



SPREP
Secretariat of the Pacific Regional
Environment Programme



PacWastePlus
PACIFIC WASTE MANAGEMENT

This initiative is supported by **PacWastePlus**-a 72 month project funded by the European Union (EU) and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) to **sustainably and cost effectively improve regional management of waste and pollution.**

Volume 3: Field Work and Results

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.

© Secretariat of the Pacific Regional Environment Programme (SPREP), 2022.

Reproduction for educational or other non-commercial purposes is authorised without prior written permission from the copyright holder and provided that SPREP and the source document are properly acknowledged. Reproduction of this publication for resale or other commercial purposes is prohibited without prior written consent of the copyright owner.

SPREP Library Cataloguing-in-Publication

Assessment of alternative to single-use disposable
diapers. Volume 3: field work and results. Apia,
Samoa : SPREP, 2022.
54 p. 29 cm.

ISBN: 978-982-04-1089-3 (print)
978-982-04-1090-9 (ecopy)

1. Recycling (Waste, etc.) – Household waste –
Technical reports. 2. Waste management – Refuse
and refuse disposal. I. Pacific Regional Environment
Programme (SPREP). II. Title.
363.728

Disclaimer: This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of SPREP and do not necessarily reflect the views of the European Union. This document has been compiled in good faith, exercising all due care and attention. SPREP does not accept responsibility for inaccurate or incomplete information.



Acknowledgment: The Engineers Without Borders of Australia on behalf of the Secretariat for the Pacific Regional Environment Programme (SPREP) would like to acknowledge partner organisations and communities who have all contributed to the study. While all care has been taken to check and validate material presented in this report, independent research should be undertaken before any action or decision is taken on the basis of material contained in this report. This report does not seek to provide any assurance of project viability and the researcher (Engineers Without Borders) accepts no liability for decisions made or the information provided in this report.



PO Box 240 Apia, Samoa
Apia, Samoa
T: +685 21929
E: sprep@sprep.org
W: www.sprep.org

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

Contents

| | |
|---|-----------|
| PacWastePlus Programme | 4 |
| About this Research Publication Series | 5 |
| Glossary | 6 |
| Introduction | 8 |
| Field Work and Research Findings | 9 |
| Research Methods | 9 |
| Geographical Scope | 10 |
| Market Research | 10 |
| Socio-Economic and Cultural Investigation..... | 10 |
| Technical Assessment and Physical Testings | 13 |
| Research Findings | 17 |
| Current Practices of Managing Baby Excreta in the Pacific | 17 |
| Current Disposal / Washing Practices | 33 |
| Technical Assessment – Reusable Nappies and Eco / Compostable Diapers | 38 |
| Discussion | 48 |
| Barriers for Management of Disposable Diapers and Adoption of Alternatives | 48 |
| Opportunities to Assist Management of Disposable Diapers and Adoption of Alternatives | 53 |



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, therefore aims 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 Markers

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







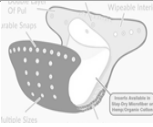


Informs communities and the private sector on viable alternatives to current single-use disposable diaper use and disposal practices



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, environmentally 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 **practises** 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

Field Work and Research Findings

Research Methods

Social and technical research was conducted to address the lack of reliable information on suitable alternatives for single-use disposable diapers, considering the social, economic, and environmental context of the Pacific. This research was designed to gain an understanding of the current use and post-use management of single-use disposable diapers in the Pacific and explore appropriate alternatives and opportunities to reduce environmental impacts associated with their disposal.

Specific research objectives are to:

- Explore current **practises** on the use and disposal of single-use disposable diapers, reusable nappies, and eco-friendly / compostable single-use disposal diaper in the Pacific
- Explore current **perceptions** on the use and disposal of single-use disposable diapers, reusable nappies, and eco-friendly / compostable single-use disposal diaper 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

This research was conducted in three parts:

- 1) Marketing research (global)
- 2) Socio-economic and cultural investigation (Fiji, Kiribati, and Vanuatu)
- 3) Physical and technical investigation (Vanuatu)

Erakor Community Facilitator (left) and Volunteer Receiving Testing Kit



Geographical Scope

The study context is Pacific Island Countries who are participating members of the PacWastePlus Programme.

With Covid-19 related travel restrictions in place during the study period, three countries were selected as case study countries – Fiji, Vanuatu, and Kiribati.

These countries were selected to represent the unique physical and socio-economic setting of Pacific countries due to the following characteristics:

- Population, access to markets, women participation in the workforce, the levels of income and clear differentiation between rural and urban settings
- Background cultures/characteristics of the Pacific regions, represented by Melanesian (Vanuatu), Micronesia (Kiribati), and Polynesian-Melanesia (Fijian people are officially classified as Melanesian, however their social and political organisation is considered closer to that of Polynesia)
- Geo-physical characteristics, with Vanuatu and Fiji representing lush volcanic islands and Kiribati representing low-lying atoll nations, and all having outer islands and urban and rural populations
- Vanuatu and Kiribati governments already aware of the environmental problems associated with single-use disposable diapers and already progressing policy to prohibit their import

Market Research

Market research included a worldwide review of nappies and diapers to determine product available and their characteristics. Results of market research provided the basis of the technical testing completed by this study.

Global research was compiled from internet research. Pacific data was primarily compiled using field investigations as minimal information was available online. Specific market analysis was conducted in outlets commonly identified as places of purchase for diapers and nappies in the case-study countries.

Market research also examined “compostability” claims of eco-friendly / compostable diapers currently on the market. This research did not undertake any physical biodegradability or compostability testing but does complete a desktop analysis of product details related to self-declared eco-friendly claims and summarises findings from literature and other field trials.

Socio-Economic and Cultural Investigation

The socio-economic and cultural investigation used three methods to collect data:

- Questionnaires
- Focus group discussions
- Semi-structured interviews

Each method is outlined below. No participants were incentivised to participate in the research.

Questionnaires

Face-to-face questionnaires were used to understand first-person perspectives from households and individuals in urban and rural areas of Fiji, Kiribati, and Vanuatu regarding their use and perception of single-use disposable diapers and reusable nappies. A total of 150 participants responded to the questionnaire representing both urban (70) and rural (80) settings. In Kiribati and Vanuatu, questionnaires were conducted face-to-face with participants selected using an ‘every second household on a given street’ approach. In Fiji, six household questionnaires were completed face-to-face before Covid-19 lockdown restrictions were put in place. After that, to ensure safety of field technicians and questionnaire participants, interviews were conducted using digital methods – phone calls, Facebook messenger, and email; selected using a convenience and snowball approach.

Vanuatu Household Questionnaire



Source: EWB, 2021

A larger number of participants were interviewed in Vanuatu to counterbalance an advancing risk of Covid-19 lockdowns in Kiribati during the study period. Fortunately, the Covid situation in Kiribati did not transpire and alert levels were relaxed, and so did not affect the completion of the face-to-face questionnaires. However, this has resulted in a larger sample representation for Vanuatu as presented in Table 1.

Table 1 Total Number of Questionnaires Completed

| Total questionnaire participants (n=150) | Fiji | | Kiribati | | Vanuatu | | Total (all countries) |
|--|-----------|----------|-----------|----------|-----------|----------|-----------------------|
| | F | M | F | M | F | M | |
| <i>Urban</i> | 18 | 2 | 18 | 2 | 27 | 3 | 70 |
| <i>Rural</i> | 18 | 2 | 17 | 3 | 37 | 3 | 80 |
| Total questionnaire participants | 36 | 4 | 35 | 5 | 64 | 6 | 150 |

Focus Group Discussions

Focus groups were used to facilitate group discussions regarding use and perception of infant hygiene products in urban and rural communities of Fiji, Kiribati, and Vanuatu. To identify locations for the focus group discussions and recruit participants, the study technician consulted with community leaders and decision makers. In Kiribati and Vanuatu, focus group discussions were held face-to-face and in Fiji, focus group discussions were conducted remotely (virtual chat room) due to Covid-19 restrictions. The total number of participants who attended the focus group discussions was 90, as presented in Table 2.

Kiribati Focus Group Discussion



Source: ChildFund, 2021

Table 2 Total Number of Focus Group Participants

| Total FGD participants (n=90) | Fiji | | Kiribati | | Vanuatu | | Total (all countries) |
|--|-----------|----------|-----------|-----------|-----------|----------|-----------------------|
| | F | M | F | M | F | M | |
| <i>Urban</i> | 10 | 2 | 11 | 0 | 18 | 1 | 42 |
| <i>Rural</i> | 8 | 2 | 4 | 11 | 15 | 8 | 48 |
| Total Focus Group Discussion participants | 18 | 4 | 15 | 11 | 33 | 9 | 90 |

Semi-Structured Interviews

Semi-structured interviews were conducted with stakeholders from civil society, private sector, and government departments who participate in or support the use and management of diapers in case study countries (plus Tuvalu, selected as they have a policy for the management of single-use disposable diapers).

Participants were selected both by targeting specific job designations from relevant agencies and departments (i.e., Director of Environment), and using a snowball approach (i.e., “who else do you recommend we contact”). Interviews were completed using phone calls and email. The total number of semi-structured interview participants was 33, presented in Table 3.

Table 3 Semi-Structured Interview Participants

| Total FGD participants (n=90) | Fiji | | Kiribati | | Vanuatu | | Total (all countries) |
|--|----------|----------|----------|----------|----------|----------|-----------------------|
| | F | M | F | M | F | M | |
| <i>Urban</i> | 2 | 0 | 2 | 0 | 0 | 2 | 6 |
| <i>Rural</i> | 3 | 2 | 3 | 2 | 2 | 3 | 15 |
| <i>NGO</i> | 2 | 1 | 1 | 2 | 1 | 3 | 10 |
| <i>Non-case study country</i> | | | | | | | 2 |
| Total Focus Group Discussion participants | 7 | 3 | 6 | 4 | 3 | 8 | 33 |

Technical Assessment and Physical Testings

A technical analysis was conducted to field test the “washability” and “useability” of reusable nappy designs and materials. The purpose of the technical assessment was to explore the physical performance of reusable nappies in a Pacific setting.

The assessment was performed in the peri-urban community of Erakor, on Efate Island, Vanuatu, and utilised washing methodologies typical across Pacific countries:

- Hand washing, non-electrical washing machine, and an electrical front load machine
- Cold water, hot water, and salt water
- Powder detergent, bar soap, no detergent
- Line drying

The methodology for the technical assessment included the following:

- 1) Selection of volunteers: 13 local caregivers (typically mothers; also, aunties and grandmothers) volunteered themselves to be the “testers” for this technical assessment. The study technician interviewed the volunteers to confirm they were committed.
- 2) Identification and sourcing of items to test:
 - “useability” assessment: 26 reusable nappy items and materials were selected for assessment through the technical analysis, including flats, prefolds, inserts, covers, pocket covers, all-in-one, all-in-two, liners, and nappy fasteners. These items were identified by the market research, available for purchase in Pacific countries, and selected to represent a variable prices and qualities. **Note:** the technical team was able to source the modern all-in-one and all-in-two reusable nappies from the second-hand network in Vanuatu, these nappies have limited availability in retail stores.
 - “washability” assessment: focused on the washing, drying, use, and performance of the typical fabric inserts currently found and utilised in the Pacific, microfiber, and cotton (as identified in the literature review and market research):

Microfiber insert (Polyester/Polyamide), the cheapest and currently most accessible nappy insert material in the Pacific.



Cotton insert (with small bamboo core), the longest used and most familiar insert material for reusable nappies in the Pacific.



- 3) Preparation for testing: The researchers washed all products before distributing the nappies. This was for hygienic reasons (to ensure babies were only in contact with clean products), but also for performance reasons (microfiber inserts are absorbent only after several washes).
- 4) Allocation of washing arrangements:
 - “useability” assessment: Carers were provided bags containing approximately 24 absorbent fabrics and accessories associated with reusable nappies to be tested. The testers could wash these 24 items of nappies in the usual way they wash their clothes. Instructions were printed on the bags provided.
 - “washability” assessment: To analyse the washing and performance of typical absorbent materials using typical washing techniques found in the Pacific, carers were provided both microfiber and cotton inserts and allocated one of the washing procedures in
 - **Table 4.** They were asked to strictly use that washing technique for the study period. **Note:** Electrical front load wash testing was not performed by volunteers, the field technicians collected and washed these nappies in Port Vila.

Table 4 Summary of Different Washing Techniques Used for Study

| | Cold water with powder detergent | Hot water 40°C with powder detergent | Cold water with bar soap | Cold water without detergent | Salt water with powder detergent (Fresh water rinse before hanging to dry) | Salt water with bar soap | Salt water without detergent |
|--------------------------------|----------------------------------|--------------------------------------|--------------------------|------------------------------|---|--------------------------|------------------------------|
| Hand wash | X | X | X | X | X | X | X |
| Non-electrical washing machine | X | | | X | X | | |
| Electrical front load machine | X | X | | X | | | |

Note: Empty (or “greyed”) boxes correspond to the tests which did not make sense technically or in the context (e.g., using soap bar or saltwater with the electrical machine).

