic waste diverted based on reusable concept: 250 kg/year per restaurant	Job creation: Reuse services create infrastructure and jobs in the community that cannot be outsourced (lowers import dependency), especially in delivery models when upscaling
Less dependence on import of plastic materials – less bureaucracy required	Between 50% and 75% reduction of global warming, fossil resource scarcity and terrestrial acidification	Reusing food containers boosts interaction between food places and customers
Lower waste disposal and clean-up costs for government	Marine ecotoxicity reduced by > 80%	Contribution to cleaner island and attractiveness for local population and visitors
	Reduced amount of plastic waste that might leak into the environment: 250 kg/year per restaurant	Human toxicity reduced > 50% compared to landfilling plastics

FACTSHEET

MARKET ANALYSIS, COST OVERVIEW, USP

Major applications and markets

- Primary market: restaurants, take-away places, pool areas of resorts and hotels
- Secondary markets: deli counters of supermarkets
- Major applications: For warm and cold meals, salads, soups and stews, sandwiches and desserts

Volumes to be procured

- Per restaurant, 25 reusable food containers as a starting point (relative to 200 meals/day of an average sized food outlet)
- If more restaurants join, purchase and import can be combined with other entities

Source

- Can be sourced from local or overseas suppliers, e.g. EMSA container from Groupe SEB. The quality needs to be high, for cost-effectiveness and multiple reuses

Costs and capacities

- Revenue: USD 126 per month.
- Collection: marginal costs, customer drops container off

- Transport: not applicable
- Washing: 0.08 USD per container
- Reverse logistics: only applicable if external washing is required

Unique selling points

- Meeting plastic waste reduction targets of food outlets
- Concept allows for high-standard food serving
- Meeting circularity/sustainability targets of governments
- Scalability: High – scheme is easy to copy and scale up
- Marketability:
 - High – reusable containers save costs and have many environmental benefits compared to single-use containers
 - Reusable containers boost customer loyalty
 - Completely circular product, based on high readiness level from key stakeholders
- Risk & compliance: health and safety compliant local setup

MARKET INTRODUCTION PLAN

FROM PILOT TO MARKET INTRODUCTION

Timeline for key milestones of scheme introduction

PHASE 1 - Reusable food containers milestone (pilot)

- Selecting Container (Assessment of viable options)
 - Material, volume, shape, colour
- Ordering Container & Developing design concept
- Printing design on reusable container
- Stocking reusable container in store

PHASE 2 – Washing milestone (pilot)

- Set up washing line (either in hub, in restaurant or external)
- Organise logistics around washing (transport to facility, training staff)

PHASE 3 – Return milestone (pilot)

- Set up return system (e.g. drop off area/drop off box)
- Set up efficient and convenient deposit return system (incorporate in cashier system)

PHASE 4 – Commercial market introduction (out of pilot scope)

- Adjust single-use container purchase
- Set up advanced washing system with other restaurants
- Set up tracking technology (RFID code + return app)

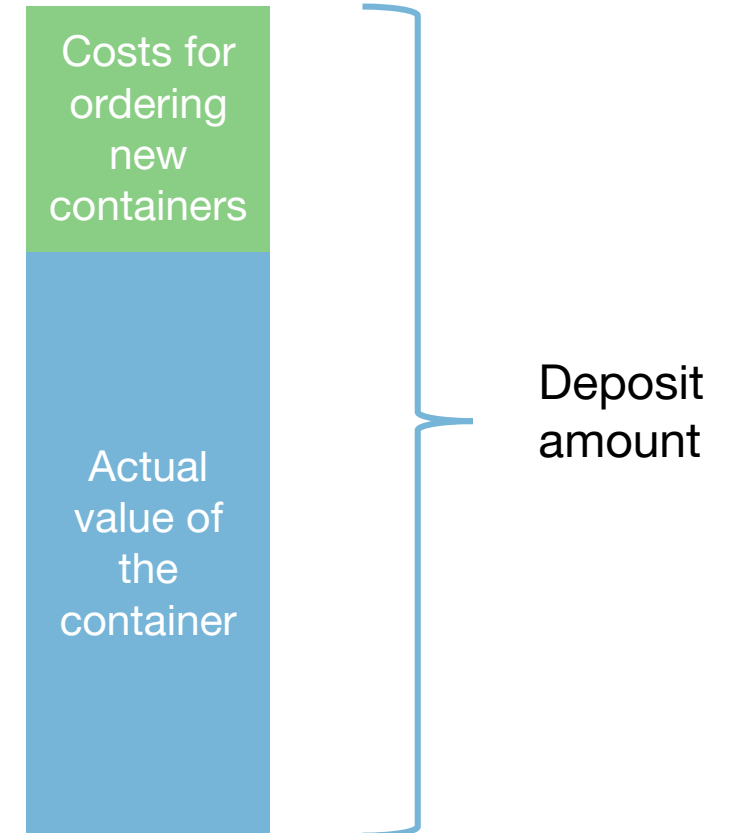
Sales & Communication

- Promotion channels
 - In-store promotion through posters and flyers
 - In-store promotion through staff
 - Make reusable food containers the default setting (customers having to ask to get a single-use one)
 - Posters in community centre and supermarkets close-by
 - Radio advertisement
 - TV advertisement
- Promotion topics
 - The What: Explaining how reuse works in practice
 - The Why: Landfill pressures, ocean pollution, resource scarcity and its impact on Saint Lucia's tourism and fisheries industry, opportunity for strengthening customer loyalty
 - The How: Emphasising local employment and business opportunity, as well as safety and compliance to hygienic standards
 - The Who: mentioning all partners and organisations

