

Sustainability Begins at HOME – Helping Our Marine Environment

Findings of Household Single Use Plastic Alternatives Trials

Waste Audit and Alternatives Trial Findings



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Abstract

The primary aim of Sustainability Begins at HOME: Helping Our Marine Environment (HOME Project) is to reduce Single Use Plastic (SUP) consumption in Hulhumalé households using a Social Behaviour Change (SBC) approach. This approach emphasizes that social and environmental factors must be considered when bringing about behaviour change. Twelve households in Hulhumalé were selected for long term engagement and the Trials of Improved Practices (TIPs) method was used to understand their SUP consumption and trial alternatives to plastic. A two-week waste audit was conducted to understand the current situation, from which a menu of alternatives was developed. The SUPs addressed in this study are PET water bottles, plastic bags, disposable diapers, disposable menstrual pads, plastic toothbrushes, and recyclable plastics. The main finding from this study is that it is important to consider how much people can and are willing to change. We found that there were multiple factors which influenced the participants' ability to change, including the economic environment, living conditions, habits and hassle, and systemic challenges.

Keywords: single-use plastic, social behavior change, Maldives

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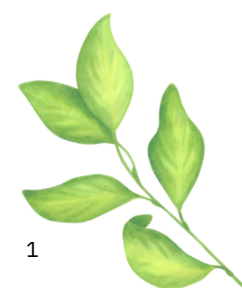
1. Introduction



Figure 1. Diver observing coral reef at Laamu Atoll

“Sustainability Begins at Home: Helping Our Marine Environment (HOME)” is an ongoing project by Small Island Geographic Society (SIGS) with the objective of bringing about social and behavior change to reduce single-use plastic (SUP) consumption. Funded by USAID’s Clean Cities Blue Oceans (CCBO) program, this project aims to address the SUP issue in Maldives. CCBO is a global initiative to reduce ocean plastic pollution by addressing the issue in urban areas - the source of this problem. This report presents the findings from our social and behavior change research which includes two main components - a waste audit and plastic alternatives trial which was carried out in Hulhumale’ as part of the HOME project.

For our social and behavior change research, we used the Trial of Improved Practices (TIPs) method. Twelve households in Hulhumale’ were selected to participate in a long-term engagement to understand their SUP consumption and trial alternatives to SUPs. The first step was to analyze the current situation, which was done by carrying out the waste audit. The waste audit was carried out over a period of two weeks in November 2021. All of the waste generated by the households were measured and categorized to assess the types of waste generated and its quantities. These findings were used to design the alternatives trial, in which the households tried seven alternatives to SUPs. This report presents the findings of the waste audit and alternatives trial of the twelve households.



2. Background

While it is well known that plastic pollution is a major threat to our small islands, marine ecosystems and public health, there are no household level SUP studies conducted in the Maldives. Therefore, we conducted a waste survey in Hulhumale' as a baseline assessment in order to understand plastic consumption and design our in-depth engagement with the households for TIPs. A total of 321 households from Hulhumale' participated in the waste survey which was the first component of the HOME project. This was the first study in the Maldives which aimed to understand SUP consumption at a household level. Survey participants found easy availability and accessibility to plastics as a reason for the high use of SUPs (Small Island Geographic Society, 2021). Plastic bags and polyethylene terephthalate (PET) water bottles were the most used SUPs. The affordability and availability of SUPs, alongside the lack thereof for alternative products make it difficult to change to alternatives. These factors made it challenging to practice sustainable behaviors even though most participants were aware of the harmful effects of SUPs.

Environmental education and awareness efforts in the Maldives have been centered in a traditional Information, Education and Communications (IEC) approach. The key principle in the IEC approach is that when provided with the correct information, people will simply accept the advice provided and change accordingly (Clean Cities, Blue Oceans, n.d.). However, providing information is not sufficient for creating behavior change. This can be seen in the Maldives, where efforts such as including environmental education in primary school curriculums, one-off events (eg: beach cleanups) and environmental recognition awards (Green Leaf Award) have not led to sufficient pro-environmental behavior change (Mohamed & Mohamed, 2021). This is because such communication is aimed to provide information about environmental issues and why we need to change; but is lacking in sharing how to change. Moreover, introducing new technology which reduces and solves environmental issues is not enough when these technologies cannot be accessed by the general public (not locally available or too expensive). This is supported by the waste survey findings; we found that people are willing to change their behavior and reduce their plastic consumption, but face challenges in terms of accessibility of alternatives. The vast majority of participants were willing to reduce their SUP use and switch to alternatives if they were easily available at an affordable price.