- 5) Carers were briefed both in groups and individually. To facilitate the understanding of the volunteers, the project team developed specific testing kits containing the materials needed to complete testing and detailed instructions in the local language (Bislama).
- 6) Complete “washability” and “useability” testing: Use and washing testing undertaken by volunteers for two weeks initially (extended to four). Carers were visited every 2 or 3 days by the research team to provide support and answer questions.
- 7) Evaluate “washability” and “useability”: At the end of the study period, feedback interviews were conducted with volunteers (in groups and individually) to evaluate washing performances and user preferences of the different components of the nappies. Feedback was sought on the following indicators:
 - Ease of use
 - Absorbency / Leakage
 - Baby comfort
 - Ease of wash
 - Ease of dry
 - Quality
 - Longevity
 - Availability
- 8) Additional “washability” indicators: Field technicians conducted E. coli swab testing and analysed visual (fabric staining) and odours (smells) on the microfiber and cotton inserts.

Limits of Research

Factors were encountered during the physical testing period that may limit research findings. The study technician team attempted to vary the methodology to ensure findings were reliable and consistent (i.e., to extend for two additional weeks to cater for testing inaccuracies).

Limits to the “washability” and “useability” testing

Limits to the analysis included:

- Some testers were reluctant to wash the diapers as requested – for example testers avoided performing tests they didn’t understand the purpose (i.e., wash without detergent or with salt water) – despite the engagement and induction provided by the research team
- Some dysfunctions amongst the community such as diapers being stolen or used for other purpose
- The number of products to be tested in “usability” test became problematic for some of the volunteers. Only “champion” testers provided insights in all the 26 products. The others tested fewer options (still testing 2 flats, 2 prefolds, 3 covers, 1 insert, 2 liners and 3 nappy fasteners).
- The planned individual interviews, discussing with volunteers separately their experience with the products according to set criteria, were not effective. The interviews generally ended up being a group conversation comparing products all together. This limited the technicity of the questions, with the researcher’s field technicians noting overall findings.

Testing for E. coli in Background Water Supplies

In the test community, groundwater is used by all households for bathing, cooking, and laundering. Drinking water came from water tanks. Water from the reticulated network is rarely used due to its cost.

Baseline testing for E.Coli was performed on seawater, groundwater, and tap water. These results show that the baseline groundwater contains a high level E.Coli (Table 5). A small pig paddock was next to the well.

It was therefore difficult for the study to draw a clear conclusion to the washing test results using groundwater and the presence of E. Coli. It can be noted that these tests should be considered as indicative due to the short period of the study; however, they align with results from existing monitoring performed (DoWR report).

Table 5 Baseline E. Coli levels in Seawater, Groundwater and Tap Water

| Location | Result | Standard | Comment |
|--------------------------|-------------|------------------------------|---|
| Bore water / Groundwater | 125 U/100mL | <1 U /100mL (drinking water) | Do not comply with WHO and Vanuatu standards for drinking water. |
| Sea water | 205 U/100mL | <500 U /100mL (marine water) | Categorised as “excellent quality” for EU guidelines for recreational water |
| Tap water | 0 U/100mL | <1 U /100mL (drinking water) | In accordance with WHO and Vanuatu standards for drinking water |

Research Findings

The results presented reflect findings from the literature review and Social and Technical Research. Discussion in this section is provided under five sections, answering Research Objectives:

- Explore current **practises** 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

Current Practices of Managing Baby Excreta in the Pacific

Before analysing current practices for managing baby excreta in the Pacific, it is important to first understand the local context and waste and water infrastructure available in typical Pacific communities. The availability (or their lack) of facilities such as waste services, water supply, and flushing toilets provides a background context for why communities may choose one option for diaper or nappy use or disposal over another.

Waste and Water Facilities

The availability of waste and water facilities in the case-study communities are illustrated in the following figures. The findings highlight a large disparity between the urban and rural communities, with most urban communities having access to authorised waste collection, reticulated town water supply, and flush toilets; and rural areas relying on other, informal, methods.

In rural areas, without authorised collection services, waste was found to generally be managed through burying (either in individual backyards or through a central dumpsite) or burning. A shared community tap was the common water service, with water collected from a natural waterway (river, creek, or spring), or rainwater tank also being utilised.

An individual pit latrine or ventilated pit was the common toilet facility available in rural areas. Twenty-one respondents indicated they had a flush toilet, suggesting that either those with rainwater tanks were able to plumb a flushable toilet and/or used water from wells and waterways to self-flush toilets, or some responses were uncomfortable to admit they did not have a flush toilet.

Over half, 61%, of households from both urban and rural settings stated they share a water source with other household(s) in their communities, either using a shared community tap or rainwater tank, or a natural water source (fresh or salt). Ten percent of households share a toilet facility.

Figure 1 Waste Management Practices in Case-Study Communities

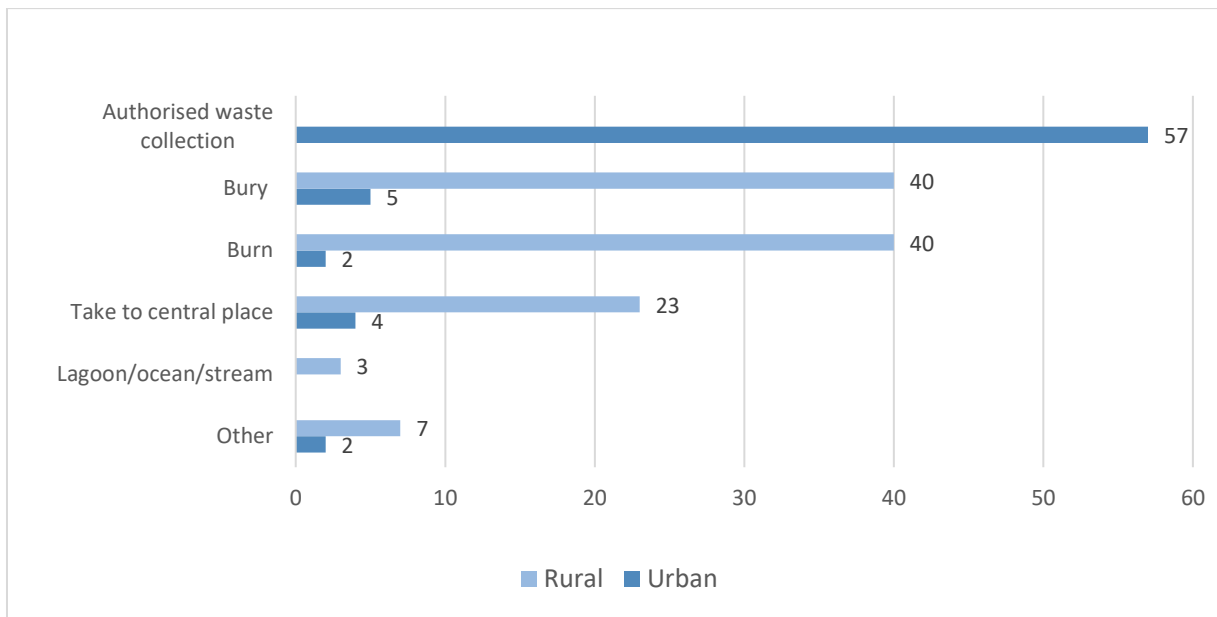


Figure 2 Water Services in Case-Study Communities

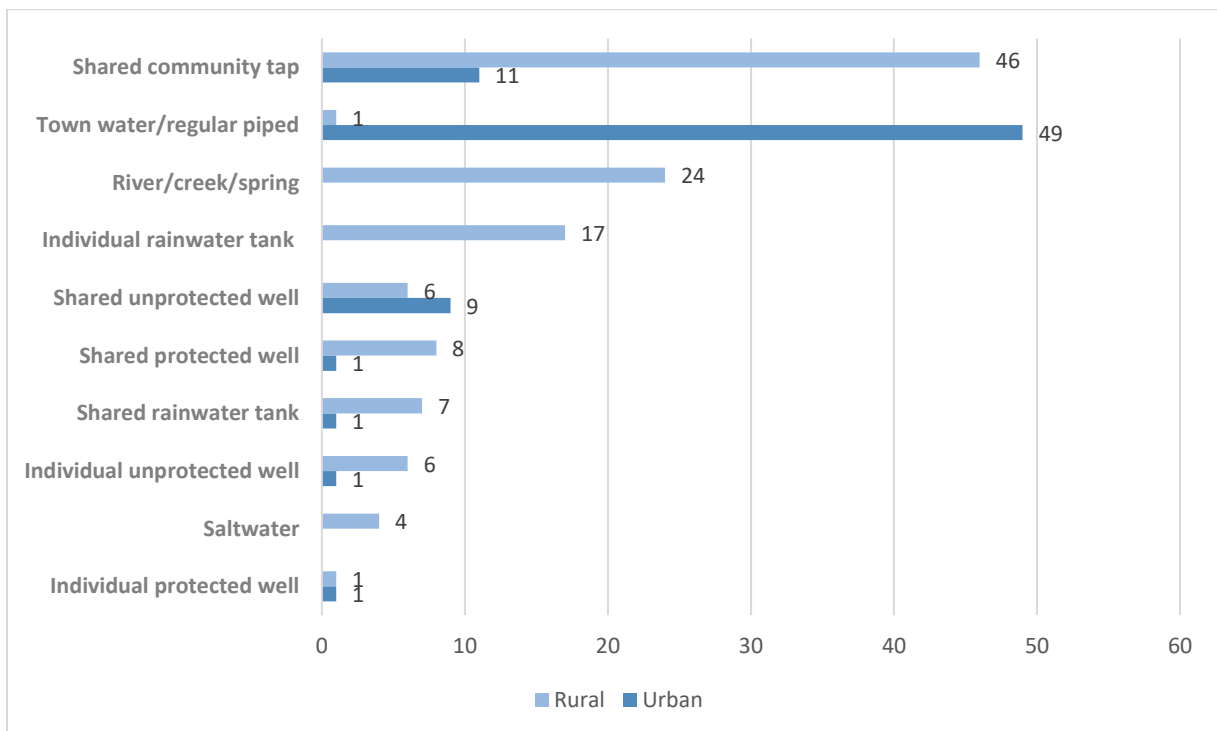
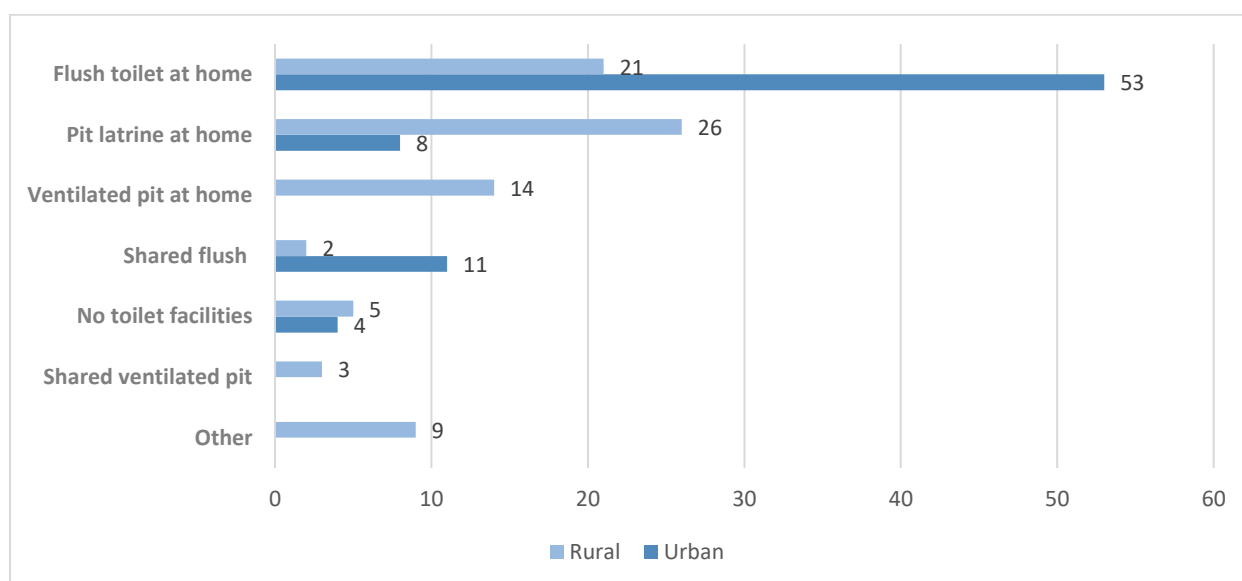


Figure 3 Toilet Facilities in Case-Study Communities



The lack of availability of water and toilet facilities represents a barrier for rural communities to adopt reusable nappies, and lack of waste collection a barrier for environmentally sound disposal of single-use disposable diapers.