DEPOSIT RANGE

DETERMINING THE RIGHT AMOUNT FOR THE DEPOSIT

- ❖ The deposit for the rent of a reusable food container should be somewhat higher than its procurement price in order to avoid losses to the supermarket/restaurant in case the reusable food container is not brought back.
- ❖ At the same time, it needs to be low enough to be affordable for the users of the container. The ratio between the rent for the packaging and the actual food should not be higher than 1:2, if possible
 - For example, if a meal costs USD 6, the rent for the reusable container should not be higher than USD 3.



➔ Key enabling factor(s): set reuse packaging as default option; slowly phase out single-use alternatives

FACTSHEET

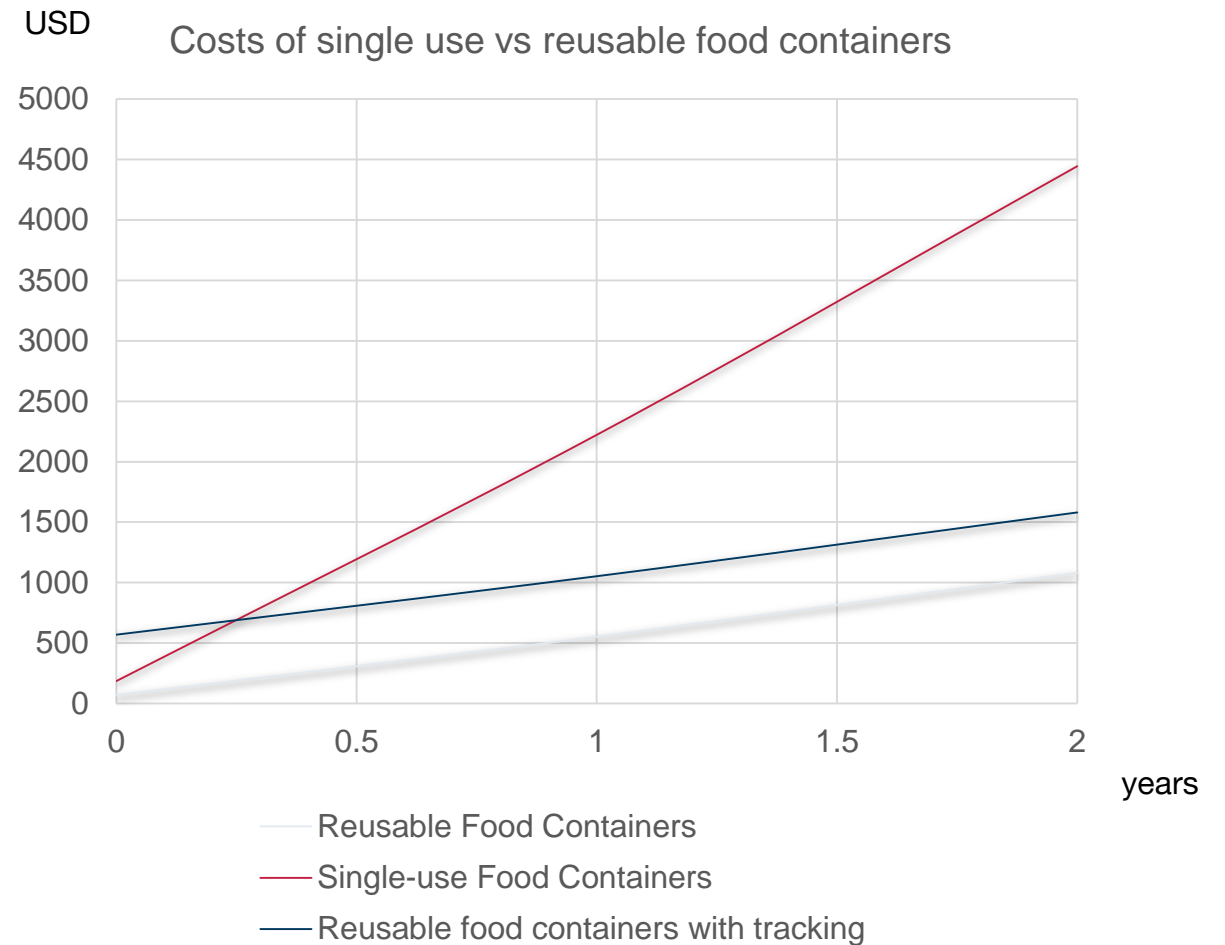
COST BENEFITS ANALYSIS

	REUSABLE CONTAINERS, 25 pcs			REUSABLE CONTAINERS WITH TRACKING, 25 pcs			SINGLE-USE CONTAINERS, 25 pcs		
	Costs (USD)	Costs (XCD)	Details	Costs (USD)	Costs (XCD)	Details	Costs (USD)	Costs (XCD)	Details
Investment costs									
Purchase of containers	50	135	price per piece: USD 2	50	135	price per piece	2.25	6.075	price per piece: USD 0.09
Purchase for tracking app				500	1350	taylor-made tracking app development, based on USD 10,000, shared through 20 restaurants			
Reoccurring costs									
Costs of additional storage	0.12	0.324	Costs of storage = costs of renting space required for storage/number of containers = USD 3 per 1m ² /25	0.12	0.324	Costs of storage = costs of renting space required for storage/number of containers = USD 3 per 1m ² /25			
Costs for washing [incl. electricity costs]	2	5.4	USD 0,08 per container	2	5.4	USD 0,08 per container			
Additional labour costs washing	16.8	45.36	based on one hour of work per week	16.8	45.36	based on one hour of work per week			
Delivery costs/import costs of SUP items							1.25	3.375	costs per piece: USD 0.05
Additional labour costs unpacking SUP items							16.8	45.36	based on one hour of work per week
Additional labour costs cleaning surrounding area of building from SUP items							16.8	45.36	based on one hour of work per week
Costs of missed customer loyalty opportunities							31.5	85.05	based on 25 returns per week, of which 5% purchase a meal worth USD 6 again
Total costs first month	68.92	186.084		568.92	1536.084		68.6	185.22	
Total costs 12th month	553.052	1493.2404		1053.052	2843.2404		823.2	2222.64	
Total costs 24th month	1081.196	2919.2292		1581.196	4269.2292		1646.4	4445.28	

FINANCIALS

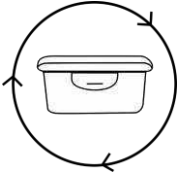
FUNDING & ROI

Summary	
Money Needed to Start	USD 150
Months to Pay Back Investment	2
Full Time Employees Needed	No difference
Revenue Earned Per Month	USD 126.00
Fixed Costs Per Month	USD 68.92



RECOMMENDATIONS

FOR LONG-TERM SUCCESS