Moving on from IEC to the Social Behaviour Change (SBC) method is crucial in creating sustainable behavior change in reducing SUP consumption in households. SBC is a research approach which emphasizes involving social and behavior change in addition to communication in order to bring about behavior change in a community. There are multiple factors which influence people's behavior, including social relationships and the environment they are surrounded by (eg: economic environment, cultural influences). According to the SBC approach, these factors which influence behavior need to be addressed to bring about positive behavior change. For example, when providing information on available SUP alternatives, it is also important to ensure that their availability in the local market is also considered.



Figure 2. Plastic waste discarded at sea in Hulhumale'

3. Method

We used an adaptation of the TIPs method in our social and behavior change component in this study. TIPs is a formative research approach initially originated in the healthcare field. A small group of participants test an intervention in their homes, and their feedback and experiences are used to inform large-scale use of the intervention (see Krieger et al.). A mix of qualitative and quantitative research methods were used in TIPs study and are explained in detail in Section 3.2.

3.1 Household Selection

Initially we wanted to use ten households, but we decided to use twelve in case any households were not able to continue or decided to not take part. Finding households to take part was a big challenge for our team due to the docuseries component of the HOME project. The project components included a docuseries documenting the journey of these twelve households to be shown to the public for awareness raising. All households were informed of the activities they have to take part in to ensure they are properly informed before they decide to take part in the research project. Many hesitated due to the docuseries. In the end, we decided to allow some participants to take part only in the research part and not the docuseries.

Some agreed to be part of the docuseries with conditions such as they could wear a face mask during interviews, only their voice narration will be shown, or we could video them doing activities such as hanging cloth diapers for washing in a way where the participant's face was not visible. We allowed participants flexibility to be comfortable with the trial and to be part of the docuseries at their own pace. It was interesting to note that as our team engaged with the households more often and continuously, some who initially were reluctant to be part of the docuseries were also interested in giving their input. We feel this change is because of the trust being built along the way between us and the participants as our engagements increased and got to know each other better. In a way this is also a journey for our team as this is something we have not tried before.

The households were chosen based on four main criteria: 1) household size, 2) household composition, 3) type of housing unit and 4) household income. The household size varied from two to nine members and the composition varied from a young couple without children to nuclear families and extended families with parents and grandparents and older couples without young children.



Figure 3. Hulhumale

In our selection we also investigated including babies and toddlers who were using diapers. There were four types of housing units identified during our initial survey in Hulhumale and these were apartments under social housing schemes, apartments in privately owned buildings, apartments in condominium style buildings and row houses which are three-storey buildings in a row. Row houses are very few in Hulhumale and are only about 1.3% of the total number of housing units according to information provided by the Housing Development Corporation at the time of the survey. We were not able to recruit anyone from row houses in the twelve households.

3.2 Trials of Improved Practices (TIPS)

As per the TIPs method, three visits are done to the participants, each with a defined objective. The first visit is to understand the current situation and get an understanding of the issue being addressed. In this project, the first visit was a quantitative waste audit to get insights on the SUP consumption behavior of the twelve households. The next step is to use the findings from the first visit to develop a menu of choices for the participants to choose alternatives to SUPs.

These choices are provided to the participants so that they can decide how they will change their current behavior, or if they would prefer to continue as they are. The waste audit findings were used to develop an SUP alternatives menu.

