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PLASTIC WASTE

Waste Technology Management Options

December 2020

This publication provides details on some of the appropriate plastic waste management techniques identified during a recent research project - with consideration to the inherent constraints of the Pacific island region.

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Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures.

Content

Introduction

Plastic recycling is the process of recovering waste plastic and reprocessing it into a useful product. This publication provides details on some of the appropriate plastic waste management techniques identified during a recent research project - with consideration to the inherent constraints of the Pacific island region. In-country small-scale recycling facilities were the focus of the investigation, as we sought to identify opportunities to establish facilities that can collect, compact and export/recycle plastic waste in the Pacific. Ultimately, the determination of whether a process, technique or technology is applicable to your situation and the waste problem you are seeking to manage will be project based. This publication identifies decision points to assist with your decision-making process.

More investigation into these technologies is required for their suitability in your specific context (site specific factors, etc.).

What is Plastic?

Plastic is used in a huge, and growing, range of applications. It is found in the clothes we wear, our houses, the cars we travel in, the toys we play with, the televisions we watch, and the computers we use. The main ingredient in most plastic is crude oil and natural gas. This is mixed with a blend of chemical additives which provide plastic with its intended properties - such as toughness, flexibility, elasticity, colour or to make them safer and hygienic to use for a particular application. There are seven types of plastic. These types and their typical uses include:

TOXICITY CODE: ⚠ LOW ☠ HIGH

Polymer Name	POLYETHYLENE TEREPHTHALATE	HIGH-DENSITY POLYETHYLENE	POLYVINYL CHLORIDE	LOW-DENSITY POLYETHYLENE	POLYPROPYLENE	POLYSTYRENE	All other plastics, including acrylic, fiberglass, nylon, polycarbonate, and polylactic acid (a bioplastic)
Resin Identification Code	1	2	3	4	5	6	7
Abbreviation	PET or PETE	HDPE	PVC	LDPE	PP	PS	OTHER
Recyclable?	Commonly Recycled	Commonly Recycled	Sometimes Recycled	Sometimes Recycled	Occasionally Recycled	Commonly Recycled (but difficult to do)	Difficult to Recycle
Percentage Recycled Annually	36%	30-35%	<1%	6%	3%	34%	Low
How Long to Decompose Under Perfect Conditions	5-10 Years	100 Years	Never	500-1,000 Years	20-30 Years	50 Years	Majority of these plastics: never Polylactic acid: 6 months
Maximum Temperature	70°C (158°F)	120°C (248°F)	70°C (158°F)	80°C (176°F)	135°C (275°F)	90°C (194°F)	Polycarbonate: 135°C (275°F) Polylactic acid: 150°C (302°F)
Brittleness Temperature	-40°C (-40°F)	-100°C (-148°F)	-30°C (-22°F)	-100°C (-148 °F)	0°C (32°F)	-20°C (-4°F)	Polycarbonate: -135°C (-211°F) Polylactic acid: 60°C (140°F)
Toxicity Level	☠ HIGH	⚠ LOW	☠ HIGH	⚠ LOW	⚠ LOW	☠ HIGH	☠ HIGH
Most Commonly Leached Toxin(s)	Antimony Oxide, Bromine, Diaszomethane, Lead Oxide, Nickel Ethylene Oxide, and Benzene	Chromium Oxide, Benzoyl Peroxide, Hexane, and Cyclohexane	Benzene, Carbon Tetrachloride, 1,2-Dichloroethane, Phthalates, Ethylene Oxide, Lead Chromate, Methyl Acrylate, Methanol, Phthalic Anhydride, Tetrahydrofuran, and Tribasic Lead Sulfate, Mercury, Cadmium, Bisphenol A (BPA)	Benzene, Chromium Oxide, Cumene Hydroperoxide, And Tert-butyl Hydroperoxide	Methanol, 2,6-di-tert-Butyl-4-Methyl Phenol, and Nickel Dibutyl Dithiocarbamate	Styrene, Ethylbenzene, Benzene, Ethylene, Carbon Tetrachloride, Polyvinyl Alcohol, Antimony Oxide, and Tert-butyl Hydroperoxide, Bensoquinone	BPA, BPS, as well as all other toxins mentioned

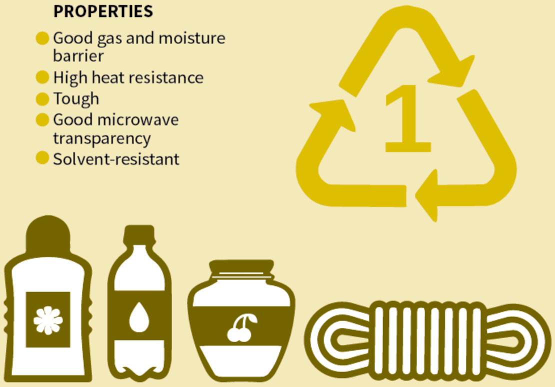
POLYETHYLENE TEREPHTHALATE (PET or PETE)

COMMONLY USED FOR

- Soda bottles
- Water bottles
- Beer bottles
- Salad dressing bottles
- Peanut butter jars
- Jelly jars
- Rope
- Combs
- Tote bags
- Medicine jars
- Clothing and carpet fiber
- Prepared food trays and roasting bags
- Some shampoo and mouthwash bottles

PROPERTIES

- Good gas and moisture barrier
- High heat resistance
- Tough
- Good microwave transparency
- Solvent-resistant



TOXINS/HEALTH RISKS

PET is the most commonly used plastic in the world, but it can leach the toxic metal antimony.

When this plastic sits on a shelf for a long time or is exposed to sunlight or higher temperatures, this can lead to a larger amount of antimony leaching into the contents.