- Reusable food container scheme ideally backed up by a national **campaign on reusing packaging material**
 - Communicates clearly about environmental benefits and cost-savings
 - Could be implemented by the Department for Sustainable Development
 - Important building block for public education for positive attitudes and behaviors
 - Could be backed up by legislation, e.g. mandatory for all restaurants to offer a reusable packaging option (e.g. as in Amendment of the German packaging Act, starting 2023)
- As system grows more popular, and more restaurants join, the **establishment of a washing hub** could be considered
 - Allows restaurants to outsource washing to an external service provider, which may lower costs even more
 - Allows for more job opportunities for entrepreneurs, e.g. pick up and washing service of reusable containers
- Consider increased technology as system scales – **a tracking app**, automated drop off with digital return payment via app
 - Can be co-financed by all participating parties

KEY RESOURCES

GET INSPIRED

- About Standardisation in Reusable Packaging:
<https://www.resolve.ngo/site-pr3standards.htm>
- Reuse Business directory:
<https://upstreamolutions.org/reuse-businesses-directory>
- KIDV – What requirements must reusable food packaging meet?
<https://kidv.nl/what-requirements-must-reusable-food-packaging-meet>
- Be part of a reuse and refill movement across the island:
<https://www.citytosea.org.uk/campaign/refill> and: <https://plasticsmartcities.org/>
- Ellen MacArthur Foundation estimates that Reusable packaging offers a USD 10+ billion innovation opportunity that can deliver significant user and business benefits:
<https://ellenmacarthurfoundation.org/reuse-rethinking-packaging>
- Searious Business introduced a similar reuse project in Morocco – in collaboration with local supermarkets, which received the Sustainability Award 2021 in the Best Practice category, from Packaging Europe:
<https://packagingeurope.com/sustainability-awards-2021-winners-revealed/>
- Let's stay in touch and don't hesitate to contact us if you need any help with implementing or upscaling your reusable systems:
connect@seariousbusiness.com



Refill app can be used to connect users across the island to places to eat, drink and shop with less waste

FOR MORE INFORMATION

IUCN



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<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



#CloseThePlasticTap

Searious Business



SeariousBusiness



connect@seariousbusiness.com



<https://www.seariousbusiness.com/islands>



#PlasticWasteFreeIslands #CloseThePlasticTap





WASTE SEGREGATION

INSPIRATIONAL GUIDE
FOR SOURCE SEGREGATED
WASTE STREAMS

An initiative supported by Norad managed by IUCN
and co-implemented by Searious Business