Increasing waste and water infrastructure is an opportunity for governments to reduce the environmental effects associated with disposal of single-use disposable diapers.

Current Baby Excreta Management Practise

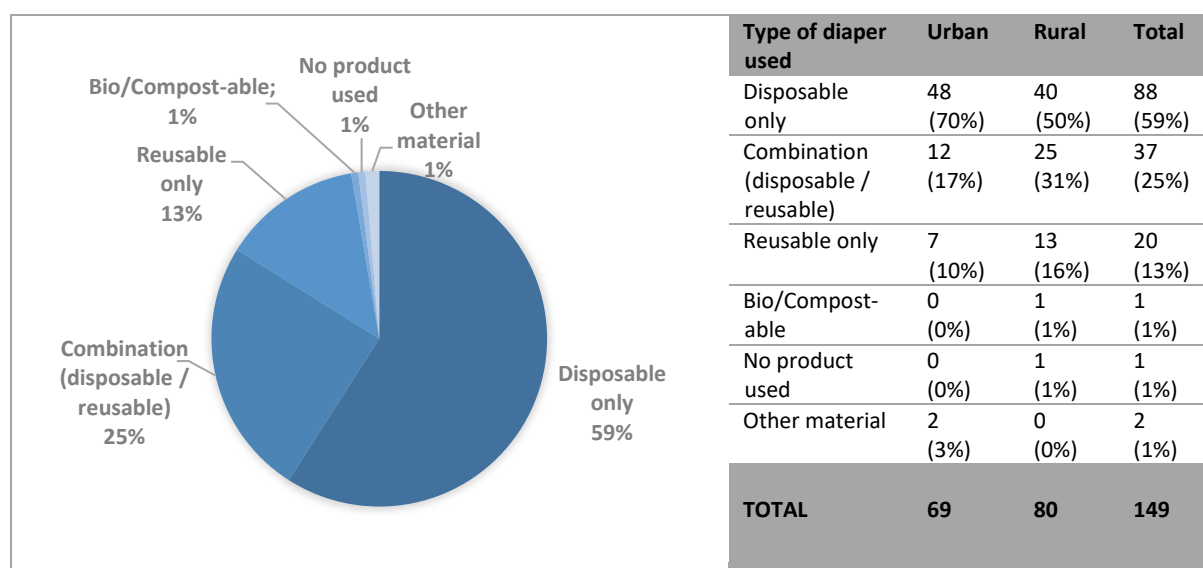
The vast majority, 84%, of families in the Pacific use single-use disposable diapers all (59%) or some (25%) of the time (i.e., reusable when at home during the day, and disposable at night or when out at events or at church) (Figure 4).

13% of respondents always use reusable nappies, with square cloth towelling the most common type used.

One percent of survey participants reported to using either eco-friendly / compostable diapers or no product. Two percent used another product such as “old shirts, lavalavas, towels, etc.”

The use of single-use disposable diapers is slightly more common in urban areas with 70% of families predominantly using single-use disposable diapers, while 50% of those in rural areas predominantly use single-use disposable diapers.

Figure 4 Products to Manage Baby Excreta



Survey participants indicate the average number of changes per day is 3-4 for single-use disposable diapers and up to 6 times per day for reusable nappies.

Why Choosing Management Practise; Perceptions

Single-use Disposal Diapers

Ease and convenience were the most common reasons why study participants chose to use single-use disposable diapers, listing “fast”, “less labour”, “no need for washing”, and “less time consuming” as common answers (Figure 5).

Survey respondents also indicate that they choose single-use disposable diapers as they are comfortable for baby, can be left on baby for longer, and are readily available.

Study participants reasons why study they chose to use single-use disposable diapers:

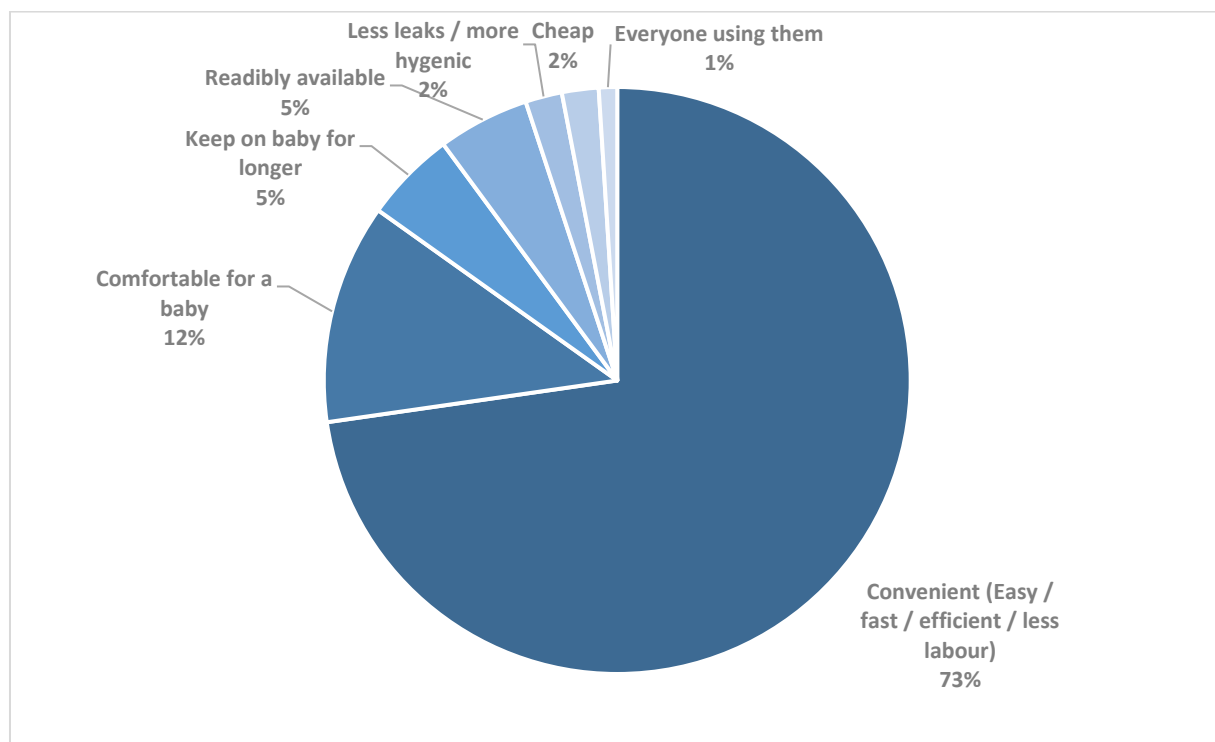


“Single-use disposable diapers are cheap, they are convenient, durable and they help mums who are trying to balance children, work and a household”

“Disposable diapers are convenient for us, because we don't have to spend much time washing, scrubbing and hanging, and waking up at night to change when they cry”

“A lot of mums are exhausted, sometimes taking care of more than one child at a time”

Figure 5 Why Using single-use disposable diapers



The perception that single-use disposable diapers stay dryer on a baby for longer is a common perception provided by survey participants



This is promoted heavily by brands and is reflected in the literature.

This practise may impact the health and development of babies – impacting their ability to balance and walk, may result in urinary tract infections and scrotum health impacts (Cole et al., 2012; Partsch et al., 2000)



“Disposable diapers can be left on the baby longer after being soaked”

“You don’t have to change baby until diaper is really heavy”

“Disposable diapers are very comfortable to babies and stay dry a very long time [less changes necessary]”

Survey respondents were asked to provide further details on their opinion of single-use disposable diaper. A common thread of these responses was income, as the affluence of a family is recognised by whether they use disposable diapers. Reusable nappies hanging on the line are seen as a sign of low income, of being from a less developed area/community, and being unable to afford to buy disposable diapers. If decision makers seek to develop infrastructure and promote the adoption of reusable nappies, this perception may be a large barrier to community behaviour change. Education and awareness campaigns are key to this behaviour shift.

Study participants opinion of single-use disposable diapers:



"With the use of diapers, they feel that the country has developed in a way that they jump from nappy cloth to disposable diapers."

"The more educated and employed households will go for disposable diapers rather than nappies"

"We always have this thinking that only the people in the rural communities have to use the cloth nappy, not the urban people. Some women might say 'oh we can work so we can afford disposable diapers, so why should we use the cloth nappy?'"

"Using reusable nappies is seen as a sign of poverty in Fiji's changing society"

Being "readily available" is another key finding of why respondents choose single-use disposable diapers. Market analysis was conducted in local shops which found single-use disposable diapers were indeed readily available, while reusable nappies generally had low stocks and often only the cheap brands with low quality standards available, particularly in rural areas. Table 6 presents a summary of the positives and negatives of single-use disposable diapers from the literature review and survey findings.

Table 6 of Positives and Negatives single-use disposable diapers

| | Positives | Negatives |
|---------------|--|---|
| Economic | <p>Low upfront cost (estimated in pacific = USD0.40 per diaper)</p> <p>Doesn't required water, soap, or energy to wash</p> <p>Allows parents (particularly mothers) to re-entre the workforce if she chooses as it is easier to share task of changing babies with family members and caregivers when using single-use disposable diaper over reusable nappies or natural infant hygiene.</p> | <p>Although the cost of diapers has a low upfront cost, costs can be out of reach for low-income households (over life of baby, households can spend USD500 on diapers (USD0.40 x 4,000))</p> <p>Inability to purchase diapers can result in parents' inability to attend work (other caregivers and day childcare centers may be reluctant to care for babies with reusable nappies).</p> |
| Social | <p>Convenience and ease of use, requires less labour</p> <p>Easier for parents to share task of changing babies with family members and caregivers</p> <p>High performance, comfortable for baby, stay dry and experience less leaks</p> <p>Low upfront cost allows different brand tests to suit baby</p> <p>Convenient to use during events and when travelling</p> <p>Commonly available in most stores</p> | <p>Possibility absorbability of diapers impeding baby development due to loss of sensation</p> <p>Chemicals used in single-use disposable diapers can cause diaper rash, skin irritation, UTIs and other illnesses</p> <p>Diapers not scraped of faeces are a source of live bacteria such as E. coli and other hazardous contaminants</p> <p>single-use disposable diapers in community bins can attract dogs who open bags and diapers and can cause a health risk</p> |
| Environmental | <p>Do not require water use and wastewater disposal</p> <p>Do not require energy to wash</p> <p>If disposed in an appropriate facility, provide convenient way to reduce exposure to baby excreta (source of bacteria)</p> | <p>Diapers in Pacific landfills average approximately 4% of total waste to landfill, diapers from one child can result in over 800kg of waste</p> <p>Diapers in landfill can contribute to leachate and methane emissions</p> <p>Manufacture of single-use disposable diapers uses resources, including energy and water, chemicals, and petrochemical-derived polymers</p> <p>Manufacture and use of single-use disposable diapers generates 2.3 times more wastewater than reusable nappies</p> <p>Single-use disposable diaper estimated to take 500 years to breakdown</p> <p>Single-use disposable diaper in community bins can attract dogs who open bags and diapers and can cause an environmental risk</p> |

Reusable Nappies

Of study participants currently using reusable nappies, the common reasons were because they are reusable (30%), can be used for multiple children (26%), and are cheaper in the long run (22%) (Figure 6). Fourteen percent of survey respondents highlighted the performance of reusable nappies (easy to use and better for babies) highlighting that not all families have the view that single-use disposable diapers are a better product. Four percent of respondents mentioned environmental benefits specifically, however the most common reply of “reusable” may also imply environmental as well as social (cost saving) benefits. Square cloth towels (or “flats”) is the most common type of reusable nappies used, made from microfiber and cotton - microfiber for its attractive cost, and cotton for its absorbance performance.