Antimony is considered a carcinogen. Bromine is another compound found to leach out of PET bottles.

It acts as a central nervous system depressant and can trigger psychological symptoms.

CAN BE RECYCLED INTO

PET is commonly recycled, although it should not be reused. It can be recycled into:

- Fleece garments
- Carpets
- Stuffing for pillows, winter jacket, sleeping bags
- Bean bags
- Storage containers
- Rope
- Car bumpers
- Tennis ball felt
- Combs
- Cassette tapes
- Sails for boats
- Furniture
- Other plastic bottles

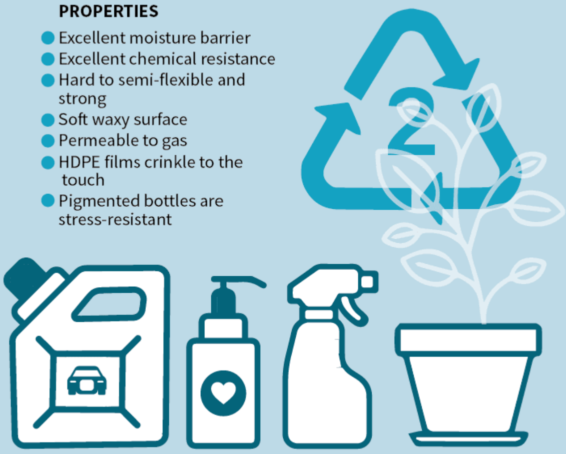
HIGH-DENSITY POLYETHYLENE (HDPE)

COMMONLY USED FOR

- Milk jugs
- Non-carbonated drink bottles
- Motor oil containers
- Shampoos and conditioner bottles
- Soap bottles
- Detergent bottles
- Bleach bottles
- Snack food boxes
- Cereal box liners
- Toys
- Buckets
- Rigid pipes
- Crates
- Plant pots
- Garden furniture
- Refuse bins and compost containers
- Park benches
- Truck bed liners

PROPERTIES

- Excellent moisture barrier
- Excellent chemical resistance
- Hard to semi-flexible and strong
- Soft waxy surface
- Permeable to gas
- HDPE films crinkle to the touch
- Pigmented bottles are stress-resistant



TOXINS/HEALTH RISKS

HDPE is the most commonly recycled plastic and is considered one of the safest forms of plastic.

It is a more stable form of plastic than PET, but while it is considered a safer option for food and drinks, it is never safe to reuse HDPE plastic for food or drink if it did not originally contain either.

Some studies have shown that HDPE can leach estrogen-mimicking chemicals that could disrupt your hormones and even alter the structure of human cells.

CAN BE RECYCLED INTO

HDPE is the most commonly recycled plastic and can also be reused.

It is recycled into:

- Plastic bottles and jugs
- Plastic lumber
- Outdoor furniture
- Playground equipment
- Fencing
- Rope
- Toys

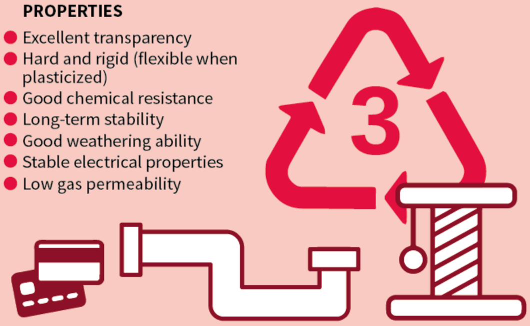
POLYVINYL CHLORIDE (PVC)

COMMONLY USED FOR

- Plumbing pipes
- Credit cards
- Carpet backing
- Floor covering
- Window and door frames
- Rain gutters
- Pipes and fittings
- Wire and cable sheathing
- Synthetic leather products
- Clear plastic food wrapping
- Cooking oil bottles
- Teething rings
- Children's and pets' toys
- Garden hoses

PROPERTIES

- Excellent transparency
- Hard and rigid (flexible when plasticized)
- Good chemical resistance
- Long-term stability
- Good weathering ability
- Stable electrical properties
- Low gas permeability



TOXINS/HEALTH RISKS

PVC is the most hazardous plastic and has been dubbed the "poison plastic" because it contains numerous toxins that it can leach throughout its entire life cycle.

It has been found to leach BPAs, phthalates, lead, mercury, and many other toxins. These chemicals can cause cancer and disrupt the hormonal system and have been linked to chronic conditions like allergies, asthma, and autism.

CAN BE RECYCLED INTO

Almost all products using PVC require virgin material for their construction; less than 1% of PVC material is recycled. Specialized programs do recycle PVC and use it for:

- Flooring
- Paneling
- Roadside gutters
- Traffic cones
- Credit cards
- Pipes

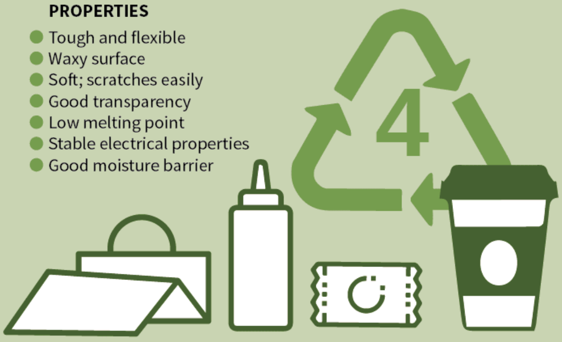
LOW-DENSITY POLYETHYLENE (LDPE)

COMMONLY USED FOR

- Plastic wrap
- Sandwich bags
- Bread bags
- Squeezable bottles
- Plastic grocery bags
- Garbage bags
- Food storage containers and lids
- Bubble wrap
- Irrigation pipes
- Thick shopping bags
- Wire and cable covering
- Coatings for paper milk cartons
- Hot and cold beverage cups

PROPERTIES

- Tough and flexible
- Waxy surface
- Soft; scratches easily
- Good transparency
- Low melting point
- Stable electrical properties
- Good moisture barrier



TOXINS/HEALTH RISKS

LDPE is considered to be less toxic than other plastics and relatively safe for use, although some studies have shown that LDPE could leach estrogen-mimicking chemicals, similar to those found in HDPE.