Based on the findings of the waste audit, each household will be informed of their current waste generation, good practices and risky behaviors with regards to SUPs. We also provided a menu of alternative choices to change risky behaviors which the households were given time to think about and decide. The aim of the second visit is for the participants to choose from the menu and agree on the behavior changes which will be tried during the trial period. Once households chose alternative behaviors to practice, we gave them a time period to trial. The third visit is to get feedback from the households for the trials; we ask them about their experiences with carrying out the trial, the challenges, the conveniences, and if they would be continuing the behavior after the project is over.

The trial period varied depending on the product. The main feedback questions asked from participants were:

- How did the decision to change come about?
- How was the overall trial?
- Inquiry on the trial process – how did they practice the behavior.
- What were the positive things about the trial?
- What were the challenges faced and how did they overcome it?
- Impact questions: If information on the project activities was discussed with family/friends and how was their response.
- Would they continue the behavior? Why or why not?

For this project, we used an adaptation of TIPs with modifications. Conventionally, TIPs is used to trial one intervention or behavior, but we tried 7 alternatives to SUPs in this project. Rather than getting feedback from the households in one visit, we maintained contact with the households throughout the one-year trial period via Viber groups, phone calls and texts. This long-term engagement with the households allowed us to develop a good rapport with them, and we were able to negotiate with them to try out products they were not initially interested in. We were also available to answer any questions the participants had regarding the products they were trialing. Further, we got rich insights from participants regarding their living situations and honest feedback on why they could not complete trials as well.



Figure 3. Reusable bag as an alternative for plastic bags for shopping

3.2.1 Waste Audit

The waste audit was conducted over a two-week period as the first visit in TIPs to understand the current plastic consumption in the households. All waste generated by the households during those two weeks was collected by SIGS, then weighed and analyzed. Households were asked to segregate their waste into wet and dry waste. The SIGS team then further categorized the waste for in-depth analysis. First, all waste was categorized into organic, plastic, metal, glass, paper, textile, hazardous, wood and rubber. After weighing, the plastic was again grouped into ten categories (Table 1). There are several ways that plastic is categorized, based on the purpose. For instance, for recycling purposes, plastic categorization may be based on the recycling process. In this case, plastic was categorized based on household use and alternatives to SUPs which are available in the market.

3.2.2 Alternatives Trial

The findings from the waste audit were used to develop the menu of alternatives for the trial stage. After identifying the types of SUPs generated in the households, the next step was to pinpoint which SUPs can be eliminated by providing alternatives to SUPs which can be locally sourced in the Maldives at an acceptable price point. For example, disposable diapers were identified as a potential SUP which can be removed from the waste stream by using cloth diapers, which are available from a local supplier. However, there are currently no alternatives for thin plastic packaging available in Maldives, so we did not include it in the trial.

This led up to the 2nd visit in TIPs, which is to provide the menu of alternatives for the households to choose from. Households agreed on which alternatives they will trial, or if they will continue as they are currently. As aforementioned, in this project, we did this over multiple household visits, phone calls and text messages. For the cloth diaper and alternative menstrual products, we held separate information sessions to help the households decide.

In these sessions, the supplier explained how these products are used, and people who have used these products shared their experiences. These sessions provided an opportunity for participants to ask questions about the product and its use to get a better understanding before deciding. The SIGS team also provided information when participants were in doubt about the products they were to trial.

Using the findings from the waste audit, Table 2 describes the SUPs that were selected to be removed from the waste stream. The menu of alternatives that were provided and the number of households which agreed to trial them are also shown. The trials for the various SUPs started at different timelines due to logistic issues in sourcing the alternative products. The trial period lasted for about one year, and we got feedback from the households while they tried the products, as well as after the trial was completed. After the trial was done, we asked them for their feedback regarding the product, such as the challenges they faced, the conveniences of the product, and if they would continue using it after the trial was over.

