



SPREP
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Environment Programme



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Volume 5: Guidance for Communities and Private Sector ASSESSMENT OF ALTERNATIVES TO SINGLE- USE DISPOSABLE DIAPERS

April 2022



Reducing Environmental Effects while Considering Social and Economic Factors

Research report to assist decision making - analysis of current single-use disposable diaper practices in the Pacific, and a review of viable alternatives.

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

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PacWastePlus Programme

The Pacific – European Union (EU) Waste Management Programme, PacWastePlus, is a 72-month programme funded by the EU and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) to improve regional management of waste and pollution sustainably and cost-effectively.

About PacWastePlus

The impact of waste and pollution is taking its toll on the health of communities, degrading natural ecosystems, threatening food security, impeding resilience to climate change, and adversely impacting social and economic development of countries in the region. The PacWastePlus programme will generate improved economic, social, health, and environmental benefits by enhancing existing activities and building capacity and sustainability into waste management practices for all participating countries.

Countries participating in the PacWastePlus programme are: *Cook Islands, Democratic Republic of Timor-Leste, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.*

KEY OBJECTIVES

Outcomes & Key Result Areas

The overall objective of PacWastePlus is “to generate improved economic, social, health and environmental benefits arising from stronger regional economic integration and the sustainable management of natural resources and the environment”.

The specific objective is “to ensure the safe and sustainable management of waste with due regard for the conservation of biodiversity, health and wellbeing of Pacific Island communities and climate change mitigation and adaptation requirements”.

Key Result Areas

- Improved data collection, information sharing, and education awareness
- Policy & Regulation - Policies and regulatory frameworks developed and implemented.
- Best Practices - Enhanced private sector engagement and infrastructure development implemented
- Human Capacity - Enhanced human capacity

Learn more about the PacWastePlus programme by visiting



<https://pacwasteplus.org/>

About this Research Publication Series

Single-use disposable diapers have been identified as a waste issue in Pacific countries, both in landfills and as a commonly littered item. Three Pacific countries (Kiribati, Vanuatu and Tuvalu) have implemented import controls to assist with the management of single-use disposable diapers, the only known measures of their kind in the world. However, the need to contain and manage baby excreta to reduce public health risks is well understood, as is the need for economic growth and equality and inclusion in today's Pacific societies, ensuing women are encouraged into the workforce and to contribute to community activities.

The Pacific therefore faces a challenge: attempting to reduce environmental risks from the disposal of single-use disposable diapers, while balancing the social and economic benefits that single-use disposable diapers bring. Currently there is a lack of reliable information on suitable alternatives for single-use disposable diapers to enable informed decisions in the Pacific Island context.

This research, commissioned by the Secretariat of the Pacific Regional Environment Programme (SPREP) through the European Union's funded PacWastePlus Programme, aimed to fill this gap by providing information to:

- Guide informed decision making for governments when developing policy controls to reduce environmental effects from single-use disposable diapers, while balancing social and economic factors
- Inform communities and the private sector on viable alternatives to current single-use disposable diaper use and disposal practices for the Pacific.

Assessment of Alternatives to Single-use Disposable Diapers Publication Series

Volume 1: Executive Summary

Summary of the research background and key findings



Volume 3: Field Work and Results

Details of the research methodology and findings for each research component



Volume 4: Guidance for Decision Makers

Guidance for informed decision making for governments when developing policy controls to reduce environmental effects from single-use disposable diapers, while balancing social and economic factors



Volume 2: Literature Review

Research report that provides details on the background of single-use disposable diapers and alternative infant hygiene garments and review of global policies addressing single-use disposable diapers management



Volume 5: Guidance for Communities and Private Sector







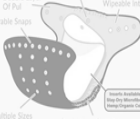


Informs communities and the private sector on viable alternatives to current single-use disposable diaper use and disposal practices