These chemicals can disrupt hormones and potentially alter the structure of human cells.

CAN BE RECYCLED INTO

LDPE is difficult to recycle, although more plastic recycling programs are gearing up to handle this material. When recycled, LDPE is used for:

- Plastic lumber
- Compost bins
- Trash cans
- Floor tiles

POLYPROPYLENE (PP)

COMMONLY USED FOR

- Prescription bottles
- Most bottle tops
- Ketchup and syrup bottles
- Yogurt and margarine containers
- Potato chip bags
- Drinking straws
- Hinged lunch boxes
- Fabric/carpet fibers
- Heavy-duty bags
- Hot food containers
- Packing tape
- Thermal vests
- Car parts
- Disposable diapers
- Sanitary pad liners

PROPERTIES

- Excellent chemical resistance
- High melting point
- Hard but flexible
- Waxy surface
- Translucent
- Strong

TOXINS/HEALTH RISKS

PP is considered a safer plastic option for food and drink use, as it can withstand high temperatures and thus is less likely to leach chemicals.
However, studies have found that PP could potentially leach some chemicals that could lead to asthma or hormone disruption.

CAN BE RECYCLED INTO

PP is one of the least recycled plastics and a majority of it ends up in a landfill. When recycled PP is used for:

- Shipping pallets
- Automotive battery cases
- Brooms
- Shovels
- Watering cans
- Mixing bowls
- Cutting boards
- Ice scrapers
- Storage bins

POLYSTYRENE (PS)

COMMONLY USED FOR

- Disposable foam cups
- Take-out food containers
- Plastic cutlery
- Egg cartons
- Fast-food trays
- Video cases
- Seed trays
- Coat hangers
- Low-cost, brittle toys
- Foam packaging (packing peanuts)
- Rigid foam insulation
- Underlay sheeting for laminate flooring

PROPERTIES

- Clear to opaque
- Glassy surface
- Rigid or foamed
- Hard
- Brittle
- High clarity
- Affected by fats and solvents

TOXINS/HEALTH RISKS

PS is commonly known as Styrofoam and is considered a highly toxic form of plastic. PS leaches many toxins, including styrene which can cause cancer and damage to the nervous system and could also affect genes, the lungs, the liver, and the immune system. Heat plays a role in the amount of styrene that is leached from PS, so it is advised to not use this form of plastic to hold hot food or drinks.

CAN BE RECYCLED INTO

Recycling is not widely available for polystyrene, and it accounts for 35% of U.S. landfill material. It can be recycled into:

- Cassette tapes
- Rigid foam insulation
- Egg cartons
- Picture frames
- Moldings
- Home décor products
- Foam protective packaging

OTHER

COMMONLY USED FOR

- Baby bottles
- Sippy cups
- Large, multiple-gallon water bottles
- Medical storage containers
- Eyeglasses
- Exterior lighting fixtures
- Metal food can linings
- CDs and DVDs
- Dental sealants

PROPERTIES

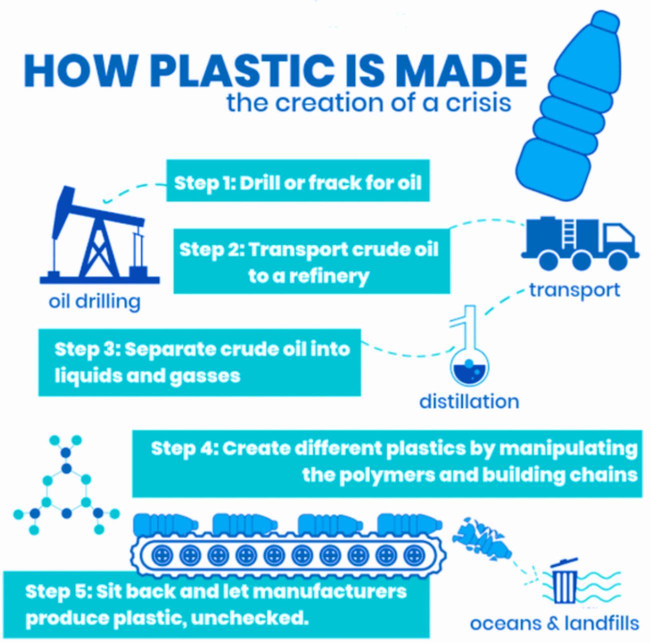
This category is a catchall for other plastic resins not described above or a combination of these plastics.

TOXINS/HEALTH RISKS

It is difficult to know exactly which toxins can be found in this category of plastics, but there is a good chance that they will leach bisphenol A (BPA) or bisphenol S (BPS). BPA and BPS are both endocrine disruptors, which can affect hormones and cause issues with growth and development, tissue function, obesity, sexual function and reproduction, brain and neurological functions, and more.

CAN BE RECYCLED INTO

Items made from #7 plastics are a combination of various plastics and are difficult to recycle, but some can be recycled into plastic lumber and specialized products. Products marked #7 with "PLA" on the bottom cannot be recycled but can be composted.



What is Plastic Waste?