ACKNOWLEDGMENTS

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AUTHORSHIP

Support and Funding



Technical Lead Authors



Implementing Partner



Design

Ludovic Di Donato

To be cited as

Searious Business, (2021). Report to IUCN Waste Segregation, Inspirational Guide for Source Segregated Waste Streams, Gland, Switzerland, IUCN

GOAL

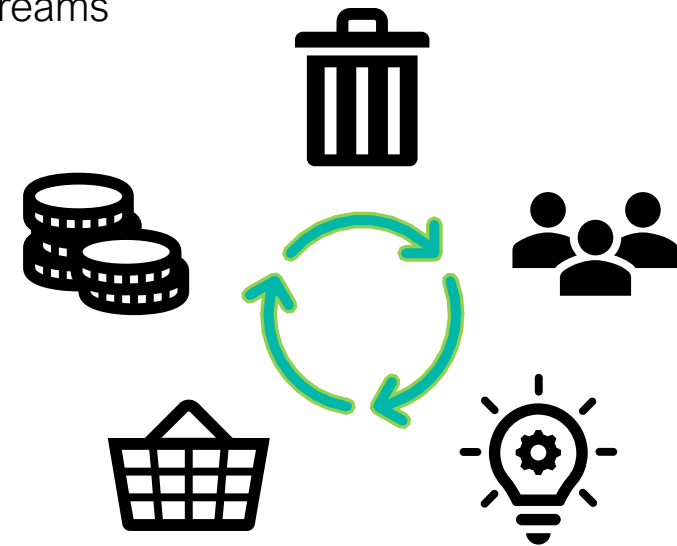
WASTE MANAGEMENT SOLUTIONS FOR SIDS

Purpose of this inspiration guide

- Show innovative, low tech recycling examples for source segregated waste streams that are well suited for island economies:
 - Organics
 - Sanitation and hygienic items;
 - Tyres (rubber)
- Focus on circular solutions
- Focus on unlocking the value of waste

Why?

- Source segregated waste streams are easier to recycle
- Achieve a cleaner plastic waste stream for more efficient processing
- Optimising waste management creates economic opportunities on SIDS



Don't mix what you can't fix

SUCCESS FACTORS & CONSIDERATIONS

FOR PROCESSING WASTE STREAMS ON SIDS



Circular solution



Turns trash into cash: creates a product with an existing local market



Enables island self reliance/autonomy



Creates island employment opportunity



Scalable/replicable



Behavioural changes



Speed of processing waste



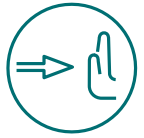
Space needed



Costs and Return on investment

KEEP MATERIALS IN THE LOOP

HIERARCHY OF ACTIONS



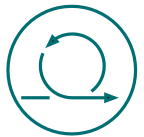
Refuse

- Ban/say no to unnecessary items, and hazardous/toxic materials
- Eliminate non-renewable/recyclable materials without a market value



Reduce

- Minimise the quantity
- Use renewable (within 1 year), and recycled content



Reuse

- Clean, reuse, repair, refurbish, remanufacture, repurpose products



Recycle

- Collect waste streams separately and recover high quality material e.g. plastics with a positive market value
- Includes mechanical and bio/chemical recycling. Mechanical recycling is priority