Study participants currently using reusable nappies said:

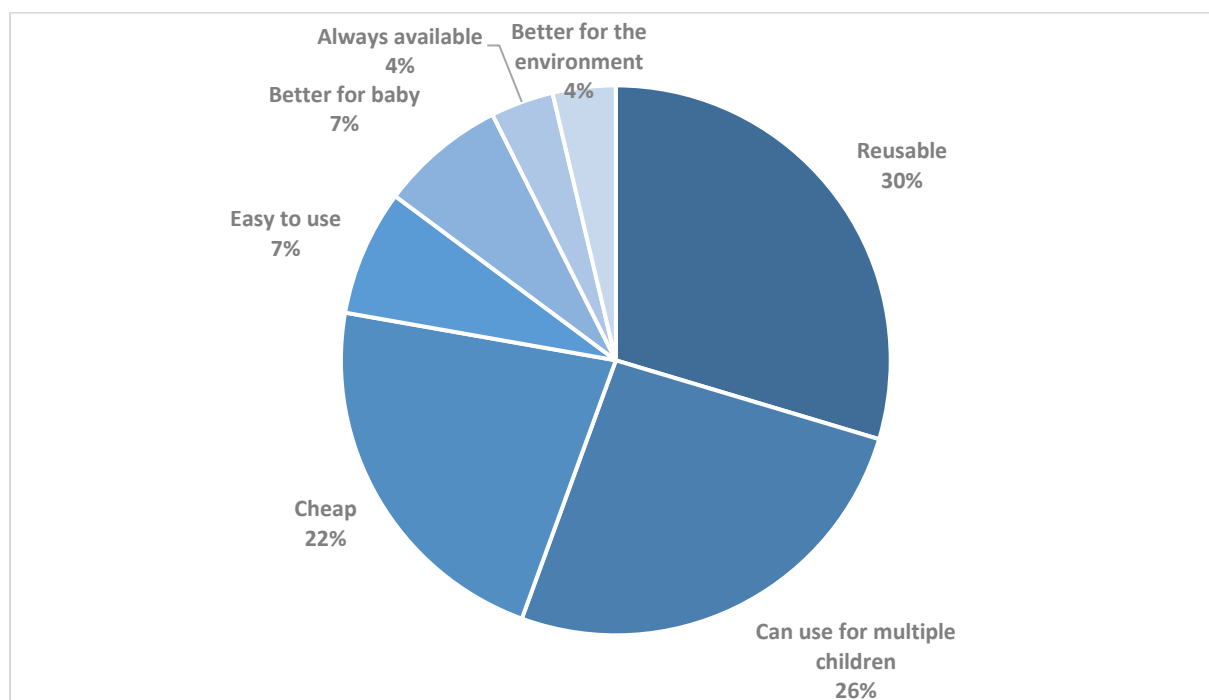


“Nappy I pay one time I use it for both kids, I don’t have enough money to continuously pay for diaper.”

“I can reuse nappy with my other kids or give it to other babies in the village to use”

“It’s the only way to help with our household budget”

Figure 6 Why Using Reusable Nappies



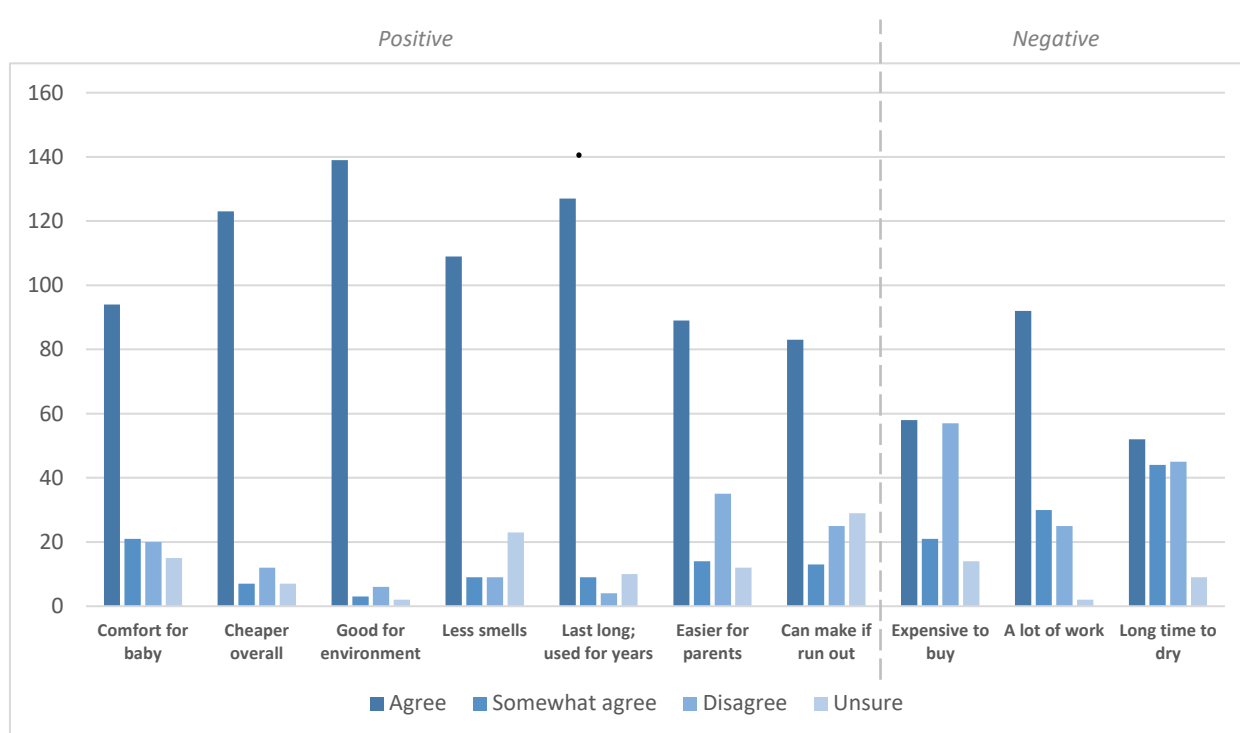
To understand perceptions surrounding reusable nappies, all participants, including those who used single-use disposable diapers, were asked to comment their level of agreement to several positive and negative sentiments found in the literature of reusable nappy use.

Figure 7 highlights the level of agreement to the different sentiments.

All participants responded to the questions relating to positives attributes of reusable nappies, reflecting the underlying assumption that parents are aware of their benefits. The strongest positive perception of reusable nappies was for the environmental benefit, followed by their ability to last for a long time, and that they were cheaper overall.

Fewer respondents provided an answer to the negative perceptions of reusable nappies, with the strongest response again illustrating the opinion that reusable nappies are a “lot of work”.

Figure 7 Perceptions of Reusable Nappies



A varying perspective of affordability of reusable nappies was highlighted through this study, with many participants (22%) seeing the economic benefits of reusable nappies (“cheaper in the long run”), while some participants highlighted expensive upfront costs as a barrier to their uptake. Reusable nappies currently available in stores were seen as expensive as there is a need to buy for two and three layers due to their low quality.

Modern cloth nappies were barely mentioned by study participants, likely due to their high upfront cost and lack of availability in case study countries.

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). This is a key finding to be considered by governments considering policy or legislative controls.

To minimise the economic impacts of policy or legislative controls, they may need to be combined with the establishment of services such as nappy washing service or assisting childcare providers to accept children using reusable nappies.

This research found a lack of education programmes on use nappies and diapers, with this topic seeming to fall between the cracks of several government departments and agencies:

- Department of Women's Affairs - *"it's not related to our work here"*
- Department of Environment / Waste - *"health and hygiene sectors need to channel this down"*
- Department of Environmental Health - *"promotion of reusable nappies by Governments is not a priority in the current programme"*
- Schools - *"We do not have any specific curriculum focused on baby waste and diapers"*
- NGOs - *"We cannot do any programmes on this because our knowledge is lacking on reusable nappies"*

As shown in Figure 7, the environmental and economic benefits of reusable nappies are known by households, however young parents may not choose reusable nappies because they are simply not aware of how to use them.

Households in the Pacific learn from the experience of peers and family. If peers and families are all using single-use disposable diapers, and there are no education programmes supplying additional education and information, it may be difficult for a young family to choose to adopt reusable nappies. Providing regular and consistent education and awareness materials provides an opportunity for governments to assist with adoption of reusable nappies.

Market analysis found a limited availability of quality reusable products in rural areas. Of the stock identified, often only the cheap brands with low quality standards were available. Holes and tears were found after a few washes of these locally available square towel products, negating the sustainability of reusable nappies.

Urban areas were found to have more options but also limited outreach and range to most communities. Accessories available to be used with reusable nappies; including, liners, fasteners, and covers were largely missing from local outlets.

Availability of reusable nappies in local stores is a key component for community adoption of reusable nappies. Liaison with and providing information to importers and retail outlets (particularly in rural areas) on preferred types of reusable nappies in the Pacific represent an opportunity for the adoption of these garments.

Table 7 presents a summary of the positives and negatives of reusable nappies from the literature review and survey findings.

Table 7 Positives and Negatives of Reusable Nappies

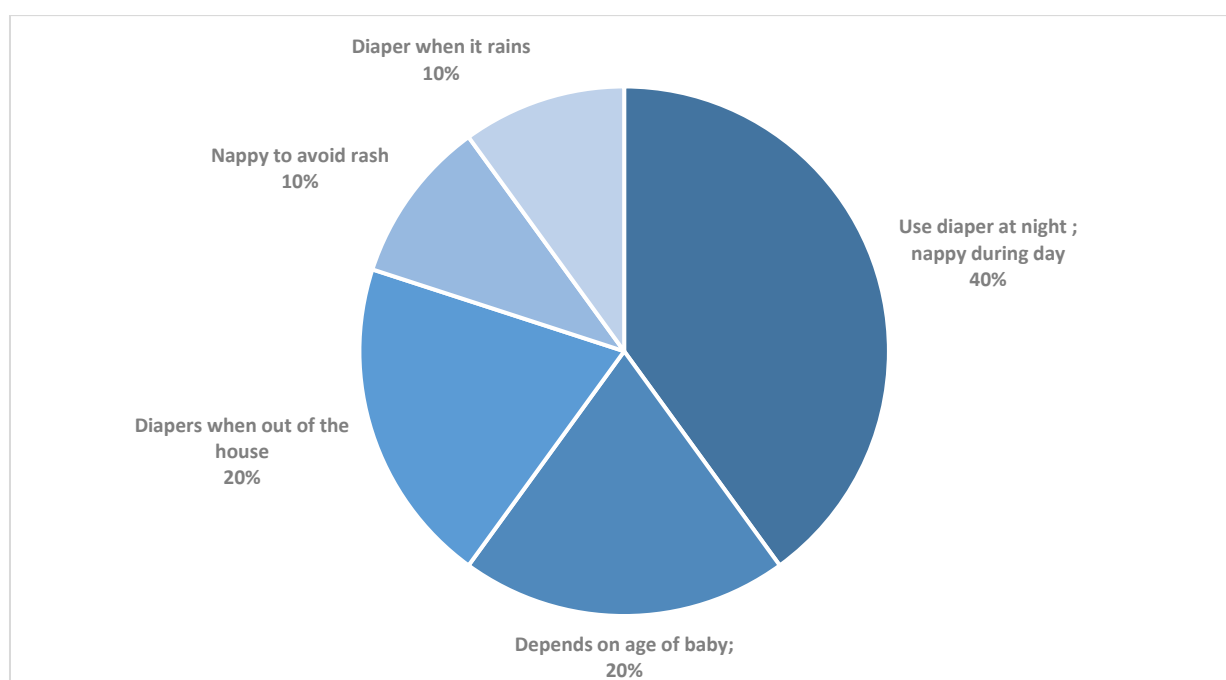
| | Positives | Negatives |
|----------------------|---|---|
| Economic | <p>Reduces ongoing cost of diaper purchases</p> <p>More cost effective in the long term than disposables – estimated savings in over 3 years = USD\$371 compared to disposables of USD\$1,752</p> <p>No need for regular income allocated to weekly purchase of disposable</p> | <p>Laundrying perceived as an arduous task which could take away from paid employment</p> <p>Upfront costs for purchase of 24 nappies</p> <p>Washing nappies may require purchase of water, electricity, detergent, etc</p> <p>Additional liners are an additional expense</p> <p>If household has no washing machine, manual washing can reduce productivity time</p> <p>Reusable nappies hanging on the line are seen as a sign of low income</p> |
| Social | <p>Can be shared and used with subsequent children [in the family and in the village]</p> <p>Can be healthier for babies and reduce nappy rash</p> <p>No need for regular purchasing of disposable and less risk of running out</p> <p>Considered to be more comfortable for small babies</p> | <p>Reusable nappies hanging on the line are seen as a sign of low income</p> <p>Laundrying perceived as an arduous task which could take away from other activities</p> <p>May require more frequent changes than single-use disposable diapers</p> <p>Childcare centres may refuse to use reusable nappies</p> <p>Family may not support use of reusable nappies</p> <p>Certain types of reusable nappies may take time to dry in humidity climates</p> <p>Concern for the baby's wellbeing (should pins and clips pop open)</p> <p>Parents not provided information on how to use</p> |
| Environmental | <p>Reduces waste to landfill – one child using reusable nappies can reduce over 800kg from landfill</p> <p>Nappies can be dried in the fresh air</p> <p>Reduced environmental impact in manufacture</p> <p>Washing in large batches (including laundry service) can reduce overall water, electricity and detergent consumption</p> | <p>Washing requires water and electricity</p> <p>Washing requires use of detergents that are released into wastewater (along with bacterial is excreta not disposed of in toilets or latrines)</p> <p>Incorrect wastewater management may be a source of live bacterial such as E.coli</p> |

Combination

25% percent of families involved this research use a combination of single-use disposable diapers and reusable nappies. Figure 8 illustrates the reasons these families choose to use both types of garments. The predominate responses are the use of single-use disposable diapers at night or when out of the house, and use of reusable nappies during day when at home. The second response was dependent on the age of the baby, with responses were mixed: some families stating they use reusable nappies for older children and disposable diapers for babies, and other stating that they used reusable nappies for babies and disposable diapers for older children.