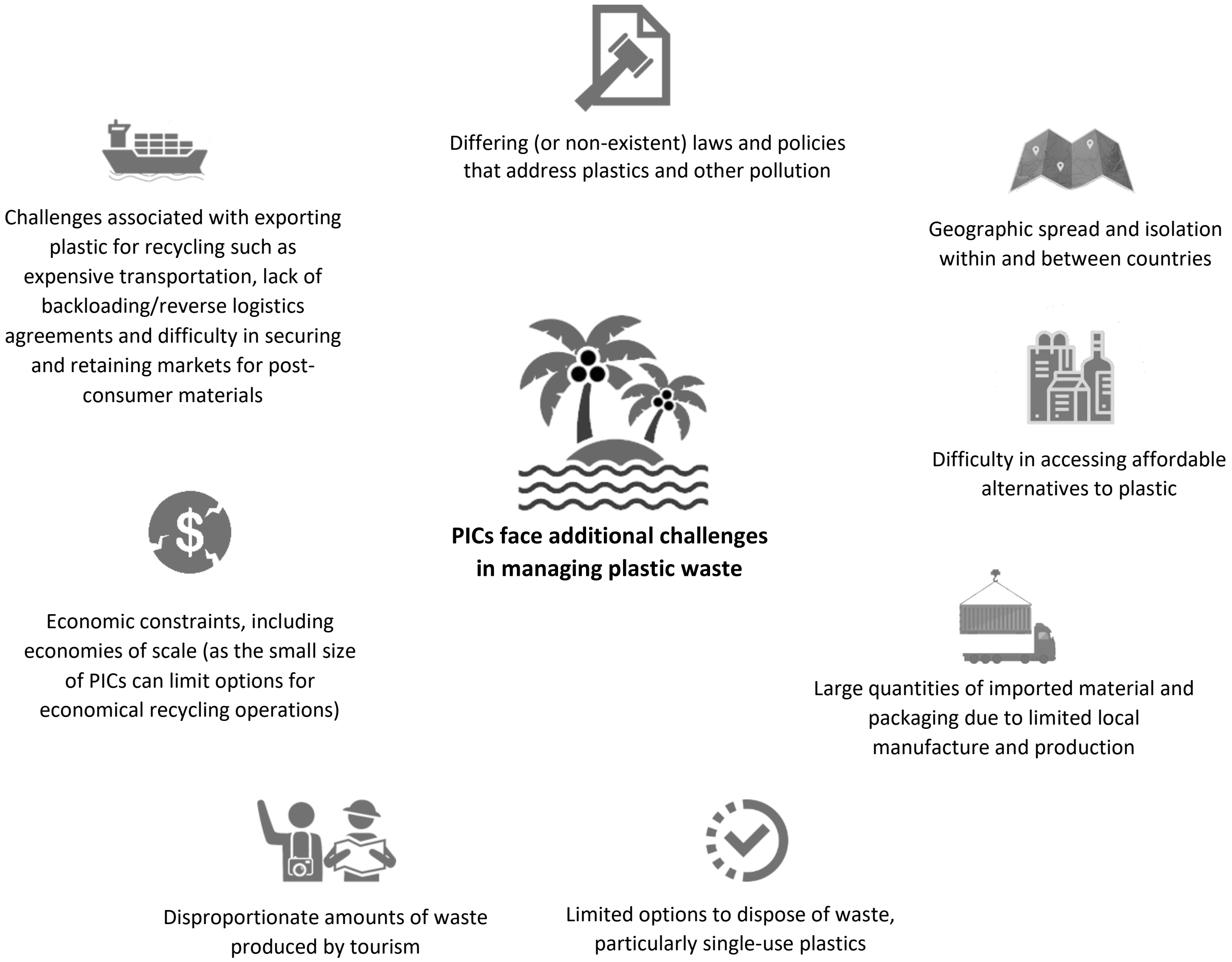
Plastic waste refers to plastic that is not recycled and ends up in landfill or thrown into unregulated dump sites, littered or burnt. So much of what we consume is made of plastic because it is inexpensive and durable. However, because of its durability, plastic is slow to degrade (taking over 400 years or more). Further, plastic breaks up, it does not break down. So as plastic degrades, it becomes smaller and these micro-plastics create additional environmental and ecological problems. It is estimated that 310,000 tonnes of waste plastic are generated by Pacific island nations and territories each year. A small portion (less than 5%) is estimated to be recycled effectively. The plastic that is not recycled may enter our environment, pollute our oceans, and cause damage to our ecosystems.

Challenges for Plastic Recycling

Globally, plastic recycling is challenging because of its low value and incapability of different types of plastics to be recycled together (there are thousands of variations even within the seven main types of plastic due to different manufacturing processes, additives, and dyes).

The main challenges include:

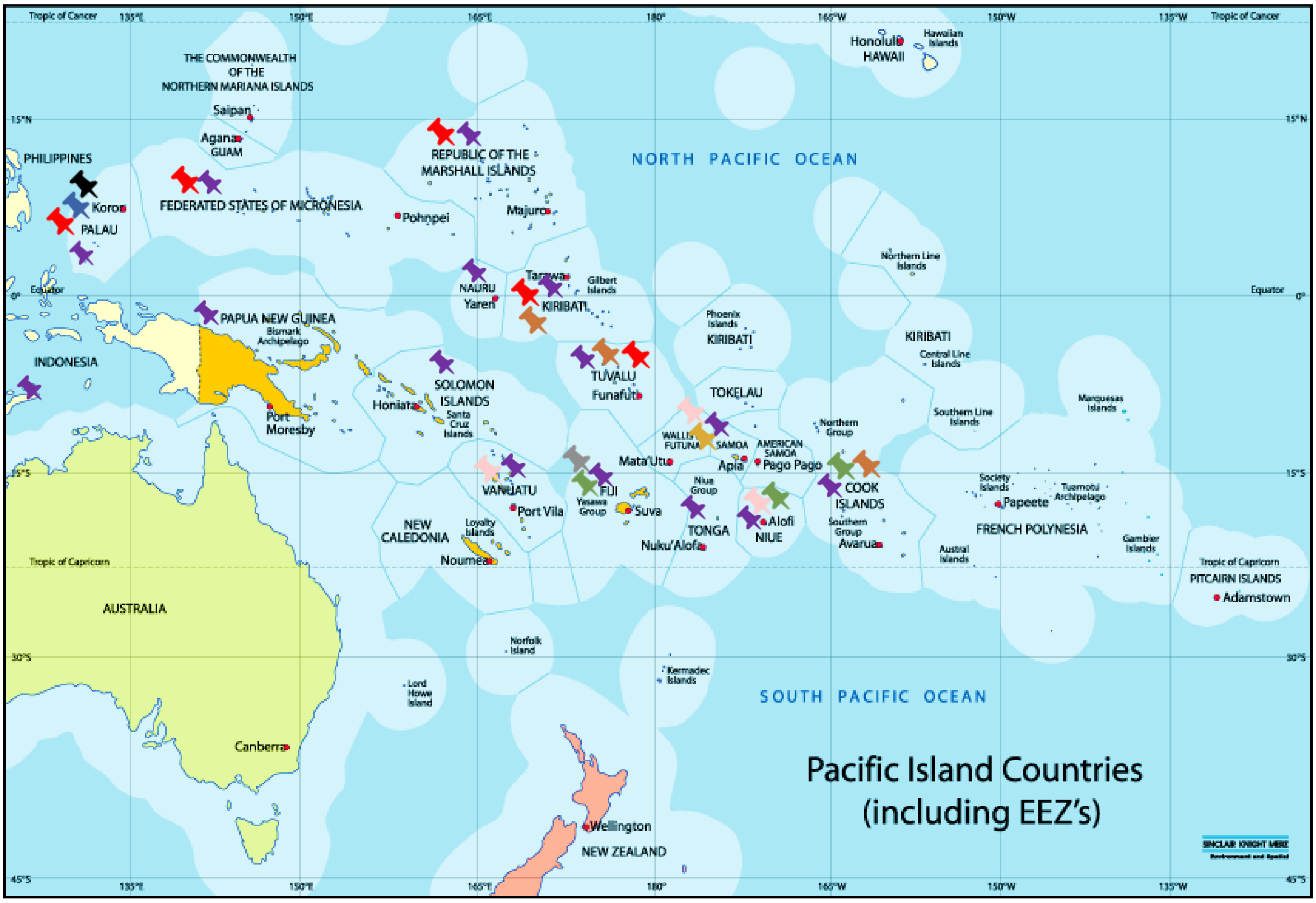
- Not all types of plastic can be economically or safely recycled
- Those that can be recycled, cannot be recycled together. When different types of plastics are melted together, they tend to separate, like oil and water, causing structural weakness
- When plastic is recycled, the quality degrades every time it is reheated meaning it has a limited duration for recycling.
- Even in countries with household recyclable collection, households generally lump all plastic waste together in one bin – often with food contamination. This waste must be carefully sorted by type, which is expensive for governments and other organisations to do.
- Because plastic has limited value as a recycled material, it is not long before it reaches its end of life and spends eternity as landfill or in our oceans and environments.



Current Plastic Recycling

A small portion of plastic imported to Pacific Islands and territories is recycled. The most common type of plastic recycling is clear PET #1 (soft drink bottles, etc). Known current practices for recycling plastic in the Pacific Islands is provided below.

Plastic recycling can vary from community-to-community or island-to-island within a country:



Known collection systems for plastic:

PET bottles collected via an Advance Recovery Fee/Deposit (ARF/D) system (CDL, Levy)

Household collection (mainly PET)

Community collection cages (mainly PET)

Known systems for recycling/ managing plastic:

Stockpiled

Baled and stockpiled

Baled and exported

Shredded and exported

Pyrolysis (Recycling or processing plastic back to its original form (oil) and used to generate energy)

Landfilled

Technology Options

Collection

Collection and separation of plastic waste is ideally managed at the source site (households and businesses), in combination with an education program so individuals know what types of plastic can be recycled and how (i.e., clean from food contamination, no caps etc).

The collection of recyclables, including plastic, requires minimal infrastructure other than a standard collection truck/trailer. These can range from low technology collection "cages" on a trailer to high technology trucks with a split compartment – allowing collection of recycling and landfill waste at the same time.

Plastic can also be collected at community collection points using collection bins or cages. To achieve correct separation these collection points often require personnel to oversee activities.

Note: Source collection and separation can be enhanced though the implementation of an Advance Recovery Fee (ARF)/Deposit (ARD) (i.e., CDL/Waste Levy) system – Palau has achieved over 80% recycling rate of beverage containers in its Beverage Deposit Scheme in the past 5 years (2015 – 2019).

Low technology collection trailers

High technology separated collection trucks

Community collection points

Separation and Washing

Separation

Collection of recyclables from households and businesses can be done by asking individuals to separate each item themselves - “source separation” - or it can be done by allowing the community to place all recyclables in one bin - “single-stream recycling” or “one bin recycling” - and for the government or waste contractor to sort the recyclables into plastic, aluminium, cardboard etc when it reaches the recovery centre.