Recover Energy

- Incinerate non-recyclable waste for energy production e.g. bio-gas converter

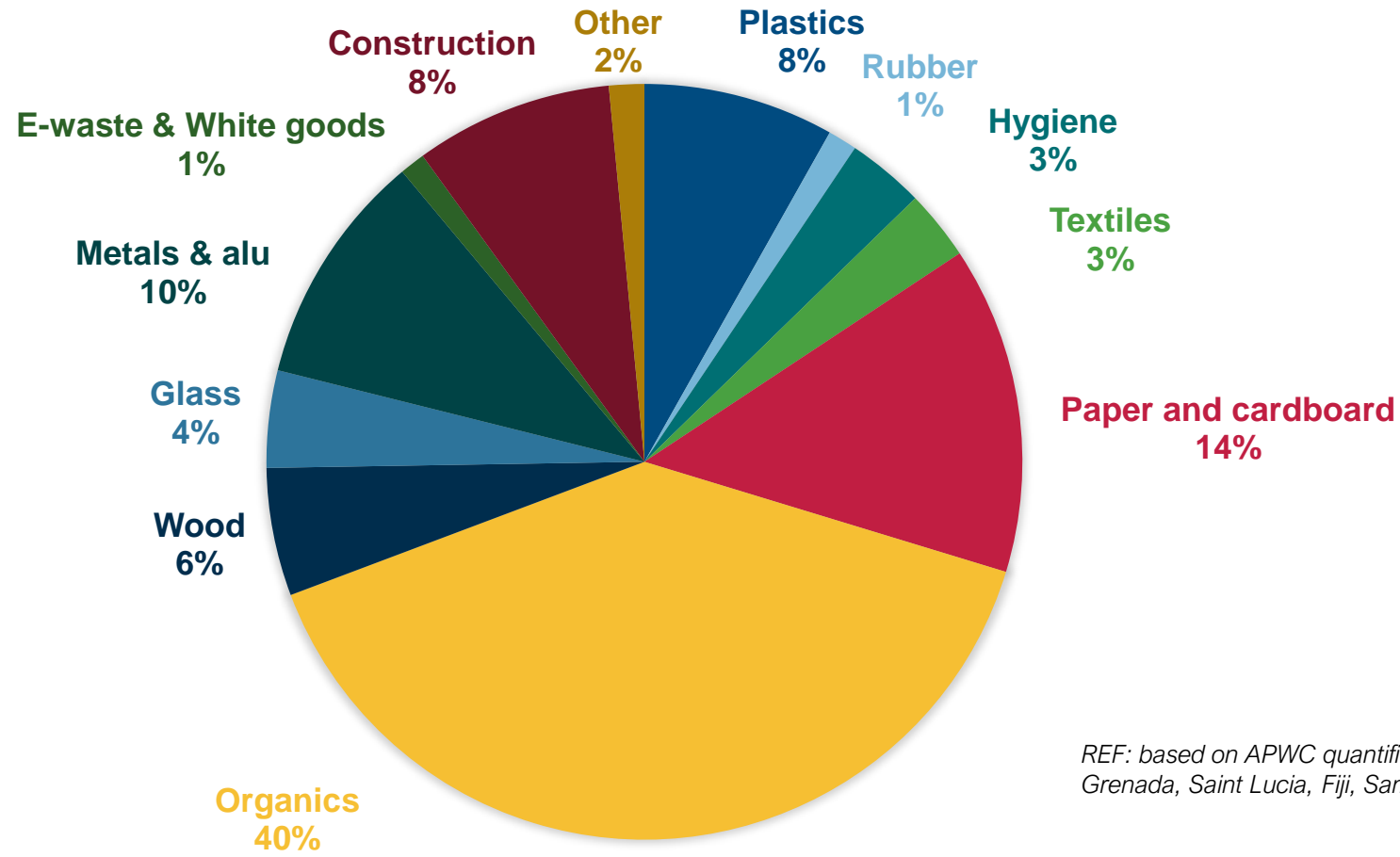


Responsible Disposal

- Waste which can't be processed is collected for disposal in a managed landfill

PRIORITY WASTE STREAMS

AVERAGE WASTE COMPOSITION IN % ACROSS PLASTIC WASTE FREE ISLANDS' SIDS, T/YR



REF: based on APWC quantification data Antigua & Barbuda, Grenada, Saint Lucia, Fiji, Samoa, Vanuatu, 2021



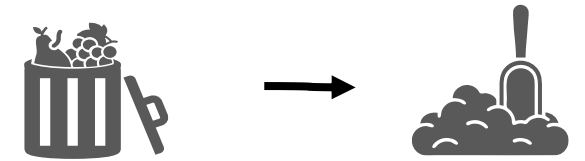
ORGANIC WASTE (1)

BEST PRACTICES

Up to 40% of waste on SIDS is organic waste. 88% is household waste, remainder is market waste, agricultural waste, food waste from restaurants

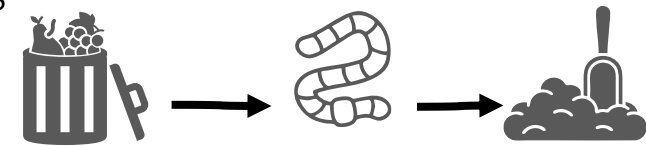
Compost heap

Kitchen and garden waste biodegrades naturally in a compost heap. Needs a mix of soft green and hard woody material to work effectively. Not suitable for meat, fish, bones or fat.



Vermiculture

Worms convert organic waste to rich compost. Worms can also be used as high quality animal feed. Suitable for kitchen and soft garden waste. Not suitable for meat, fish, bones, fats, citrus fruit, raw garlic and raw onions.



VERMICULTURE

WHAT DO YOU NEED FOR A WORM FARM?