Glossary

Item	Description
Engineers Without Borders	For-purpose organisation creating social value through engineering. Completed social and technical components of this research.
Escherichia coli (E. coli)	Bacteria found in the environment, foods, and human excreta. E. coli can make humans sick with diarrhoea and other illnesses.
Excreta	Waste matter (such as urine and faeces) eliminated from the body
Infant hygiene garments	Covering used to contain baby excreta including single-use disposable diapers and reusable nappies
Pit latrine or ventilated pit (bush toilet / long drop)	Type of toilet that collects human excreta in a hole in the ground
Reusable nappy	A cloth garment, traditionally square and made from towelling, but more recently including modern cloth nappies. They are reusable and require laundering. The local vernacular differs in describing these types of products. For example, in Vanuatu and Samoa, the word 'napkin' is used for this type of nappy, and in Tonga 'napikeni' is used. Components of reusable nappies are provided in the following illustration.
Rural	Small villages with a low population, outside cities or towns
Secretariat of the Pacific Regional Environment Programme (SPREP)	Inter-governmental organisation established by the Governments and Administrations of the Pacific charged with protecting and managing the environment. Commissioned this research.
Single-use biodegradable, eco/environmentally friendly, compostable diaper (eco-friendly / compostable single-use diaper)	A single-use garment that has waterproof qualities similar to those in single-use disposable diapers, but that claim biodegradability, environmental friendliness, or compostability. These diapers are commonly made from cellulose, chlorine-free wood pulp, super absorbent polymer (SAP), cotton, bamboo, and other plant-based fibres. Most versions use non-compostable (petrochemical-based) plastics for fasteners.
Single-use disposable diaper	A single use, throw away garment that is waterproof, and fitted. Single-use disposable diapers are available to be used from birth until babies are potty trained. Single-use disposable diapers are manufactured with a range of petrochemical-based plastics, and a complex combination of polymer types.
Super Absorbent Polymer (SAP) (also known as slush powder)	A water-absorbing polymer that can absorb and retain extremely substantial amounts of a liquid. Primarily used as an absorbent solution for diapers. Main ingredients are acrylic acid, and sodium hydroxide.
Urban	Densely populated area, usually a city or town, usually provided with government services such as water and wastewater
Wastewater soak-away area	Typically, a pit, filled with natural liner/filtration such as gravel or aggregates, into which wastewater is piped so it can drain slowly out into the surrounding soil

Components of Reusable Nappies'

Components	Illustration	Description
Prefolds		Flat square of fabric with thicker middle panel sewn in, eliminating some folding
Fitteds		Fabric diapers that have sewn-in elastic and often fasteners such as snaps or velcro
Covers		Water resistant material that is used over an absorbent piece such as prefold, fitted, or insert.
Inserts and Boosters		Absorbent layer you add to your nappy to absorb fluids
Pockets		Diapers with a waterproof cover already sewn to the outside, a fabric inside layer, and an opening for stuffing inserts.
All-in-One		Diapers sewn all together with inserts, waterproof cover, and fasteners all in one piece.
All-in-Two		Waterproof outer covers that feature either lay-in or snap-in inserts.
Liner		Thin top layer helps catch solids and reduce soiling. Usually designed to draw moisture. Can be disposable or reusable.
Modern Cloth Reusable Nappy (Modern Cloth Nappy)		Fitted premade reusable nappy design similar to single-use disposable diapers but able to be washed and reused

Introduction

The transition to a more convenient lifestyle over the last seventy years has seen a dramatic increase in single-use plastic items onto global markets (UNEP, 2018). Included in the range of items are single-use disposable diapers. Although convenient in their use, the post-use disposal of these items is increasing solid waste that is difficult to manage and has significant impacts on our environment (UNEP, 2021).

Single-use disposable diapers have been identified as a waste issue in Pacific countries, both in landfills and as a commonly littered item. Three Pacific countries (Kiribati, Vanuatu, and Tuvalu) have implemented import controls to assist with the management of single-use disposable diapers, the only known measures of their kind in the world.

However, the need to contain and manage baby excreta to reduce public health risks is well understood, as is the need for economic growth and equality and inclusion in today's Pacific societies, ensuing women are encouraged into the workforce and to contribute to community activities.