Whether using “source separation” or “one bin recycling” it is likely additional separation of recyclables will need to occur at the recovery centre. Separating recyclables before processing is undertaken to ensure contamination is minimised and each material (i.e., PET #1, aluminium cans, etc) can be processed/recycled/exported in the correct way.

There are many technologies offering capabilities in sorting recyclable materials.

Various scales of these technologies are available, some of which can be mobile or modular depending upon the scale and application.

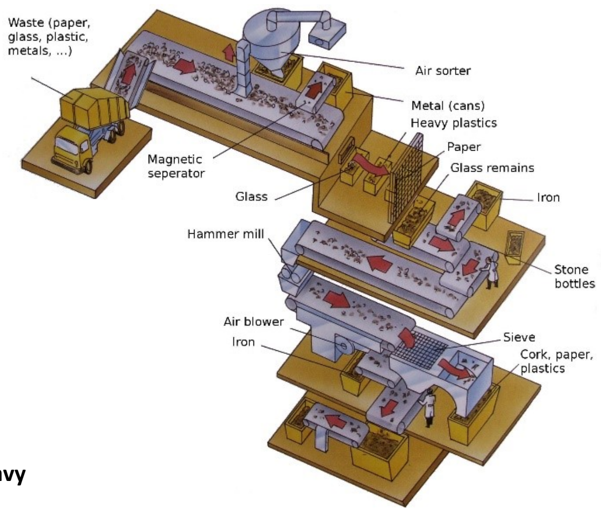
Sorting technology can include:

- simple conveyor/hand picker systems (workers collecting recyclable items from a conveyor)
- rotating tunnels (to remove small items)
- magnets (collecting ferrous metals)
- automated machines (able to sort recyclables – plastics metals, glass, organics, etc – from each other and into different areas, however usually unable to sort via different types of plastic)
- robotic sorting stations (able to sort plastics by polymer, shape and/or colour or by specific objects, such as garden furniture, pipes, crates etc).

Automated and robotic sorting systems are generally designed for large recycle operations.

Kiverco Modular Compact Recycling Plant

Beston Municipal Solid Waste Sorting Machine



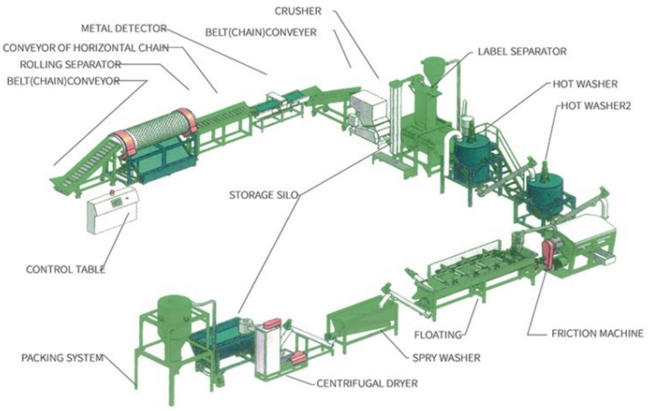
Zenrobotics Heavy Picker

Washing

Plastic washing machines are used to remove dirt and food contamination from plastics before recycling or reuse. This is most important for high-quality plastics if they will be re-used for food or beverages.

Automated washing machines use friction and centrifugal force are available to clean mixed plastics with a high contamination or persistent dirt, for instance, PET and film flakes.

For plastic recycling, wastewater from water baths is typically filtered before release and disposed to capture microparticles and residues.



Plastic Recycling & Washing

B+B Plastic Washing Machine

Advantages and Disadvantages of this Technology

Advantages

- Low impact equipment. Generally low to no emissions, operating on electricity or battery power, unless a diesel/ petrol generator was required for a location with no power.
- Little if any emissions to air or consumables.
- Improves diversion to recycling and recovery processes
- Certain washing technology will allow high-grade plastic to be cleaned and re-used in country
- Promotes in-country employment in the recovery industry. One to many people required for operation depending upon the hours of operation and volume of plastic being processed. Medium skill level required to operate machinery and electronics. Skills can be obtained on-site or via remote training by most technology provider companies.
- Certain units are scalable, available in varying sizes, dependent upon type of unit and how many units are employed.

Disadvantages

- Automatic and robotic sorting machines generally need a large area and may be cost prohibitive - units typically cost more than US $100,000 per unit.
- Generally suitable for large recycle operations
- Potentially intensive maintenance program required
- Separating plastic and washing will assist recycling and export but will still need to identify and coordinate a recycle market

Compaction and Shredding

Compaction

Compaction by balers or bin compactors are technologies employed to reduce the volume of plastic to help with its storage and transport to recycle markets.

There are a variety of technologies in a variety of sizes and feed rates suitable for plastic compaction and recycling/transfer operations in PICs.

StarLogixs SpaceBinMulti Bin Compactor

Trethewey Top Load Recyling Balers – Ti 200 & Ti 100

Shredding

Shredding plastic is an alternative method for compacting plastic waste to reduce its volume and help with storage and transport. Shredded waste is easier to handle and may receive a higher income from recycle markets as it is further advanced in the recycling process. Shredded plastic is also able to be input into energy conversion technologies.

Plastic shredders are available in a variety of sizes and configuration to suit the inputs and desired output product. Technology ranges from small-scale modular plastic shredding for use in small-scale applications, to industrial scale technology offering one or multiple shafts able to process a large volume of plastics and have different speeds for efficient processing of different materials.