Table 1 - Categorization of SUPs and their description

Category	Description
Thin plastics	Snack wrappers, noodles packet, thin packaging film like for wrapping water cases, plastic bags, bubble wrap
Water bottles	PET water bottles of any size
Nappies	Disposable nappies
Sanitary pads	Disposable sanitary pads
Mask	Disposable face masks
Recyclable (except PET waterbottles)	Recyclable plastics that are being collected locally for recycling (Categories 1, 2 & 5). E.g. toiletry bottles, yoghurt containers, beverage bottles, bottle caps, margarine containers, cooking oil bottles, sanitizer bottles, instant cup noodles cups, etc.
Medium packaging	Plastic packaging e.g. inside layer of biscuit packets (e.g. Chipsmore brand)
Composite cartons	Food packaging consisting of a mix of materials including plastic. E.g. juice and milk cartons, Pringles chips tubes
Foam	Takeaway food containers, packaging, styrofoam, toy pieces like letters, mats, puzzle pieces
Others	Pieces of toys, or other miscellaneous pieces of plastic, cleaning sponges, straws

4. Findings

Table 2 SUPs addressed in the trial and the alternatives menu offered.

SUP Address	Alternatives menu offered	Number of households/individuals trialing
PET water bottles	Water Filter	9 households
	19L Refill bottle with dispenser	1 household
Plastic bags for shopping	Reusable Bags Bundle	12 households
Disposable sanitary pads (some tried both alternatives)	Reusable cloth pads	17 women
	Menstrual cups	5 women
Disposable diapers	Reusable Diapers	4 children
Recyclable plastics	Take to public collection points	4 households
	Keep for household collection	7 households
Plastic toothbrush	Bamboo Toothbrush	12 households
Plastic brush	Silicone bottle brush	12 households

4.1 Waste Audit

The total annual waste generated from the twelve households added up to 5164 kg. As seen in Figure 4, organic waste was the most generated type of waste from the households. Aside from organic waste, plastic waste was the heaviest from all households, consisting of 41% of the total waste generated annually. A total of about 2,199kg of plastics were consumed from all households (See Annex A).

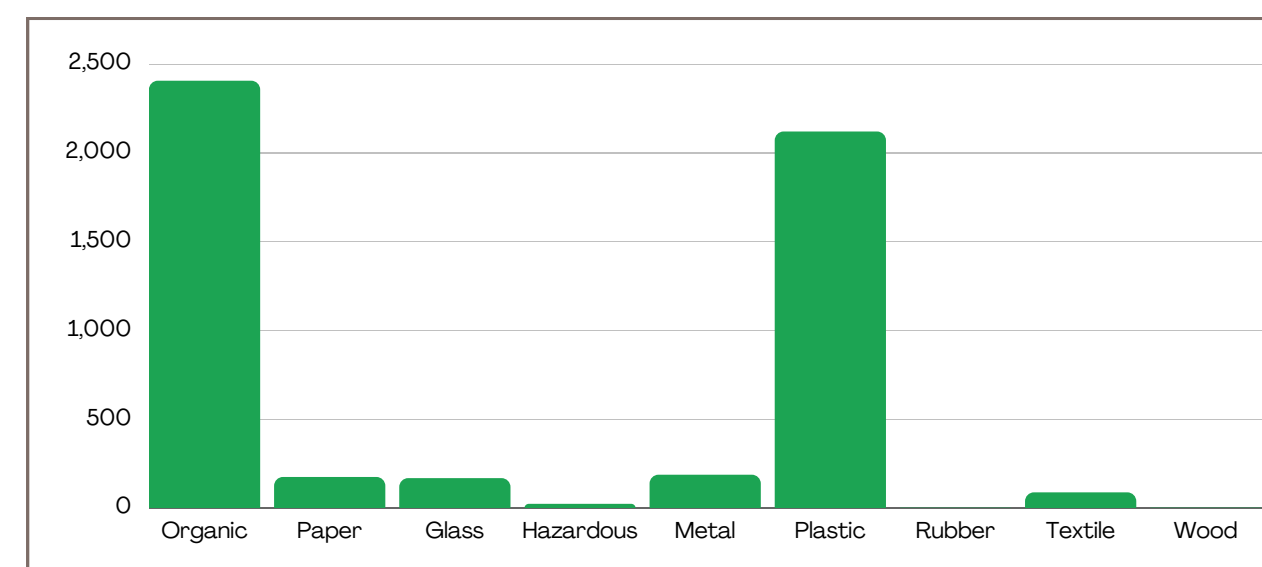


Figure 4. Total waste generated by households

We found that 0.25kg of waste was generated per person per day. These findings were very significant as this figure was much lower than what has been previously reported in literature. In the planning stages of this project, we used 1.7kg as the waste generated per capita per day, making our estimate of SUPs removed from the waste stream due to this project, higher than actual figures. The differences we found in this figure may be due to changes in lifestyles and associated waste generated. On the other hand, it is unsure if the 1.7kg reported in literature is household waste only or includes commercial waste as well.