The Pacific faces a challenge:



attempting to reduce environmental risks from the disposal of single-use disposable diapers



while balancing the social and economic benefits that single-use disposable diapers bring



Currently there is a lack of reliable information on suitable alternatives for single-use disposable diapers to enable informed decisions in the Pacific Island context.

This research, commissioned by the Secretariat of the Pacific Regional Environment Programme (SPREP) through the European Union's funded PacWastePlus Programme, aimed to fill this gap.

This research sought to:

- Explore current **practices** on the use and disposal of single-use disposable diapers, reusable nappies, and eco-friendly / compostable diapers in the Pacific
- Explore current **perceptions** on the use and disposal of single-use disposable diapers, reusable nappies, and eco-friendly / compostable diapers in the Pacific
- Explore the **physical performance** of reusable nappies and eco-friendly / compostable diapers in the Pacific
- Identify and understand **barriers and opportunities** for reducing environmental impacts associated with single-use disposable diaper disposal in Pacific communities, balancing social and economic factors

Guidance for Pacific Communities and Private Sector

This volume summarises research findings to provide guidance to Pacific communities looking to increase their understanding of:

- options available for management and disposal of diapers and nappies in their communities
- facts about use of reusable nappies (“myth busting” the common perceptions)
- environmental reasons for adopting reusable nappies

This section also provides information to the Private Sector on potentially viable business opportunities available to assist communities to adopt reusable nappies.

Best Practise Management and Disposal

Not all Pacific communities have same access to water and waste collection facilities and therefore the recommended management and disposal of diapers and nappies for each community will vary.

The information in the following illustrations will assist households and communities to identify the best option available for your community, and what extra infrastructure may be needed to keep communities healthy.

Communities WITH Waste Collection



Communities WITH REGULAR WATER

1 Use reusable nappies whenever possible



Recommended practice:

- Empty baby excreta into toilet or ventilated improved pit toilets (*or other*)
- Wash reusable nappies in a bucket
- Take care to empty wastewater away from children, pets, water supplies and gardens, in either a flush toilet or in a dedicated soak-away where dry toilets are used
- Dry reusable nappies in the sun to use UV to disinfect any E.coli



Option: Construct community designated soak-away area – away from groundwater, water supplies and gardens

2 If single-use disposable diapers are used



Recommended practice:

- Empty baby excreta into toilet or ventilated improved pit toilets (*or other*)
- Put out for collection (*taking care to keep away from dogs and other wildlife*)



Recommendation: Construct community dog-proof waste collection platforms / cages



Communities WITHOUT REGULAR WATER

1 Use single-use disposable diapers



Recommended practice:

- Empty baby excreta into toilet or ventilated improved pit toilets (or other)
- Put out for collection (taking care to keep away from dogs and other wildlife)



Recommendation: Construct community dog-proof waste collection platforms / cages

Alternative

Use reusable nappies



Recommended practice:

- Empty baby excreta into toilet or ventilated improved pit toilets (or other)
- Use seawater or rainwater water in a bucket to wash nappy (if using seawater, try to rinse with rainwater after cleaning, and use rainwater every so often (when possible) to remove the hardness of the nappy)
- Take care to empty wastewater away from children, pets, and water supplies into a soak-away where dry toilets are used
- Dry reusable nappies in the sun to use UV to disinfect any E. coli



Option: Construct community designated soak-away area for nappy wastewater – away from groundwater, water supplies and gardens

Communities WITHOUT Waste Collection



Communities WITH OR WITHOUT REGULAR WATER



Use reusable nappies whenever possible

Recommended practice:

- Empty baby excreta into toilet or ventilated improved pit toilets (or other)
- Use seawater or rainwater water in a bucket to wash nappy (if using seawater, try to rinse with rainwater after cleaning, and use rainwater every so often (when possible) to remove the hardness of the nappy)
- Take care to empty wastewater away from children, pets, and water supplies into a soak-away where dry toilets are used
- Dry reusable nappies in the sun to use UV to disinfect any E. coli



Recommendation: Construct community designated soak-away area for nappy wastewater – away from groundwater, water supplies and gardens

Alternative

Single-use disposable diapers



Recommended practice:

- Empty baby excreta into toilet or ventilated improved pit toilets (or other)
- Bury used diapers in controlled, covered pits



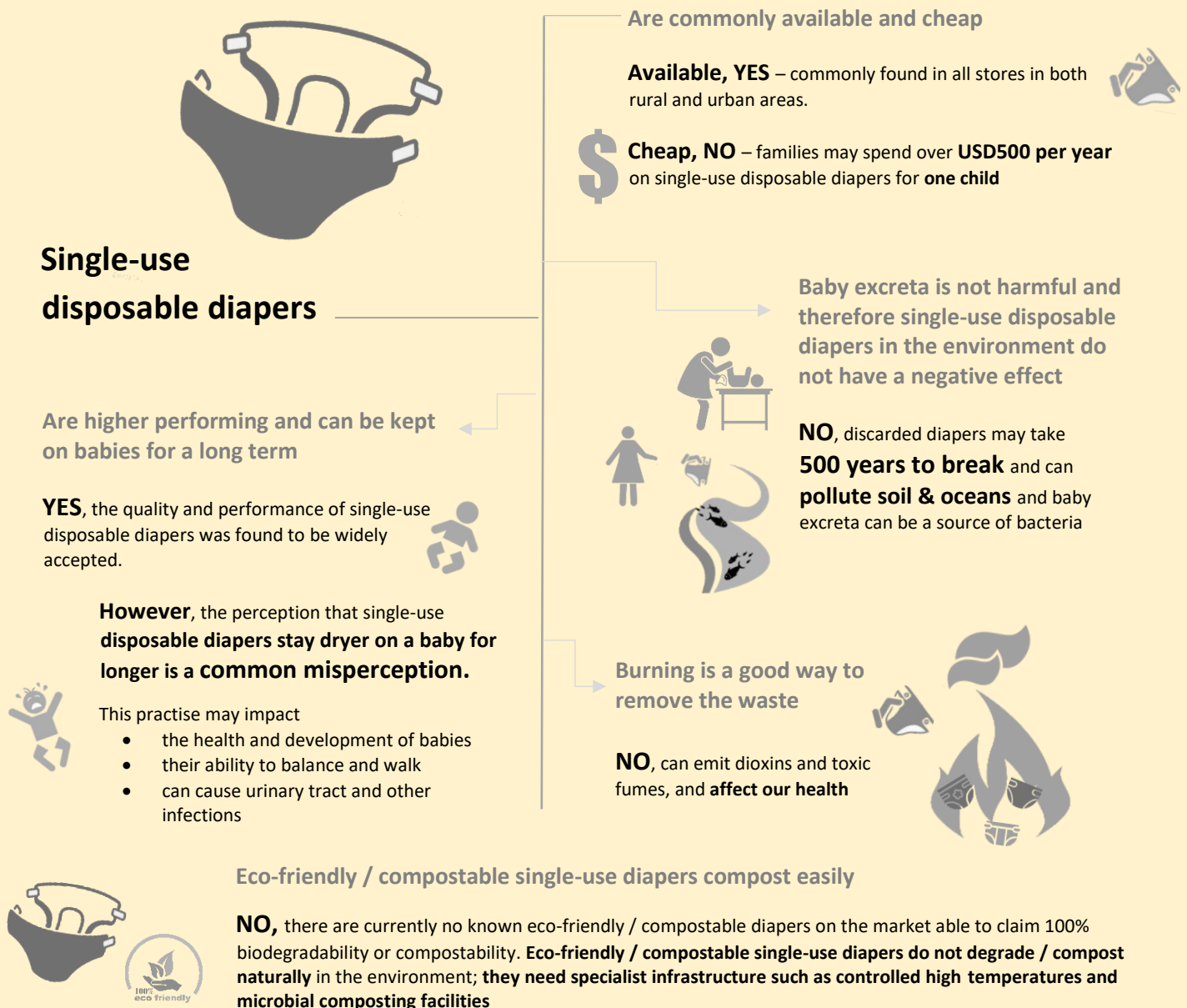
Recommendation: Construct community designated disposal area – away from groundwater / lined with clay or impervious surface

“Myth Busting” Incorrect Perceptions

Many actual and perceived barriers against adoption of reusable nappies were found through this study. Many of the perceptions were found to be misguided. The illustration below summarizes these perceptions and provides the facts found during this study.