Precious Plastic Shredder Pro

Waste Initiative 1-Shaft Shredder

Advantages and Disadvantages of this Technology

Advantages

- Compaction and shredding units typically less than US$100,000 per unit
- Low impact equipment. Generally low to no emissions, operating on electricity or battery power, unless a diesel/ petrol generator was required for a location with no power.
- Enables volume of plastic waste to be reduced to enable storage and transportation, economical.
- Ease of scalability and enables end product market. Baling and shredding machines may be configured to be used for other recycling initiatives – i.e., cardboard, timber, tyres, hard plastic casings from e-waste and vehicles.
- Low energy
- Promotes in-country employment in the recovery industry. One to many people required for operation depending upon the hours of operation and volume of plastic being processed. Medium skill level required to operate machinery and electronics. Skills can be obtained on-site or via remote training by most technology provider companies.
- Increased diversion rates of plastic from landfill by improving collection and handling.

Disadvantages

- Shredding and compacting plastic may assist recycling and export but will need to identify overseas receivers or a local application for the collected plastic
- Potentially intensive maintenance program required
- If shredded plastic not managed correctly may become a significant source of fly-away litter contributing to microplastic concerns.

Processing

Melting, Moulding, Extruding and Reforming

Recently there has been a variety of technologies offering solutions for converting plastic into a variety of products.

Products made from, primarily, recycled PET and PP include:

- trinkets (jewellery, coins, magnets)
- furniture (outdoor chairs and tables)
- building products (tiles, outdoor pavers, floorboards, furnishings, building bricks)
- landscape (fence posts, piping, raised garden beds)
- 3D printing filament
- Other products tailored to local requirements.

This technology is not generally able to be purchased for operation in the PICs, however there may be opportunity for collaboration if suppliers were contacted directly.

Known extrusion and reforming technology available for purchase and use for in-country processing of plastics includes:

- Small-scale mobile units to recycle various forms of plastics into small products. This technology is aimed at the smaller community level, processing between 4 kg/h to 300kg/h.
- Industrial processes to convert plastic waste into an aggregate for use in making concrete building blocks. This technology is scalable to process between 250 kg/h to 4.5 tonnes/h.

Plastic Fantastic Mobile Factory

Precious Plastic Shredder Pro

Plastic Collective Shruder MKII

Advantages and Disadvantages of this Technology

Advantages

- Process efficiency depends on technology employed but can range from 0% (concrete blocks) to 20% (waste or unrecoverable material
- Certain processes take all plastics ("tragic plastic") without needing to be sorted
- Technologies could potentially promote community engagement through direct employment and education and inspire creation for new products and opportunities
- Promotes in-country employment in the recovery industry. One to many people required for operation depending upon the hours of operation and volume of plastic being processed. Medium skill level required to operate machinery and electronics. Skills can be obtained on-site or via remote training by most technology provider companies.
- Promotes high rate of diversion to recycling and recovery processes if plastic waste can be collected and handled
- Products offer certain about of scalability and end product market potential, generating more business opportunities and reduction of importing recycled products
- Plastic fumes released to air vary dependent upon plastics. If plastics are not burnt, the toxicity levels are minimal.
- Mobile reforming technology units typically less than US $200,000 per unit

Disadvantages

- Plastic fumes released to air - dependent upon plastics being melted, i.e., PP or HDPE plastics are used and not burnt, the toxicity levels are minimal. PS typically has stronger fumes when melted.
- Unknown effects on health from melting plastic
- Higher energy requirements
- Introduction of new industry, competition in new markets
- Potentially intensive maintenance program required
- Mobile extrusion and reforming technology may not accept all plastic and will need plastic input to be segregated to a high degree
- Certain products produced by technology may become plastic waste themselves

Recovery by Waste to Energy Conversion Technologies

Waste to Energy technology is an energy recovery process that converts chemicals from waste residues into practical forms of energy like electricity, heat, or steam.

Common Waste to Energy technology options for managing plastic includes:

- Incineration/thermal - processing combustible materials, such as plastics, into thermal energy
- Pyrolysis - converting certain plastics into liquid fuel via heating above 430 °C in the absence of oxygen. Because no oxygen is present the material does not combust, but the chemical compounds convert into liquid fuel (oil)
- Solid fuel (biochar) - low temperature pyrolysis of certain plastics with paper and dry biomass (i.e., wood, straw, and timber) into briquettes and charcoal for bioenergy production

This technology tends to require high operation requirements (surveillance). For example, certain pyrolysis units can require operation 24 hours per day, for as many continuous days as possible and requires three to four persons per shift. For incineration plants a similar approach applies requiring two persons shift during the day and at night.

Waste to Energy is generally suited for highly populated countries/community centres where there is a large source of input and can be operated continuously.