1. **Bedding**- various materials can be used including straw, newspaper, leaves, corn cobs and stalks
2. **Food source**: organic material
3. **Moisture (50% by weight)** – Worms need moisture to breathe so bedding must be able to hold sufficient moisture
4. **Aeration** choose bedding correctly so that it does not pack too densely. No need to turn the bedding.
5. **Protection** from extreme temperature worms can be grow outdoors all year round. Worms survive as low as 0°C but thrive between 15°C and 20°C. Max temperature 35°C
6. **Space** to build the vermicomposting system which can be windrows, beds, bins or flow-through reactors. The systems are either batch or continuous flow



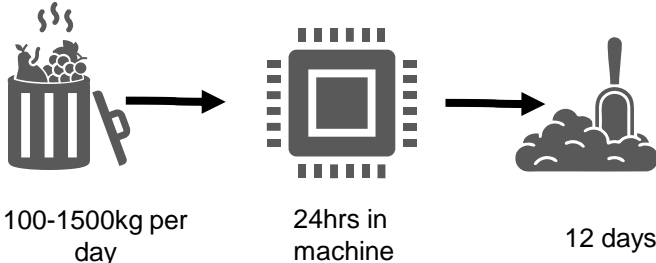


ORGANIC WASTE (2)

BEST PRACTICES

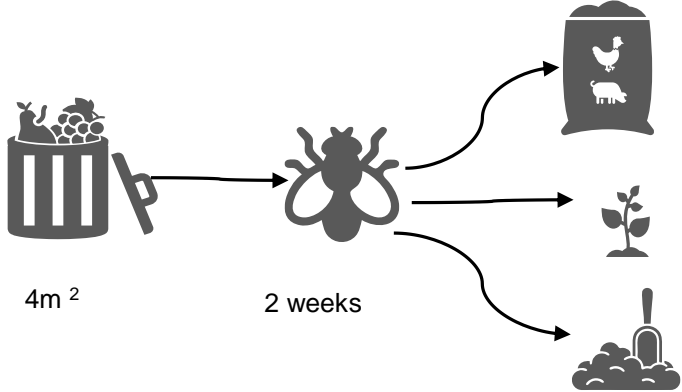
Organic Waste Converter

Machine which converts organic waste to compost within 2 weeks. Specifically interesting for markets, community-level, hotels, canteens, restaurants, schools