Figure 8 Why Using Combination (Nappies and Diapers)



Understanding that a combination approach may be appropriate for households may provide an opportunity for Governments to achieve an increase in reusable nappies use.



"Reusable nappies are used when the child is born up to around three or five months old, then they switch to single-use disposable diapers."

"Cloth towelling is sometimes used for one week after birth because of tradition – it's custom to bring cloth nappies when the baby is born. It shows the baby is welcomed to the world"

"Nappy is expensive but use for long time, only when it rains and nappy not dry then I use diaper"

"Financial Problem so use nappy as can't afford diaper all the time"

Eco-friendly / Compostable Single-use Diapers

One percent of survey participants reported to using eco-friendly / compostable single-use diapers. This is an interesting finding considering one of the case-study countries, Kiribati, has recently introduced a policy introduction to ban the importation of 'non-biodegradable' diapers.

The finding indicates that either retailers in Kiribati are still selling non-biodegradable disposable diapers or that families are not aware of any compostability or biodegradability claims of the products they are purchasing. Thirteen percent of participants said they had had seen biodegradable diapers in their store (compared to global estimates of 3.5% (Volume 2)).

Through the market research component of this study, researchers examined the “compostability” claims of eco-friendly / compostable diapers currently on the market. The findings reveal a lack of regulation on claims of product compostability, allowing companies to make bold eco-friendly statements on their packaging without being required to provide any evidence to support the claims.

As highlighted previously, there are currently no known eco-friendly / compostable single-use diapers on the market able to claim 100% biodegradability or compostability. Eco-friendly / compostable diapers do not reduce volumes in landfills or degrade / compost automatically in the environment. Additionally, the presence of petrochemical based fasteners and absorbency materials make the products a contaminant rather than a benefit to any potential industrial composting, where such infrastructure is available.

Table 8 presents a matrix of findings for eco-friendly / compostable single-use diaper, listing brands, models and the main product details related to the self-declared eco-friendly claims. Key findings include:

- Claims are chosen for consumer appeal, to make them unique and different from the other brands. Some brands do not provide evidence of their claims.
- Most brands focus on eco-friendly claim with one aspect of their product rather than the product as a whole
- The compostability rate is usually not written on the packaging as it is often only between 50% to 90%
- Compostability rates are provided by some brands (e.g. *Ecoriginal* 90%, *g-Diapers* also called *Eenee* 100%) but they do not include Super Absorbent Polymer (SAP) (that are mostly non-compostable). SAP can comprise 30% of diaper weight.
- One brand (*g-Diapers* also called *Eenee*) has removed the elastic part that is usually non-compostable and replaced it with a reusable elastic belt in a unique design that offers reusability with convenience in a potentially compostable single-use diaper.

It is noted this research did not undertake any biodegradability testing and only summarises findings from the literature review and market research. It was, however, found studies are currently being undertaken globally, including in Tuvalu, exploring the characteristics and feasibility of eco-friendly / compostable diapers.

Decision makers in the Pacific are recommended to follow this research and consider required infrastructure (i.e., composting facilities with controlled high temperatures and microbial activity needed to provide for appropriate composting) prior to implementing policy which promotes the use of eco-friendly / compostable diapers. Table 9 presents a summary of the positives and negatives of eco-friendly / compostable diapers.

Table 8 Examining Claims of Eco-friendly / Compostable Single-use Diapers

| Brand | Claim | Compost-ability/ biodegrade-ability rate | Free from oil based plastics | PEFC ¹ or FSC ² wood pulp | Free from Heavy Metals | TCF ³ or ECF ⁴ | Free from Formaldeh yde | Free from Latex | Packaging Type | Unit Price USD (global) |
|------------------------------|----------------------------------|---|------------------------------------|--|------------------------------|---|-------------------------------|--------------------|--|-------------------------------|
| Honest | Biodegradable or eco-friendly | not stated | Y | | | Y | | Y | plastic | 0.34 |
| Tooshies by Tom | Biodegradable or eco-friendly | not stated | Y | | Y | | | Y | LDPE | 0.35 |
| Progeny | Biodegradable or eco-friendly | 80% | Y | Y | Y | Y | Y | Y | Oxo-degradable bags | 0.35 |
| DYPER | Biodegradable or eco-friendly | 61% | Y | | Y | Y | Y | Y | degradable bag | 0.36 |
| Little And Brave | Compostable | 100% (except SAP) | Y | Y | Y | Y | Y | | Plastic | 0.37 |
| Rascal and Friends | Biodegradable or eco-friendly | not stated | Y | | Y | Y | Y | Y | compostable | 0.37 |
| Mama Bamboo | Biodegradable or eco-friendly | 80% | Y | Y | | Y | | Y | compostable | 0.38 |
| Comfy Koalas | Biodegradable or eco-friendly | 67% | Y | Y | Y | Y | | Y | Plastic | 0.40 |
| Nest | Biodegradable or eco-friendly | 64% (10% of the SAP is from biomass) | Y | | | Y | | Y | paper & oriented polypropylene, recyclable | 0.40 |
| Noopii | Biodegradable or eco-friendly | 50% | Y | | | | Y | Y | renewable coated paper | 0.42 |
| Little Genie | Biodegradable or eco-friendly | 50 | Y | | | Y | Y | | plastic | 0.45 |
| Eco Boom | Biodegradable or eco-friendly | 61% Sunomito SAP | Y | Y | | Y | | Y | biodegradable plastic | 0.47 |
| Eco by Naty | Biodegradable or eco-friendly | 55% renewable materials ; not compostable | Y | Y | Y | Y | Y | Y | plant-based material | 0.47 |
| Eenee (Gdiapers Gnappies) | Compostable | 100% (except SAP) | Y | Y | Y | Y | Y | | LDPE | 0.47 |
| Pampers | Biodegradable or eco-friendly | not stated | Y | Y | | Y | | Y | plastic | 0.49 |

| Brand | Claim | Compost-ability/ biodegrade-ability rate | Free from oil based plastics | PEFC ¹ or FSC ² wood pulp | Free from Heavy Metals | TCF ³ or ECF ⁴ | Free from Formaldehyd e | Free from Latex | Packaging Type | Unit Price USD (global) |
|----------------|----------------------------------|--|------------------------------------|--|------------------------------|---|-------------------------------|--------------------|--|-------------------------------|
| Love and Green | Biodegradable or eco-friendly | not stated | Y | Y | Y | Y | Y | Y | Paper Packaging | 0.53 |
| Ecoriginal | Biodegradable or eco-friendly | 90 | Y | Y | Y | Y | Y | | Paper Packaging home compostable | 0.54 |
| Moltex | Biodegradable or eco-friendly | not stated | Y | Y | Y | Y | | Y | OK biobased® TUV (2 stars 40% to 60% biological carbon content) | 0.58 |
| Bambo Nature | Biodegradable or eco-friendly | not stated | Y | Y | Y | Y | Y | Y | LDPE | 0.58 |
| Joonya | Biodegradable or eco-friendly | not stated | Y | Y | Y | Y | Y | Y | bio based and PE | 0.58 |

Table 9 Positives and Negatives of Eco-friendly / Compostable Single-use Diapers

| | Positives | Negatives |
|----------------------|---|---|
| Economic | Costs may decrease as production is increased Governments may consider financial incentives to manufactures that produce products with less impact | Presently more expensive than single-use disposable diapers Investment in separate industrial composting facilities with controlled high temperatures and microbial activity needed to provide for appropriate composting |
| Social | Usually no petroleum, chlorine, etc. used during manufacture, reducing skin allergies Usually hypoallergenic and dermatologically safe | Limited access in developing countries (only few models available) Risk of green-washing marketing, which can have the consequence of minimising unfairly the perception of the performance of the diapers of the most advanced brands in eco-conception Incorrect disposal in community or household compost facilities may result in bacteria spread and health risks |
| Environmental | Could be recycled where scale and infrastructure are available Limited use of fossil fuel during manufacture Use more renewable materials compared to single-use disposable diapers | Limited evidence available of any bio-based polymer and has different properties from a diaper made from fossil fuels Specific conditions are needed to degrade, including microbial activity Need industrial composting to be truly compostable Still requires fossil fuels and water for manufacture |

Natural Infant Hygiene / Elimination Communication

One percent of survey participants reported to using no product to capture their babies' excreta. This practise is called Natural Infant Hygiene or Elimination Communication and encourages babies to 'eliminate' when in a set position. Parents become in tune with baby eliminations, saving time, energy, waste disposal, and nappy cleaning. Elimination communication can work where time and focused attention is available by parents, particularly in the first few months, but can be challenging to achieve if parents need to return to work. Although there are no upfront costs to adopt this option, one could argue there are costs of time away from work to build bonds with the baby to recognise baby rhythms and for the baby to learn the cues. Table 10 presents a summary of the positives and negatives of natural infant hygiene / elimination communication.

Table 10 Positives and Negatives of Natural Infant Hygiene / Elimination Communication

| | Positives | Negatives |
|----------------------|---|--|
| Economic | Nil direct costs | Time and focused attention needed, challenging if parents are always not present (if they return to work) |
| Social | Reduces urinary tract infections and skin and soft tissue infections Creates strong bonds between parents and baby Encourages earlier toilet independence | Can be challenging for family and friends to understand Childcare centres might not approve |
| Environmental | Avoids diapers altogether and eliminates diaper waste in landfills | Haphazard excreta disposal can result in bacteria and virus exposure Could increase diarrheal disease without active monitoring of excreta disposal locations |

What did you use in the Pacific before single-use disposable diapers or reusable nappies?



"Thin sheets of cloth known as "sulu l tavoi" or "Masi" our traditional cloth made from the bark of trees."

"Leaves (coconut tree leaves, te uri leaves, mao leaves)"

"Nakpon [a wild leaf] to cover our babies and to keep them warm, but they did not use anything as a nappy"

"Sand and then we cleaned them with water and soap"

"We didn't use nappies or diapers – nothing. The parents could tell if the baby is about to go"

Costs of Diapers in the Pacific

Table 11 provides the estimated costs of using reusable nappies and single-use disposable diapers in the Pacific per year and for three years (being the average length of time before potty training). This calculation was completed using findings from the market research and participant responses to average changes per day.

As shown, there is a significant cost advantage towards using reusable nappies (Cost for 3 years = USD169 or USD375 for reusable nappies; compared to USD1,752 for single-use disposable diapers); a saving of at least USD1,377. Considering the average GDP of Pacific Island Small States was USD4,268 in 2019 (World Bank 2021), a reduction of household expenses of USD1,377 over three years (and even of \$285 in the first year) represents a significant proportion of household expenses. Additionally, if the same set of reusable nappies purchased for one child can be used for subsequent children, the cost savings per households can be even greater.

Table 11 Cost Estimates Comparing Nappies and Diapers

| 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 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: <ul style="list-style-type: none"> Obtained from market analysis and supported by interview and focus group participants Informed from participant responses Cost for washing <ul style="list-style-type: none"> 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 | | | | | | | |

A reason provided by survey respondents for choosing single-use disposable diapers was they were cheap and easy to obtain, whilst reusable nappies have a high upfront cost. However, as shown in the above calculations, when averaged over the three-year period, reusable nappies may provide a significant economic advantage. This finding provides an opportunity for awareness messages associated with adoption of single-use disposable diapers to promote the potential economic advantages.

It is important to note the calculations presented in Table 11 contain the listed assumptions and variables and costs are to be used as a guide only.