The total waste generated from households varied greatly due to the varying compositions of households (Figure 5). Considerably more waste was generated from households which had children who wear diapers. As such, households 02 and 04 both have two children who wear diapers; households 06, 09 and 11 have one child each who wears diapers. In household 04, almost 50% of the waste generated is plastic waste – over half of this is from diapers. In the households where diapers are not in the waste stream, PET bottles are the highest in plastic waste, as seen in households 07, 08 and 10. The least total waste and plastic waste was generated in household 07, as this household comprises just a young couple, both of whom work full-time. There is less PET water bottle waste generated in this household as they use the water filter from another household for their water consumption. In household 08, there are no menstruating women or children in the house, meaning there are no diapers or sanitary pads in the waste stream; the source of the plastic waste generated from this household is mainly PET water bottles.

An estimated 0.11kg of plastic was consumed per person per day in these 12 households. The SUP patterns observed were similar to the initial household waste survey. Looking at the types of plastic waste generated in the households, diapers were by far the heaviest, contributing to over 50% of the SUP waste (Figure 6). PET bottles were the 2nd highest contributor, at 19%. Thin plastics, although very low in weight, were generated in volumes so high that it was the third highest. Thin plastics included plastic bags and food packaging such as noodles packets and instant coffee sachets. The “other” category included items such as cleaning sponges, houseware, and broken toys which could not be segregated into a particular group. An estimated 168 kg of thin plastics were generated annually by the twelve households. 7% of the total plastic waste generated by all twelve households included recyclable materials such as cosmetic/toiletry supplies and yogurt cups. These items were identified as recyclable after consulting with Parley Maldives who provide recyclable plastic collection facilities in Hulhumale.