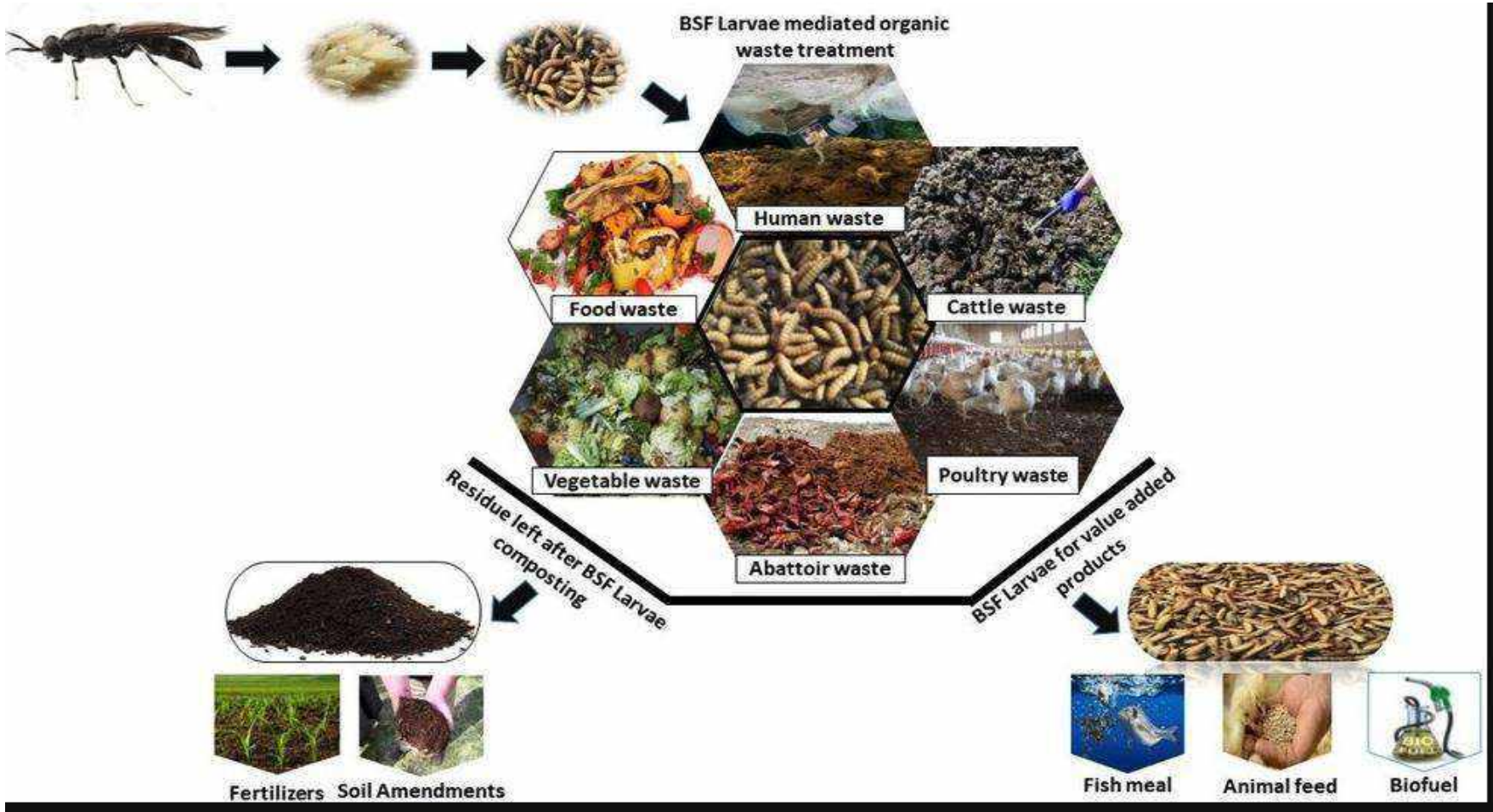
Black Soldier Fly Larvae Farms

Low-tech DIY kit to farm black soldier fly larvae. The larvae eat all kinds of organic waste, and generate valuable compost



100-1500kg per day 24hrs in machine 12 days

BLACK SOLDIER FLY LARVAE FARM





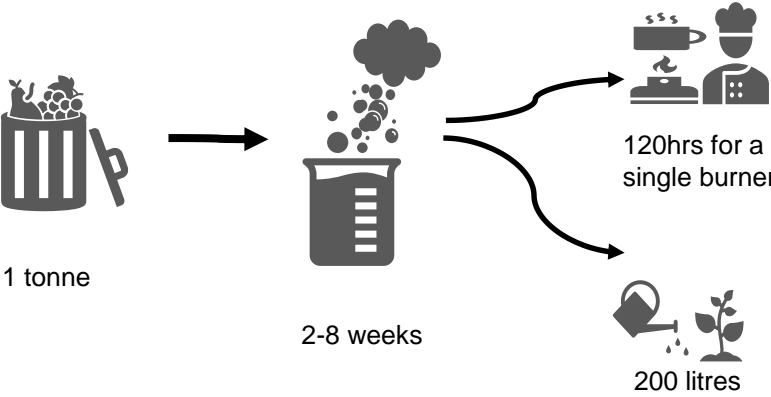
ORGANIC WASTE (3)

BEST PRACTICES

Anaerobic digester

Organic waste biodegrades under anaerobic conditions using bacteria from manure. Produces biogas & liquid fertilizer. Not suitable for meat, fish, oil or fat.

NB!! Burning methane contributes to climate change but is less harmful than methane emitted from landfill. Ensure controlled conditions using a sealed, oxygen-free tank.



SPECIFIC ORGANIC WASTE TYPE SOLUTIONS (1)

ALTERNATIVES TO PLASTIC



Waste Banana trunks can be turned into beautiful veneers for surfaces and walls



Banana tree leaves for reusable bags, customisable cups, takeaway containers, gift boxes etc



Coconut husks turned to coir fibre for ropes, doormats, mattresses, carpets, insulation, and cocopeat for growing plants

NB: Substitutes for plastic can be categorized into: A) **Traditional materials** are based on naturally occurring polymers of plant and animal origin as well as non-renewable mineral substances found in nature; B) **bio-based polymers** are derived from natural polymers, but undergo extensive physical, chemical and abiotic transformations. Many bio-based polymers are only compostable under specific industrial composting conditions and, for this reason, may not be a solution in places where such facilities are few or non-existent, particularly in developing countries. Read more: https://unctad.org/system/files/official-document/ditctedinf2021d5_en.pdf

SPECIFIC ORGANIC WASTE TYPE SOLUTIONS (2)

ALTERNATIVES TO PLASTIC



Waste Palm leaves for weaved reusable bags (e.g. 300 coconut bag, Vanuatu) and Harakeke (Flax) woven basket



Fish waste for producing compostable packaging, i.e. MarinaTex. Related innovations include packaging made from seaweed, algae, agar-agar



JACKS fibres, any natural fibres and value-added plastic replacing products like bags, particularly jute, abaca, coir, kenaf and sisal (JACKS fibres) are produced and exported by several developing countries thereby benefiting smallholder farmers and reducing plastic waste



DIAPER AND HYGIENIC WASTE (1)

BEST PRACTICES

Toilet / 'potty' training

Babies don't wear nappies at all

- Clothing without a crotch can be considered, which is widely used in countries such as China
- In many countries, toilet training begins very early, sometimes within days of birth and usually no later than a month



Reusable nappies, menstruation pads & cups

- Washable cloth nappies and pads
- Upfront costs replace ongoing costs
- Lots of YouTube videos available



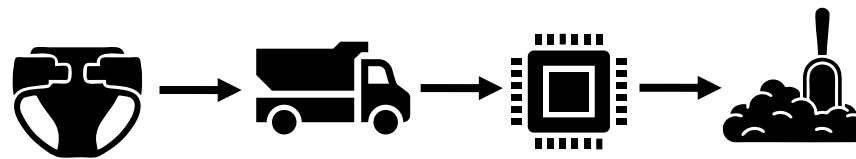


DIAPER AND HYGIENIC WASTE (2)