This information can help communities make an informed choice when considering what infant hygiene garment to use. Also note, for many families a combination approach may be appropriate – i.e., using reusable nappies when at home during the day, but using disposable diapers when travelling, at events, and during the night.

Key Perceptions of Single-Use Disposable Diapers in the Pacific



Key Perceptions of Reusable Diapers in the Pacific



Reusable diapers



People who use reusable nappies are poor

NO, families choosing reusable nappies do so also for social (health) and environmental reasons

Reusable nappies can also be seen as a “wise household choice” that can free up budget for other activities

The upfront costs of reusable nappies are expensive

Upfront costs can be as little as \$54 for common flat / cloth square reusable nappies.

Use of reusable nappies may represent a saving of at least USD1,377 over 3 years.



Wastewater from reusable nappies is not a risk to public health

NO, without management, reusable nappies wastewater disposal sites can be a source of E. coli and other health effects

Using reusable nappies will limit my ability to work

NO, options may be available assist parents when using reusable nappies, include a nappy washing service and/or assisting childcare to use reusable nappies.

Also using a combination approach may be appropriate – disposable diapers used on babies when parents are at work.

Reusable nappies are hard to clean and hard to dry

The technical testing found that reusable nappies were generally found to be **easy to wash and dry**.

Participants liked microfiber inserts (even if they had to be doubled), due to washing and drying



Reusable nappies only include the old-style cotton flat towels

NO, reusable nappies can now come with many “accessories” including plastic clips, covers, and liners to assist user experience.

Also available are ‘modern cloth nappies’, that are fitted premade designs similar in design to single-use disposable diapers.

Reusable nappies are less effective than single-use disposable diapers

NO, study participants found that the level of absorbency / leakage found in reusable nappies was generally **good**, except for the cheapest products.



If I use reusable nappies, I have to use them all the time

NO, a combination approach may be appropriate for many households – i.e., using reusable nappies when at home during the day, but using disposable diapers when travelling, at events, and during the night



Table 1 Cost Estimates Comparing Nappies and Diapers in the Pacific

Product	Cost per unit ¹	Number used per day ²	Number needed (upfront)	Upfront Cost	Estimated annual costs for washing ³	Cost - Year 1	Cost - For 3 years ⁴
Flat / Cloth square reusable nappies	\$2.25	6	24	\$54	\$38	\$92	\$169
Modern cloth reusable nappies	\$10.85	6	24	\$260	\$38	\$299	\$375
Single-use disposable diapers	\$0.40	4	0	\$0	\$0	\$584	\$1,752