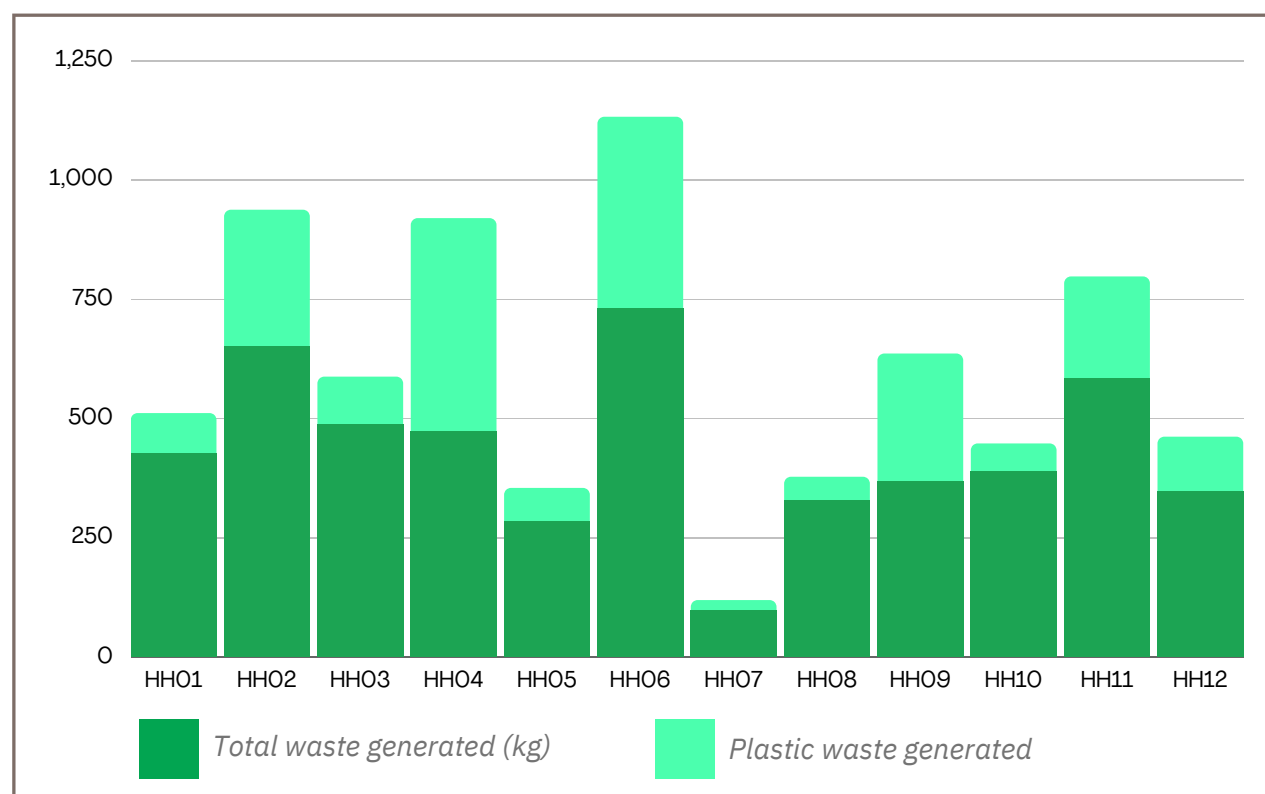


Figure 5. Total annual waste generated per household

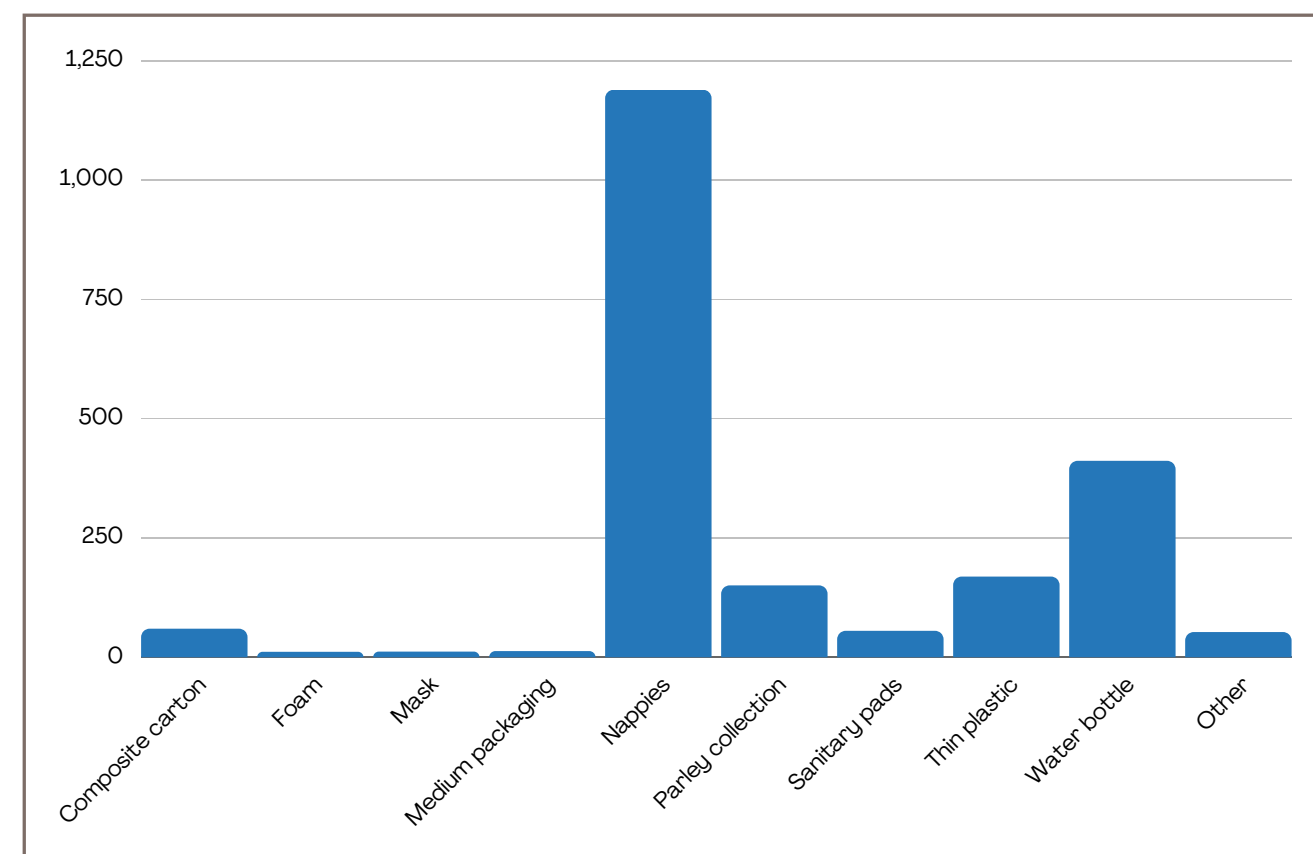


Figure 6. Total annual plastic waste generated

Positive and Risky Behaviours

Though our project is about addressing risky environmental behaviors, we found that some households already practiced the following positive behaviors, which were also in line with the initial household survey.

- Reusing containers such as biscuit, ice cream and cup noodles for storing food,
- Buying items such as lotion, detergent in bulk volumes which reduce small SUP bottles as waste.
- Using vegetable peelings, eggshells, and tea bags as nutrients for plants.
- Using reusable cloth/tote bags for carrying items to houses and sometimes for shopping.

The risky behaviors were identified in terms of SUP waste. These included:

- Water bottles. Use of bottled drinking water packed in polyethylene terephthalate (PET) bottles. Only two houses use tap water for drinking and one of these uses tap water after filtration. Another house brings filtered water from their adjacent apartment for use, but this means sometimes they also sometimes buy PET bottles. In total, nine of the households entirely depended on bottled water for drinking purposes. Cases of bottled water also come with a thin plastic casing which adds to the SUP consumption.
- Plastic bags. Most of the households use the plastic bags from supermarkets for shopping. Only two of the households mentioned they sometimes take reusable bags. However, as plastic bags are needed for waste disposal under WAMCO household waste collection requirements, they also have to often use the plastic bags from the supermarket. All households use plastic bags for bringing fresh fish from the market.
- Disposable diapers. Six of the households had, in total, eight babies and toddlers that were using disposable diapers.