BEST PRACTICES

Compostable nappies with a collection service

- Suitable for community which uses large volumes of compostable nappies and incontinence material
- Used compostable nappies are collected and commercially composted to certified standards in 72 hrs (e.g. Little Brave company in New Zealand). Requires considerable investment, but has a significant landfill diversion impact



TYRE WASTE

CHALLENGES AND OPPORTUNITIES

- Tyres cause 28% of primary microplastics in the ocean
- On average a tyre loses 10% of its weight in 4 years in the form of microplastics
- Solutions include i.e. circular design & business models, reuse and recycling

For SIDS, tyre recycling could contribute significantly to reduce plastic leakage and landfill pressures

NB: !!! Prioritise applications where there is limited wear & tear, and water/food contact, to prevent negative impacts from micro-plastics during the use phase



TYRE WASTE MANAGEMENT HIERARCHY

WASTE HIERARCHY	REUSE		RECYCLING		OTHER MATERIAL RECOVERY	RECOVERY HYBRID			ENERGY RECOVERY	DISPOSAL
ELT INPUT	Whole tires	Whole or Shredded tires	Rubber granulate	Whole or Shredded tires, Rubber granulate, Crumb rubber and Powder	Whole or Shredded tires	Whole or Shredded tires	Steel cords, Whole or Shredded tires	Textile, Whole or Shredded tires	Whole tires	
MANAGEMENT METHODS	Repairing Regrooving Retreading	Granulation and associated applications	Reclamation	Civil engineering	Pyrolysis and gasification				Landfill Incineration	
PRODUCTS (OUTPUT)		Granulate and powder	Reclaimed rubber	N/A	Oil, gas, carbon/char, steel			Other energy recovery		
APPLICATIONS		<ul style="list-style-type: none"> Artificial turf infill Athletics tracks Molded rubber products Playgrounds Roofing material Rubber-modified asphalt 	<ul style="list-style-type: none"> Inner tubes Insulation tiles used in public transportation for reducing the noise level Tiles for laying pedestrian concrete areas Tubeless tire liners 	<ul style="list-style-type: none"> Agricultural use Baled tires Breakwaters Coastal protection Erosion barriers Ground improvement Landfill construction operations Road embankments Shelters Slope stabilization Sound barriers, insulation applications 	<ul style="list-style-type: none"> Carbon black: industrial gaseous effluents treatment (e.g. mercury, sulphur dioxide) Char: water and purification Oil and gas: TDF 	Cement Kilns	Steel production	<ul style="list-style-type: none"> Alternative or additional fuel for energy generation in: <ul style="list-style-type: none"> Brick production Industrial boilers Power plants Pulp and paper mills Waste-to-energy plants 		
EXAMPLES OF ADVANCED TECHNOLOGIES		<ul style="list-style-type: none"> Absorption of phenol and oil in water Composites Concrete Micronized rubber powder Porous pipes from recycled ELT 	Reclamation by depolymerisation by nitrous oxide	<ul style="list-style-type: none"> Retaining walls Soft clay reinforcement 	Use as anodes in lithium, potassium and sodium-ion batteries	N/A	N/A	N/A		

*The waste hierarchy category "Reduce" is not in the scope of this analysis. In addition, "Reuse" has been included, however this is not applicable to all tires and would depend on the condition of the product in relation to the appropriate safety standards.

Ref: Tyrewise-2.0-Master-Report-Final-Released-22July2020-with-disclaimer.pdf



TYRE RECYCLING (2)

BEST PRACTICES

For example: Xtyre recycling

- Using low-tech recycling technology
- Low start-up costs
- Manufacturing recycled rubber products from waste tyres such as: reusable pallets, matting, sports materials, architecture materials, and safety & construction materials
- The steel tyre wiring can also be retrieved for recycling
- Scalable business model via a licensed manufacturing agreement with technology transfers
- Principle: Same products, same moulds and same formulations in all manufacturing entities and markets
- The recycling line/machinery can be dual purposed to recycling/granulating both used tyre and plastic waste
- Government could support business development in the form of regulation/mechanisms to obtain waste recycling licenses, and taxing for example the tyre suppliers per kg of tyres sold into this market. Then using this tax to pay/substitute the cost for the collection, storage and recycling of these waste tyres



RUBBER TYRE RECYCLING

BEST PRACTICES

Want to learn more about the benefits of source segregation and integrated waste management systems:

- Community level waste management, see: Waste Aid - Making Waste Work toolkit: <https://wasteaid.org/toolkit/>
- General Solid Waste Management suggestions for SIDS:
 - UNEP - SIDS Waste Management Outlook: <https://www.unep.org/ietc/node/44>
 - IUCN's Plastic Waste Free Islands quantification and qualification reports. Contact IUCN at plastics@iucn.org



FOR MORE INFORMATION

IUCN



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<https://www.iucn.org/theme/marine-and-polar/our-work/close-plastic-tap-programme>



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