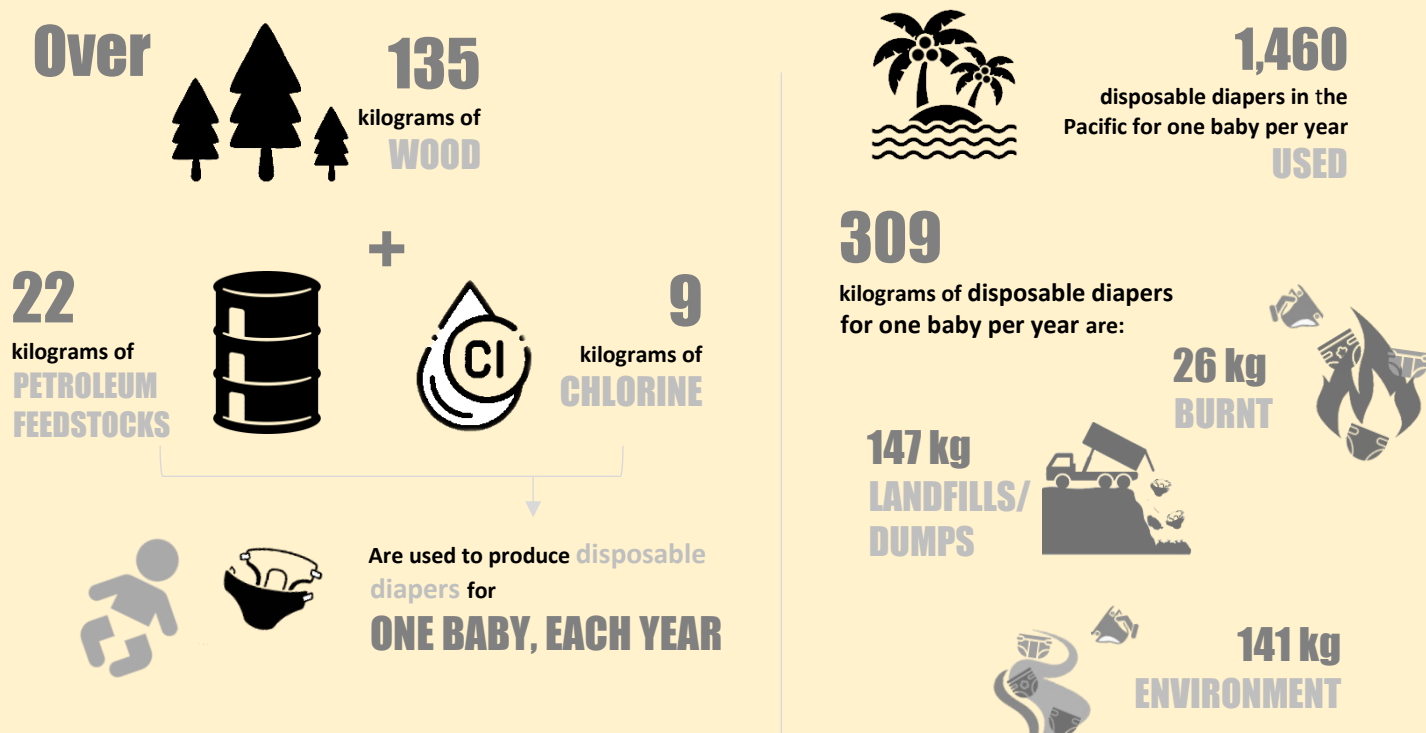
All costs in USD; Calculation is for one child

Assumptions:

- Pacific costings; obtained from market analysis and supported by interview and focus group participants
- Informed from participant responses
- Cost for washing
 - Cost of washing one load of ~12 nappies (cold of tepid water; hand washing in a bucket) = USD0.21c (Water (15L) USD0.01; Soap (20gm) USD0.20)
 - Water is an estimate based on UNELCO water tariff for Vanuatu
 - Washing powder and bar soap costs are estimates from Vanuatu and Fiji suppliers
 - Number of washes is estimated from participant responses and literature

Environmental Factors

An estimated 135 kilograms of wood, 22 kilograms of petroleum feedstock, and 9 kilograms of chlorine is used to manufacture disposable diapers for **one baby for one year** (GroVia, 2020; based on Lehrburger et al., 1991) and over 300 kilograms¹ of waste is produced, most of which is disposed in landfills and discarded in the environment, where it will remain for approximately 500 years.



¹ Pacific children found to use an average of four single-use disposable diapers per day (Volume 4), (4 diapers x 365 days = 1,460 diapers used each year, weight calculated using an average post-use weight of 212 grams (Colon et al, 2010)

Options for the Private Sector

The Private Sector in the Pacific may have an opportunity to provide services available to communities for management of nappies and diapers.

Table 2 discusses these opportunities and provides comments on social and economic factors to consider.