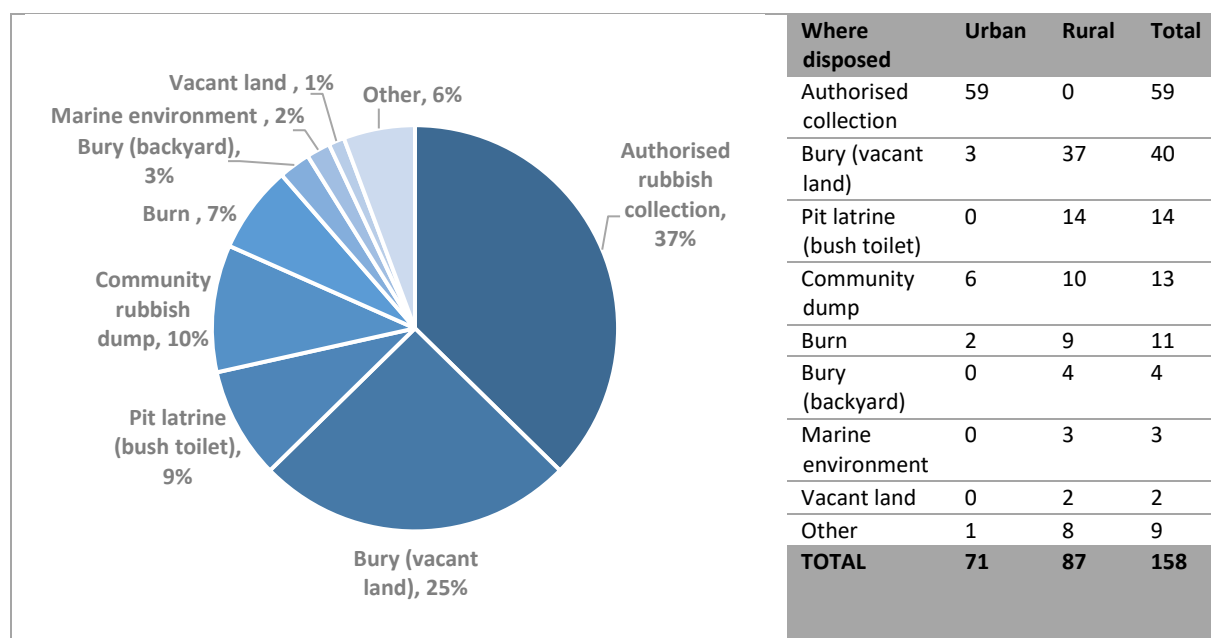
Additionally, while this cost savings is worthy to note, consideration also needs to be placed on the social and economic challenges that may be placed on families with the adoption of reusable nappies in the modern economy, and on access to facilities needed to effectively wash and manage reusable nappies. A mid-ground of using potential savings from not using single-use disposable diapers to establish services such as a nappy washing service could be investigated by Governments in collaboration with private sector and funding partners.

Current Disposal / Washing Practices

Single-Use Disposable Diapers

Of the families using single-use disposable diapers all or some of the time, Figure 9 illustrates current disposal practices used for their post-use management. The findings show predominant use of rubbish collection services in urban areas (which have a rubbish collection services), but burying diapers (either on vacant land, in pit latrines, or in a community dump) is the most reported practice (45%).

Figure 9: Disposal of single-use disposable diapers



An estimated 815,500,000 single-use disposable diapers are used and discarded by Pacific countries every year. Based on disposal method findings, this equates to 387 million single-use disposable diapers disposed in an authorised city or community landfills and dumps (47%), 371.5 million disposed to the environment (burying, dumping in waterways, or dumping on vacant land) (46%), and 57 million being burnt (7%).

Figure 10 Disposal of Diapers in Pacific

An estimated

815,500,000

single-use disposable diapers are used by families in the Pacific every year



57 million single use disposable diapers are **BURNT**



371.5 million single use disposable diapers end up in our **ENVIRONMENT**



387 million single use disposable diapers end up in managed **LANDFILLS & DUMPS**

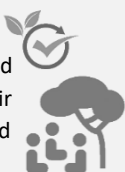


Community Initiative to Access Waste Collection



The Lelepa Island (Vanuatu) has no municipal or provincial waste collection

The community and council were worried about the effects of used diapers on their environment, so a system was developed to enable their collection and removal



Chiefs purchase rubbish bags wholesale and sell them to the community for at a slightly higher rate



The profit on each bag is used by the Council to pay for labour and boat transport across to the landing where a rubbish stand was constructed



A local truck from the neighbouring village of Tanoliu collects the rubbish, funded by the provincial government



Why Disposal Method Chosen

Many communities do not have waste collection services and, without any guidance on best options for post-use management of single-use disposable diapers, have little choice but to manage the waste in whatever way they have available. The use of pits in communities is common to avoid access to used single-use disposable diapers by dogs – stray or otherwise – that tear open bags and diapers causing environmental and health concerns for residents. In rural Vanuatu, participants explained used single-use disposable diapers are often stored on the roofs of homes to keep them away from dogs. It is unclear if these families also catch rainwater from these same roofs. Burning was also seen as an option to dispose of the diapers to reduce their environmental effect.

Community Rules

Almost two-thirds of questionnaire participants (73%) indicated their community had community ‘rules’ or practices regarding the discard of single-use disposable diapers. Community Rules included factors such as:

- Keep environment clean
- Put the single-use disposable diapers in the garbage collection bags (where collection existed)
- Bury used single-use disposable diapers
- Dig and use a separate single-use disposable diapers pit
- Burn every day to avoid the smell of the diapers
- Throw the diaper in the toilet (pit toilet)
- Wash away the inside of the diaper in the sea, then dry the outside and burn

The rules illustrate that without guidance on appropriate options for management of the diapers, communities will have little choice but to manage single-use disposable diapers in whatever way they know and have available in their communities. The rules are generally aligned with the common disposal practices identified in the previous section, demonstrating that households follow community rules. The representation of these rules and waste disposal methods identified are a signal to the government of the types of educational campaigns and infrastructure needed to improve single-use diaper disposal practices. They also demonstrate that community leaders are an effective median for communicating messages to their communities.

What community ‘rules’ or practices regarding the discard of single-use disposable diapers are practiced?



“We have a father in our community who decided to dig a 12-foot pit just for single-use disposable diapers in the community”

“My family usually burns the single-use disposable diapers and when it's been raining for some days, they usually bury the diapers in the ground”

“Throw them on the beach to make it as our seawall”

“Those in rural areas throw the single-use disposable diapers into the bush toilets. These fill up very quickly; so many just drop them anywhere”

“Every household must burn their used diaper in a small amount because it cannot affect our environment if they burn in a small amount”

46% of participants indicated they dispose of single-use disposable diapers to the environment; however, most were aware of the environmental issues that single-use disposable diapers left in the community may bring.

In the questionnaire, over 90% of participants had an issue with seeing used disposable diapers dumped on the beach or in the community and were concerned about the potential health and environmental impacts.

"Single-use disposable diapers in the environment disgusts people who are going to get their food at the sea"

"Diapers can be seen on the beach during high tide or low tide; whenever there is rain, we see diapers floating downstream"

"If dogs have torn open the trash bags at the collection point, parents don't care because they have already done their part by putting their trash bags at a collection point"

"I burn or bury the diapers because I cannot afford to take rubbish to be collected by the municipal truck"

"Yes, I think it really does have negative impacts on the environment. It causes sickness as it is unhygienic if they are not kept properly"

"In some villages in coastal areas, most of the time you can just see that it's floating; it's just thrown around"

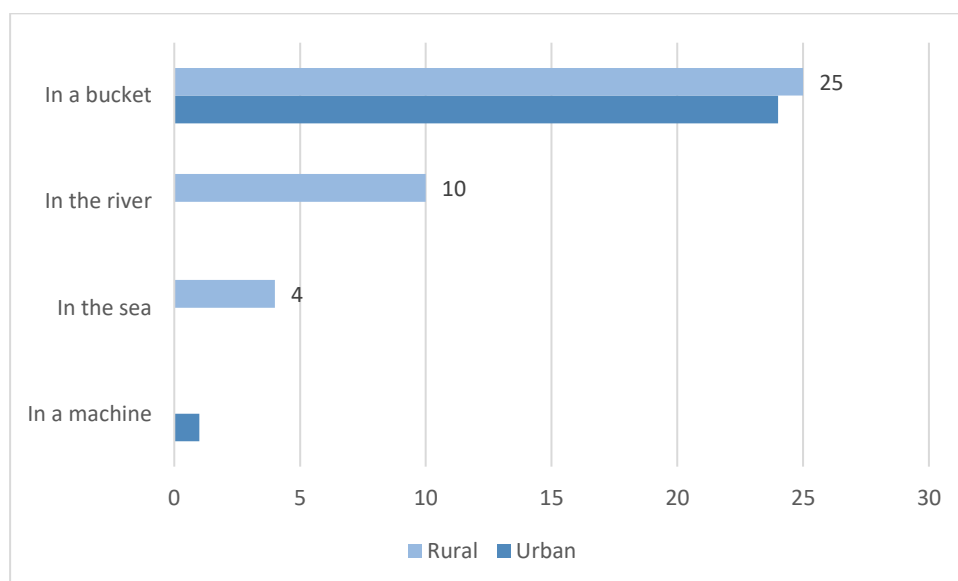


The lack of awareness of locally appropriate options for post-use management of diapers, specific to the context and service/facility availability, is a barrier for communities to implement sound management of single-use disposable diapers. The research identified a need for education and awareness for decision makers to understand and communicate appropriate practise disposal methods to households and communities.

Washing Reusable Nappies

Of the families using reusable nappy all or some of the time, [Figure 11](#) illustrates current washing techniques. The findings show a use of bucket is the most common washing method in both rural and urban areas. Washing in natural waterways (river or sea) was also a common practise in rural areas. Few of the survey participants have access to a washing machine.

Figure 11 Where do you Wash Reusable Nappies



It was not clear from the survey how respondents disposed of the wastewater however it is likely there are few options for designated soak-away systems away from ground water sources and gardens.



"Nappies are washed, and the dirty water is just poured onto the garden/grass. The mothers and house-girls are not aware that this is unhygienic. The flies will sit on it and then go sit on their food. That's how diarrhoea happens and spreads."

"People don't link diarrhoea to sanitation of water or leaving food uncovered. They might think it's something they have eaten, but they don't think that poop or poopy wastewater could be the problem"

"There is a lack of understanding of how disease spreads"

As with the lack of awareness of locally appropriate options being a barrier for sound environmental management of single-use disposable diapers, the same lack of awareness applies as a barrier to communities implementing sound disposal of reusable nappy wastewater, further identifying a need for a targeted education and awareness programme on locally appropriate options for diaper and nappy management appropriate to the context and service/facility availability.

Technical Assessment – Reusable Nappies and Eco / Compostable Diapers

Performance of Reusable Nappies in the Pacific

The two technical assessments explored the “useability” and “washability” of reusable nappies in the Pacific Island context. The findings are presented in Table 12 to Table 15.

Usability Test Results

The first tables present findings from the usability test. Table 12 provides a summary of the performance of absorbent materials (i.e., flats, pre-folds, inserts, all-in-ones, and all-in twos) and Table 13 provides a summary of the usability of “accessories” available to be used with reusable nappies; including, liners, fasteners, and covers.

Feedback from study participants in this analysis were recorded against the seven performance criteria (price, ease of use, absorbency / leakage, baby comfort, ease of wash, ease of dry, quality / longevity and availability). Colour coding based on survey responses were provided against a low (1), medium (2), and high (3) ranking for each criterion.

Table 14 provides a summary from literature of the general characteristics of fabrics used in reusable nappies.

Overall results from the useability study found:

- Quality products were important in providing survey participants a good experience – for example, the cheaper products did not have the same absorption capacity or quality components (covers, fasteners)
- Participants liked microfiber inserts (even if they had to be doubled), due to washing and drying performance. These are readily available in local stores for USD0.83.
- Covers were found to be usually easy to wash and dry by participants. The preferred cover available in Vanuatu (double elastic gusset with snap buttons; 100% polyester) is sold for USD4.93
- Flats (also called traditional square towels) were reported to have good washing and drying properties. These square towels are widely used and the folding methods are known by every carer
- Liners were loved by every tester. This product is not commonly found in shops and was not familiar to survey participants, however it was found to make washing the nappies much easier and more efficient
- The research highlighted some discoloration and shrinking of some absorbent layers in cotton and bamboo core
- Other manufacturing detail highlighted as positive by survey respondents included:
 - snap buttons preferred to hook and loop
 - models with a double elastic gusset on the legs helped decrease leakage
 - adjustable covers were preferred

The useability test highlighted two key misconceptions regarding reusable nappies.

- Throughout the study reusable nappies were described as “a lot of work” and having a low performance (“more leaks”). However, this use test has highlighted that reusable nappy were generally found to be easy to wash and the level of absorbency / leakage, except for the cheapest products, was generally good.
- The socio-economic study highlighted a tendency for households in the case-study areas to use (either through choice or due to lack of availability) the cheapest reusable nappies models, which have low quality standards. Through the technical study, these low-quality products were found to generate dissatisfaction and would negate environmental benefits and require ongoing spending (to replace worn out nappies). The research found that when provided with a variety of options and choices, testers valued the quality of the components. Better quality was also seen to reduce nappy rashes and discomfort for babies.

Therefore, through the promotion of these results, and promoting/controlling the quality of products imported and available to communities, there may be an opportunity for governments to increase adoption of reusable nappies.

Quality products did not necessarily mean the most expensive products, the physical testing found that there were some good and cheap products available on the Vanuatu market. A promotion and awareness campaign explaining the long run benefits of good quality reusable nappies could assist with their promotion.

Washability Test Results




Table 15 presents findings from the washability test, summarising the washing performance of square microfiber and cotton towels (or “flats”) chosen to represent the washability test as they are the most common types used in the Pacific (microfiber for their attractive cost and cotton for their absorbance performance across).