Advantages and Disadvantages of this Technology

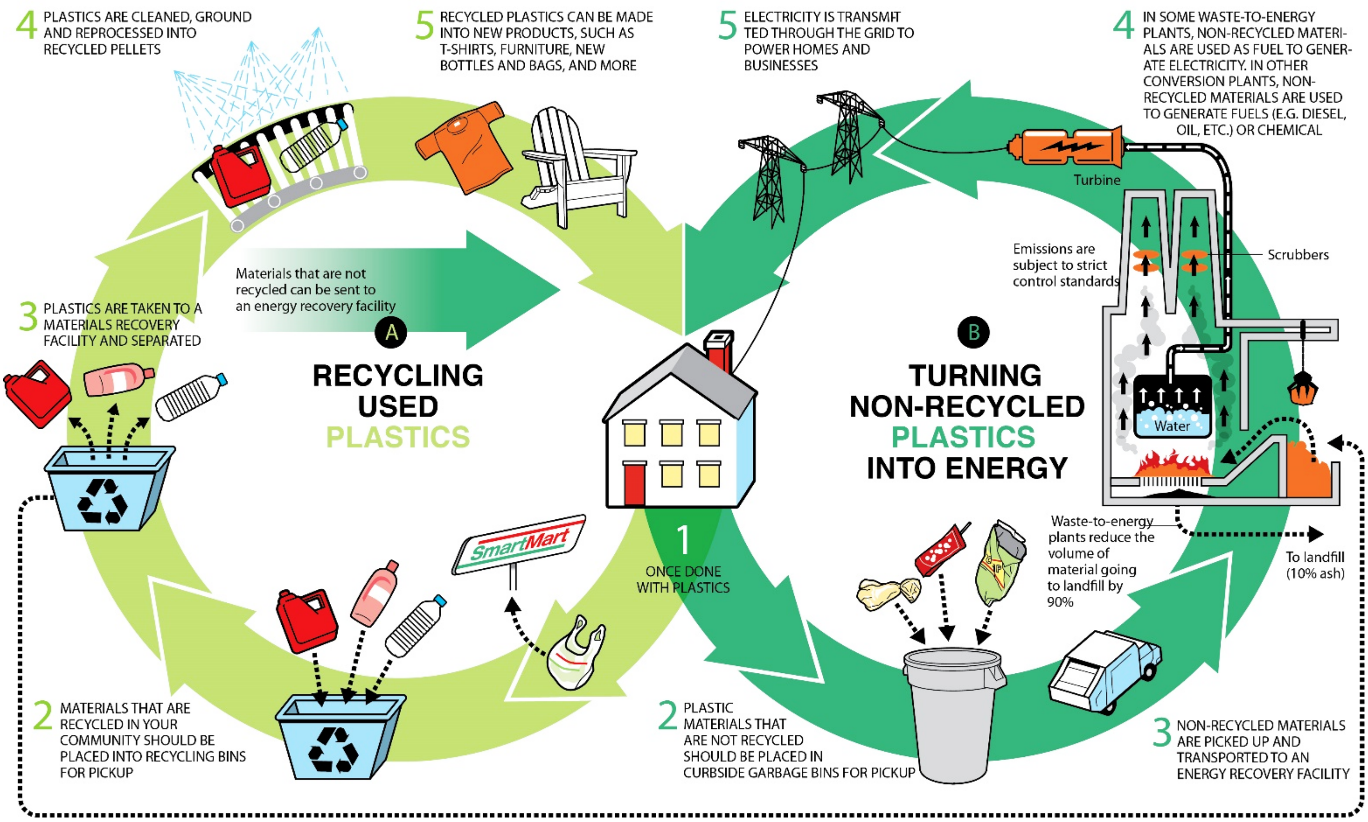
Advantages

- Provide alternative fuel source for countries
- Volume reduction of wastes
- Typically, energy neutral if not positive due to the innate capacity of high temperature thermal processes such as incineration and pyrolysis to generate energy.
- High temperature thermal processes can typically achieve over 80% conversion to solid or liquid fuels.
- Emissions to air are regulated, high temperature thermal processes require management of emissions which are controlled by thermal oxidisers and filtration equipment.

Disadvantages

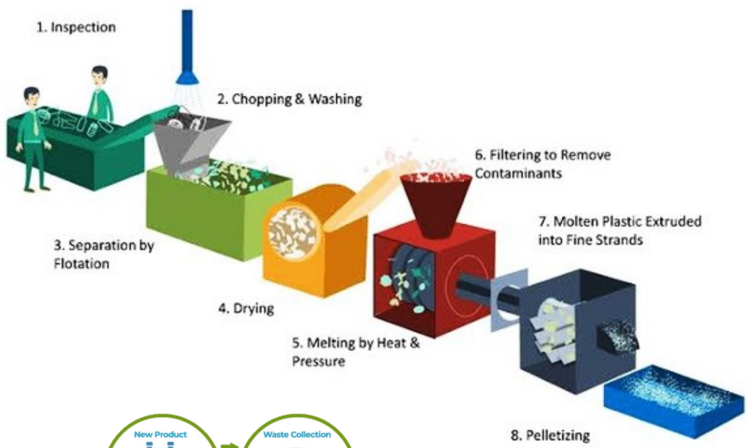
- Low on the waste hierarchy - not promoting circular economy
- Emerging industry in the Pacific, not well-known by local communities, could cause concern
- Potentially intensive maintenance program
- Medium to high skill level required to operate machinery and electronics.
- Certain technology will produce potentially toxic ash which needs disposing
- Emissions to air need to be regulated if thermal oxidisers and filtration equipment not operating correctly could result in air pollution and damage to human health.
- Plastic fumes released to air vary dependent upon plastics being melted.
- This technology tends to require significant manpower for operation, dependent upon the operating requirements of waste to energy conversion technology – e.g., the Balanced Energy Cost Rica pyrolysis reactor requires operation 24 hours per day, for as many continuous days as possible and requires three to four persons per shift.
- Suited to highly populated countries/community centres

DIVERTING PLASTICS FROM LANDFILLS: A TWO-PRONGED APPROACH



PLASTIC RECYCLING

Plastic Recycling Process



8.3 BILLION TONNES
The amount of plastic produced to date since invention.

$80 BILLION DOLLARS
The estimated value of global plastic waste annually.

350
350 MILLION TONNES
Quantity of plastic produced annually across the world.

ONLY 9% RECYCLED
Just 9% of all plastic produced ever has been recycled.

8 MILLION TONNES
of waste plastic enters the world's oceans each year.

20% OF GLOBAL OIL
By 2050, it is expected that 20% of the world's oil production will be used to manufacture plastic.

EUROPEAN UNION

SPREP
Secretariat of the Pacific Regional Environment Programme

PacWastePlus
PACIFIC WASTE MANAGEMENT