Table 2 Opportunities for Entrepreneurial Activities for Improving Management / Disposal of Diapers and Nappies

Opportunity	Comments
Establishing reusable nappy washing service (“nappy library”)	<p>The perception held by many of reusable nappies being a lot of work, could be mitigated through the introduction of nappy washing services</p> <p>Participants in the research indicated support for using a nappy washing service, provided there were standards agreed to and implemented to avoid any widespread outbreaks of disease</p> <p>By providing a nappy washing service, environmental benefits from fewer single-use disposable diapers can be achieved without negative social effects (i.e., on parents returning to the workforce).</p> <p>Opportunity for Private Sector entrepreneurs to establish a nappy washing service. Laundering activities have proved economically viable and socially accepted in other countries</p>
Supporting Pacific-based manufacture of reusable nappies or modern cloth nappies (all-in-ones / all-in-twos)	<p>Globally, the uptake of modern cloth nappies is gaining momentum with parents seeking to make environmentally friendly choices while balancing ease and practicality</p> <p>Modern cloth nappies were barely mentioned in the research, likely due to their very limited availability and upfront cost</p> <p>In Vanuatu, with a well-promoted modern cloth nappy variety, access to this product was found in the market research to be limited. Additionally, few of the internationally manufactured modern reusable nappies were identified.</p> <p>Three known local initiatives, Vanuatu, Fiji and the Cook Islands, are manufacturing modern cloth nappies in the Pacific region</p> <p>Opportunity may exist for Pacific companies to provide quality products at an affordable rate</p>
Explore designs of reusable nappies (including liners) made locally using local materials	<p>Production of locally biodegradable liners and diapers in the Pacific could be feasible using readily available plant fibres and other biological based components.</p> <p>Combining modern designs and traditional solutions can increase uptake of consumable products in the Pacific. Therefore, manufacturing reusable nappies (including liners) locally using local materials may increase their interest and adoption by community. However, survey participants disagreed that the use of local materials may be a motivator to increase reusable nappy use.</p> <p>Opportunity for Private Sector entrepreneurs to design and manufacture locally biodegradable liners and diapers.</p>
Supporting importers and suppliers, including rural suppliers, to make informed product choices on reusable nappy components	<p>Research found limited stocks of reusable nappies, particularly in rural areas. Where reusable nappies were found, it was usually of low-quality standard.</p> <p>Low quality products reduce user experience and increase cost of reusable nappies (three needing to be used at a time)</p> <p>Opportunity for Private Sector importers to:</p> <ul style="list-style-type: none"> • stock quality reusable nappies and promote their benefits • supply reusable nappies as a pack – including plastic clips, covers, and liners (which was found in this research to add significant value to participants’ experience) • supply liners – Survey participants valued the convenience of liners (to improve absorbency and reduce handling of excreta) which could be a major driver for behaviour change

Opportunity	Comments
<p>Assisting childcare providers to accept babies using reusable nappies</p>	<p>Impact to paid work opportunities is portrayed by participants, particularly in urban communities, as a barrier for the adoption of reusable nappies (the higher use of reusable nappies in rural areas was generally found to be enabled by a stay-at-home parent with strong family support networks).</p> <p>Childcare centres may be reluctant to care for babies with reusable nappies, however, they provide an opportunity, particularly in combination with a nappy washing service to assist with the uptake of reusable nappies.</p>



Do Not: Dispose single-use disposable diapers in Waterways, Oceans, or the Environment

Single-use disposable diapers may take **500 years to break down** in the environment. They can release chemicals and bacteria and may entangle land and marine animals. When single-use disposable diapers eventually start to decompose, they break into smaller particles called “**microplastics**”, which can be eaten by fish and end up in food eaten by us.



Do Not: Burn single-use disposable diapers

Burning of single-use disposable diapers will **emit dioxins and toxic fumes**. These fumes may affect our health and may spread into the surrounding environment (*into food and water sources*). Bury used diapers in controlled, covered pits.



Do Not: Dispose single-use disposable diapers in areas near water supply and gardens

Single-use disposable diapers in the environment may release chemicals such as dioxins, heavy metals, and bacteria from the baby excreta into the soil and water. These chemicals may end up in gardens and can **spread pollution and disease**.



Do Not: Dispose reusable nappies wastewater near groundwater, water supplies and gardens

Untreated wastewater, including from washing reusable nappies, has the potential **spread disease and contaminate soil and drinking water** sources. Most outbreaks of waterborne illnesses can be traced to wells or water supplies contaminated by sewage.

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