There are few clear conclusions from the testing with no material or washing technique being a clear favourite.

General findings include:

- Slightly higher performance of the cotton material across washing technique, experiencing less staining and odour across
- The washing technique of cold water without any soap or detergent, unsurprisingly, resulted in worse performance (more staining and odour)
- The handwashing technique performed as well or better than the machine-washing techniques
- Saltwater washing performed just as well as fresh water washing
- Inconsistent E. coli findings likely illustrate both the presence of E. Coli in the baseline water and that the weather during the four weeks of tests was mostly sunny so drying nappies in the sun can contribute to killing E. coli. Further studies of E. coli in a controlled situation are recommended if further conclusions are required.

Table 12 Results from Usability Testing – Absorbent Material

| Part | Composition | Unit Price USD | Ease of use | Absorbency / Leakage | Baby comfort | Ease of wash | Ease of dry | Quality / Longevity | Availability | General comments |
|--------|--|----------------|-------------|----------------------|--------------|--------------|-------------|---------------------|--------------|---|
| Flat 1 |  100% brushed cotton flannelette 70 cm x 70 cm soft, thick cotton | 5.51 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | Testers liked the shape - available in the local stores and testers are familiar with it and the folding methods. Flat 2 had limited performance: has to be doubled to avoid leakages. some testers as they reported being frustrated about the poor quality with some holes and tears occurring Flats 1 and 3 more expensive and only available in pharmacies, but preferred, particularly flat 1 that is less thick. Were reported by a few testers to show a higher “wet” feeling The testers considered the flats to be easy to maintain, easy to wash and easy to dry (except the flat 3 that takes longer time to dry). The versatility of this product is also a main advantage |
| |  100% cotton 60 cm x 60 cm light terry | 0.60 | 3 | 1 | 2 | 3 | 3 | 1 | 3 | |
| Flat 2 |  100% cotton 60 cm x 60 cm light terry | | | | | | | | | |
| Flat 3 |  100% cotton 60 cm x 60 cm thick terry | 5.58 | 3 | 3 | 1 | 3 | 2 | 3 | 2 | |
| |  100% cotton 60 cm x 60 cm thick terry | | | | | | | | | |

| Part | | Composition | Unit Price USD | Ease of use | Absorbency / Leakage | Baby comfort | Ease of wash | Ease of dry | Quality / Longevity | Availability | General comments |
|-----------|---|---|----------------|-------------|----------------------|--------------|--------------|-------------|---------------------|--------------|---|
| Prefold 1 |  | 100% cotton multilayers in the middle To be fold in 3 | 9.95 | 3 | 2 | | 3 | 1 | 3 | 2 | Prefolds are widely appreciated because their use is quite instinctive. However, some parents did not fold in the right direction which made absorption less efficient. |
| |  | outer cotton layer and bamboo core multilayers in the middle To be fold in 3 | 5.39 | 3 | 2 | | 3 | 1 | 1 | 2 | The maintenance was found to be easy but the drying time was long (needed wind and sun). Shrinkage and stains appeared on the prefold 2 after a few washings. |
| insert 1 |  | outer : 100% polyester inner : 66% Polyester/Polyamide, 34% Polyester just need 1 | 8.96 | 3 | 3 | 3 | 3 | 2 | 3 | 1 | Inserts globally preferred The absorption was found to be good Drying time was mainly good with wind and sun but longer without the appropriate weather conditions. Insert 1 was liked well by testers but is no longer commercially available |
| |  | microfiber 88% Polyester 12% Polyamide need to be doubled | 0.90 | 3 | 2 | 3 | 3 | 2 | 3 | 2 | Insert 2 was usually doubled to avoid leakage. One advantage insert was that it could be mixed with the flat or prefold, allowing an increased absorption. |
| |  | Polyester / Polyamide 29cm X 31cm to be fold in 3 | 7.62 | 3 | 3 | 1 | 3 | 1 | 3 | 2 | Insert 3 was considered too thick especially for young babies. It was easy to put it on and remove it, especially with the pocket cover. |














| Part | Composition | Unit Price USD | Ease of use | Absorbency / Leakage | Baby comfort | Ease of wash | Ease of dry | Quality / Longevity | Availability | General comments |
|--------------------|---|------------------|-------------|----------------------|--------------|--------------|-------------|---------------------|--------------|--|
| All-in-Two (AIO) 2 |  PUL Nappy Shell, Minky fabric insert : 70% Viscose from Bamboo 30% Organic cotton top dry-in layer : 100% Polyester adjustable size | 5.50 2nd hand | 3 | 3 | 3 | 3 | 1 | 3 | 1 | <p>widely appreciated because it is a very easy to understand product, it has colour snaps so it is very easy to prepare.</p> <p>As the inserts are removable, they are easy to wash.</p> <p>The drying time was long and required wind and sun.</p> |
| |  outer : 100% polyester (PLU coating) core : 85% Polyester / 15% Polyamide inner : 100 % Polyester adjustable size | 35.02 | 3 | 3 | 2 | 3 | 1 | 3 | 1 | The AIO 1 was considered too thick for small babies but convenient because there was one model to wash. It took a lot of time to dry. |
| |  inner and outer : 100% polyester tabs: 95% polyester 5% elastane soaker: 80% polyester 20% polyamide adjustable size | 5.50 2nd hand | 3 | 3 | 3 | 3 | 1 | 2 | 1 | The leg elastics of the AIO 2 (2nd hand) were not efficient anymore, many leakages happened |

Table 13 Results from Usability Testing – Accessories

| | Part | Photo | Composition | Unit Price USD | Ease of Use | Comment |
|-----------|------------------|---|------------------------------|----------------|-------------|---|
| Liners | Liner 1 |  | viscose of bamboo disposable | 0.13 | 3 | Liners were loved by every tester. Even though they were not familiar with the product, they understood very quickly the advantage of using it. The disposable liner was preferred for its ease of disposal - directly in the toilets or in the rubbish. The reusable liner was preferred for ecological reasons. The reusable liner dries very quickly and is sometimes used as a wipe. Using a liner makes it much easier and more efficient to clean a nappy. Cheap option not yet available in all Pacific countries; but it possible it can be imported. Some testers found it convenient to use a liner at night. |
| | Liner 2 |  | 100% cotton reusable | 2.25 | 3 | |
| Fasteners | Nappy fastener 1 |  | plastic | 0.18 | 2 | The metal pins were not liked because of the risk of hurting the baby. The nappy fastener 3 was preferred for its capacity to hold strongly the folded fabric, the nappy fastener 1 fixed less well. Observations showed that the nappy fastener 3 was of better quality in the choice of plastics and was as a result the more expensive option. |
| | Nappy fastener 2 |  | metal pins | 0.24 | 1 | |

| Part | Photo | Composition | Unit Price USD | Ease of Use | Comment |
|------------------|---|---|----------------|-------------|---|
| Nappy fastener 3 |  | plastic more expensive brand | 0.90 | 3 | |
| Cover 1 |  | 100% Polyester PLU Double elastic gusset on the legs 1 size only | 19.76 | 3 | <p>The three main differences between all the covers that have been tested are their sizing (adjustable vs unique size), making up (simple or double elastic gusset on the legs), pocket or not.</p> <p>The main comments are as follows:</p> <p>Testers did not like the hook and loop as it does not last long and did not fit properly over time. They preferred the snap button.</p> <p>Testers preferred models with a double elastic gusset on the legs.</p> <p>The covers were found to be usually easy to wash and dry. The minky fabric of the pocket cover 1 was however longer to dry. The cotton fabric inside the cover 2 also took longer to dry.</p> <p>The testers preferred the adjustable covers. This could imply savings, as they don't have to buy new covers while their baby is growing.</p> <p>Some of the pocket covers had a fleecier polyester fabric inside (pocket cover 1 and 3), which the testers liked as they felt that it helped increase the global absorbency and reduce the leakage.</p> <p>The cover 5 which is not adjustable and has plastic lining was mainly criticized for its low quality and performances. This model can only be used to cover some flats that have been folded and fixed with fasteners. Furthermore, as this model contains PVC</p> <p>Some snaps of the pocket cover 2 broke. The general quality seemed poor which may lead to a short period of use.</p> <p>Pocket cover 2 and insert 2 needed to be washed several times to improve the speed of absorbency.</p> |
| Cover 2 |  | outside 100% Polyester PLU inside: 100% cotton Double elastic gusset on the legs 1 size only | 11.20 | 2 | |
| Cover 3 |  | Simple elastic gusset on the legs 100% Polyester PLU adjustable size | 2.24 | 3 | |
| Cover 4 |  | Double elastic gusset on the legs 100% Polyester PLU adjustable size | 4.93 | 3 | |
| Cover 5 |  | outer 100% Polyester inner lining: 100% PVC Simple elastic gusset on the legs 1 size only | 0.90 | 1 | |




| Part | Photo | Composition | Unit Price USD | Ease of Use | Comment |
|----------------|---|--|----------------|-------------|---------|
| Pocket Cover 1 |  | 100% Polyester (with PLU coating), Minky fabric Double elastic gusset on the legs adjustable size | 15.2 | 2 | |
| Pocket Cover 2 |  | 100% Polyester (with PLU coating) Simple elastic gusset on the legs adjustable size | 3.60 | 1 | |
| Pocket Cover 3 |  | 100% Polyester with bamboo charcoal granule (with PLU coating) Simple elastic gusset on the legs adjustable size | 5.80 | 3 | |

Table 14 Characteristics of Fabrics used in Reusable Nappies (from Literature)

| Fabric | Cost* | Biodegradability | Absorbency speed | Absorption Capacity | Leakage | Drying | Appearance, touch & use |
|------------------------|-----------|---------------------------------------|------------------|---------------------|--------------------|--------|---|
| Cotton | \$1 - \$3 | Yes | Fast | Moderate to High | Low | Quick | Soft, comfortable, durable, safe against baby's skin |
| Organic cotton | \$>\$3 | Yes | Fast | Moderate to High | Low | Quick | Soft, comfortable, durable, safe against baby's skin |
| Microfiber | <\$1 | No, generates plastic micro-particles | Very Fast | Moderate | High if compressed | Quick | Soft, can wear out, can be irritating, not recommended for use directly against baby's skin |
| Bamboo | >\$3 | Yes | Moderate | High | Moderate | Long | Soft and strong, Safe against baby's skin |
| Charcoal Bamboo | \$1 - \$3 | No, generates plastic micro-particles | Very Fast | Moderate | High if compressed | Long | Soft, can wear out over time, safe against baby's skin |
| Hemp | >\$3 | Yes | Slow | Very High | Low | Long | Thick and stiff, durable, safe against baby's skin |

Table 15 Results from Washability Testing

| Fresh Water | Nappy type | Cold water with powder detergent | | | Hot water with powdered detergent | | | Cold water with bar soap | | | Cold water without detergent | | |
|---|------------|------------------------------------|--------|--------|--------------------------------------|--------|--------|--------------------------|-------|--------|------------------------------|--------|--------|
| | | E.coli* | Odour | Visual | E.coli* | Odour | Visual | E.coli* | Odour | Visual | E.coli* | Odour | Visual |
| Hand wash | Microfiber | 6 | Slight | Slight | 1 | None | None | 0 | None | Slight | 0 | None | slight |
| | Cotton | 4** | None | None | 0 | None | None | 0 | None | None | 4 | None | Slight |
| Non- electric machine | Microfiber | 0 | None | None | | | | | | | 19 | Slight | Slight |
| | Cotton | 0 | None | None | | | | | | | 0 | None | Slight |
| Electric machine | Microfiber | 2 | Slight | None | 1 | Slight | None | | | | 0 | Slight | Slight |
| | Cotton | 1 | None | Slight | 1 | None | None | | | | 0 | None | Slight |
| Salt Water | Nappy type | Salt water with powdered detergent | | | No hot water testing with salt water | | | Salt water with bar soap | | | Salt water without detergent | | |
| | | E.coli* | Odour | Visual | | | | E.coli* | Odour | Visual | E.coli* | Odour | Visual |
| Hand wash | Microfiber | 0 | None | Slight | | | | 0 | None | None | 0 | None | Slight |
| | Cotton | 0 | None | None | | | | 0 | None | None | 12 | None | None |
| Non- electric machine | Microfiber | 0 | Smell | Stain | | | | | | | | | |
| | Cotton | 0 | Slight | Stain | | | | | | | | | |
| Electric machine | Microfiber | | | | | | | | | | | | |
| | Cotton | | | | | | | | | | | | |
| * Difficult to draw a clear conclusion to the washing test results as the presence of E. Coli in the groundwater used for washing | | | | | | | | | | | | | |
| ** Extremely high level of E. Coli found after the washing cold water with powder detergent, findings from handwashing with cold water without powder detergent used as proxy | | | | | | | | | | | | | |

Discussion

Barriers for Management of Disposable Diapers and Adoption of Alternatives

Several barriers for the management of disposable diapers and adoption of alternatives to the use of single-use disposable diapers were identified throughout the socio-economic and technical studies. These barriers include technical factors, socio-economic factors, public perception, and market / availability factors. Discussion on each barrier, along with their potential impacts and opportunities are discussed in Table 16 and Table 17.



Table 16 Barriers for Management / Disposal of Single-use Disposable Diapers

| Barrier | Finding | Impacts | Opportunity |
|--|---|--|---|
| Technical barrier Lack of infrastructure for appropriate management of used single-use disposable diapers | 31% of households have an authorised waste collection service 47% of households have access to an authorised community landfill or dump | Incorrect disposal of single-use disposable diapers may result in health and environmental effects from burning and disposal on land and in waterways, and effects from dogs spreading bacteria in communities | Increased access to waste collection services Increased facilities to provide for management of single-use disposable diapers (dog proof bins etc) |
| Socio-economic barrier Lack of information about appropriate management of single-use disposable diapers | Community “rules” do not always promote best practice for single-use disposable diaper management (burying, burning, wash diapers in ocean) | | Education for households on appropriate management of single-use disposable diapers |

Table 17 Barriers for Adoption of Alternatives to Single-use Disposable Diapers

| Barrier | Finding | Impacts | Opportunity |
|---|--|--|--|
| Technical barriers | | | |
| Lack of infrastructure for reusable nappy management, such as water availability for washing | 61% of households share a water source with other household(s) 47% of households have access to an individual flush toilet; 10% of households share a toilet facility Common sites for washing reusable nappies are buckets, using sea water, groundwater, and tank water. There are no known designated soak-away systems for nappy wastewater in communities. High levels of E. coli were found in background water | Sufficient clean water supply is required in communities if reusable nappies are promoted to be widely adopted If shared facilities are used and no appropriate management of nappy wastewater is implemented, risk of E. coli infection and other health effects E. coli remaining on nappies can increase risk of irritation or illness for babies urinary tract infections. Drying of nappies in the sun, however, can kill remaining E. coli | Governments or donor investment in increasing water supply for communities, increased toilet facilities, and designated areas for wastewater disposal to contain excreta from reusable nappies. Regular water quality testing advised in designated wastewater / soak-away systems to identify any outbreaks and reduce risk of illness. Education for households on appropriate washing techniques for reusable nappies and wastewater disposal |
| Perception that reusable nappies are difficult to use in the Pacific climate and have low performance / low absorbency | 73% of households use single-use disposable diapers as they are easy and convenient; and 12% because they are comfortable for baby, can stay on for longer, and do not leak Being “a lot of work” and taking a “long time to dry” are the common perceptions against using reusable nappies. | Current perception could hinder the increased uptake of reusable nappies | Work with community leaders and champions to develop locally appropriate educational materials on why to use/how to use reusable nappies effectively Promotional campaigns to increase awareness of the benefits of reusable nappies Advertising that using a combination approach (reusable nappies and disposable diapers) may be an achievable option for families |

| Barrier | Finding | Impacts | Opportunity |
|--|--|--|--|
| | The technical assessment found reusable nappies were in fact easy to wash and the level of absorbency / leakage, except for the cheapest products, was generally good | | <p>Adopting quality import standards to ensure available reusable nappies are of good quality, increasing user experience and increasing their life</p> <p>Governments or donor investment for Pacific based businesses to develop modern cloth nappies, to increase reusable nappy quality and availability</p> |
| Overstated eco-friendly / composability claims for eco-friendly / compostable diapers | <p>No 100% compostable diapers were found to be available for Pacific countries</p> <p>Confusion for consumers on eco-friendly / composability claims</p> <p>Existing studies underway may provide Pacific-based evidence for eco-friendly / compostable diapers, however, separate collection and compost infrastructure is necessary</p> | <p>Environmental effects from disposal of dumped, buried, or burned bio/compost-able diapers will remain like those from single-use disposable diapers, with the risk that the community will not be aware of environment or health effects</p> <p>Countries will include bio/compost-able diapers to composting activities, potentially contaminating compost with bacteria and/or petrochemicals</p> | <p>Follow current research (especially in Tuvalu) to substantiate claims of selected eco-friendly / compostable diapers</p> <p>Consider required infrastructure (i.e., controlled high temperatures and microbial composting facilities) prior to implementing policy to promote eco-friendly / compostable diapers.</p> <p>Work with qualified suppliers to develop standards and guaranteed supplies of substantiated products</p> |
| Socio-economic barriers | | | |
| Perception of low-socio economic beliefs surrounding reusable nappy use | <p>Using reusable nappies is seen as a sign of poverty, of being from a less developed area/community, and that families are unable to afford to buy disposable diapers.</p> <p>Many see using reusable nappies as a move 'backwards' as the rest of the world benefits from the convenience of disposable diapers</p> | <p>Current perceptions could hinder the uptake of reusable nappies</p> | <p>Promotional campaigns to increase interest and awareness of the financial and community benefits from increased reusable nappy use</p> <p>Advertise cost savings associated with reusable nappies as a "wise household choice" that can free up budget for other activities</p> <p>Work with community leaders and champions to develop locally appropriate educational materials on why to use/how to use reusable nappies effectively</p> |

| Barrier | Finding | Impacts | Opportunity |
|---|---|--|--|
| Perception of lack of affordability – upfront and maintenance costs for reusable nappies | <p>Varying perspectives of affordability of reusable nappies, with a common perception that reusable nappies are a sign of poverty; however other feel they are expensive, with expensive upfront costs and a lack of funds to pay for ongoing cleaning products</p> <p>A significant cost advantage was found for using reusable nappies (Cost for 3 years = USD375; compared to USD1,752 for single-use disposable diapers); a saving of USD1,377</p> | <p>Upfront cost and washing costs preventing adoption of reusable nappies</p> <p>Limited capacity to afford modern cloth nappies</p> | <p>Promote cost/benefit information for parents to show financial benefits of using reusable nappies – including upfront cost and maintenance costs</p> <p>Adopting quality standards to ensure available reusable nappies are of higher quality, increasing their life and user experience</p> <p>Governments or donor investment for Pacific based businesses to develop modern cloth nappies, to increase reusable nappy quality and availability</p> |
| Perception of, if switching to reusable nappies, need to use them 100% of the time | <p>Reusable nappies (towel squares) are incompatible with travelling, events, church, and night-time use</p> <p>Storage of soiled nappies is a barrier to using reusable nappies while away from home</p> <p>Night-time leaks are uncomfortable for baby and can leak onto shared mattresses creating hygiene issues</p> | <p>Low uptake of reusable nappies</p> | <p>Advertising that using a combination approach (reusable nappies and disposable diapers) may be an achievable option for families</p> <p>Improve facilities for management of single-use disposable diapers use where reusable nappy use is inconvenient</p> |
| Limited support for parents using reusable nappies | <p>Using reusable nappies takes time away from working opportunities and other community activities</p> | <p>Low uptake of reusable nappies</p> | <p>Governments or donor investment for entrepreneurial activities such as community laundry services, or assistance for childcare providers to have facilities to enable acceptance children using reusable nappies</p> |
| Lack of education and awareness of how to use reusable nappies and their benefits | <p>A consistent thread through the findings is a lack of awareness of how to use reusable nappies and their benefits</p> <p>‘Experts’ currently delivering community education have a low level of knowledge of use and benefits of reusable nappies, minimal awareness raising conducted by governments</p> | <p>Low community awareness on use and benefits of using reusable nappies, resulting in low uptake of reusable nappies. What information is shared is often incorrect or outdated</p> | <p>Educational campaigns including cross-departmental approaches, and working with NGOs and communities to ensure consistent messaging</p> <p>Develop resources and deliver training for antenatal and postnatal care</p> |

| Barrier | Finding | Impacts | Opportunity |
|--|---|---|---|
| Market / availability barriers | | | |
| Limited availability of quality reusable products, in particular in rural areas | Generally low stocks of reusable nappies were found in stores, particularly in rural areas | Low uptake of reusable nappies is unavailable in certain areas | Governments working with suppliers to develop standards and guaranteed supplies of quality nappies |
| | Low quality products commonly found, these products found to reduce user experience and often increase costs of using reusable nappies (three needing to be used at a time) | A high price for quality reusable nappies may be a barrier for uptake | Encourage suppliers in rural areas to stock quality reusable nappies |
| | The use of liners with reusable nappies was trialled in the technical study and were loved by all testers as they improved absorbency and reduced need to handle excreta | | Subsidise or provide a “starter’s kit” of reusable nappies for parents, available from health clinics – with education on how to use them Investigate Pacific made modern cloth nappies to provide higher quality products at an affordable rate |
| | | | Encourage suppliers to stock and promote reusable liners Education on the use of liners (and the need to appropriately clean and dispose them) |



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.

Opportunities to Assist Management of Disposable Diapers and Adoption of Alternatives

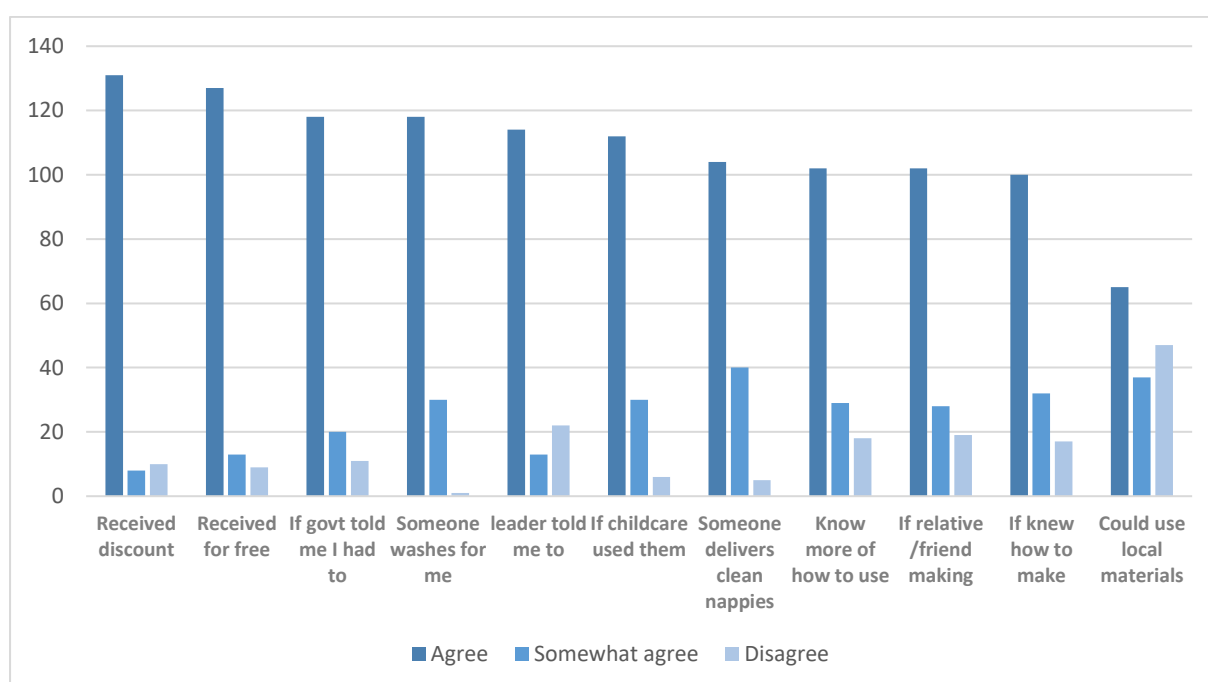
This section addresses research Objective 3 for this study: Identify and understand barriers and opportunities for reducing environmental impacts associated with single-use disposable diaper disposal in Pacific communities, balancing social and economic factors. Guidance to support decision makers because of opportunities found is provided in Volume IV.

Questionnaire participants who use single-use disposable diaper were asked what reasons might encourage their use of reusable nappies. The results show many factors could encourage participants to use reusable nappies, with very few respondents “disagreeing” with factors presented (Figure 12).

As highlighted, participants see the greatest encouragement to adopt reusable nappies from economic benefits in either reduced costs or discounts, or if the government or a community leader told them to do so.

If someone washes them or delivered clean nappies, or if the childcare used them, were also identified as strong reasons to encourage use of reusable nappies. Increased knowledge on how to use and make reusable nappies was also highlighted as factors. Participants disagreed on the use of local materials as a tool to increase reusable nappy use.

Figure 12 Reasons that Would Encourage the Use of Reusable Nappies



These results suggest economic instruments (incentives or subsidies), policy (through governments or communities), business opportunity (nappy delivery service and childcare policy), and increased education and awareness can encourage participants to use or increase use of reusable nappies.

ISBN 978-982-04-1089-3



9 789820 410893