- Menstrual pads. A total of 19 women from 11 households had women of menstruating age and were currently using plastic-based disposable sanitary pads.
- Recyclable plastics. About 7% of plastics thrown are recyclable and there are facilities operated locally by Parley Maldives to collect these in Hulhumale. These collection points are through schools and public areas. Households can make some additional effort to dispose of these at the collection points.

- Thin plastics. These are mainly from packaging of foods like biscuits, noodles, cheese slices and sachets like instant coffee, and liquid detergents. The houses which used bottled water bought cases in bulk and these came wrapped in a thin plastic film. Although by weight the amount of thin plastics was small (7%), there was a large amount disposed of and this could be one of the most common by volume. This would be the hardest SUP to address, and packaging is currently not included in SUPs planned to be phased out by the government.

It is not possible to address all risky behaviors within this trial mainly due to lack of alternatives that are locally available. For example, 3-in-1 single use coffee sachets are very commonly used and popular in the Maldives. However, there are no products in glass bottles, bulk packaging or other sustainable packaging available in the Maldives. The SIGS team met with local coffee importers to discuss providing alternatives in the market. Though they were supportive of reducing SUPs, they were hesitant in case there is not enough demand to replace the currently popular brand. Refer to Table 2 for the SUPs that were tried and a menu of alternatives that were provided to households.



Figure 7. Plastic waste washed up onto beaches and seas in Maldives

4.2 Alternatives Trial

4.2.1 PET Water Bottle

The plastic water bottle replacement trial would be the most successful trial from the project. All households taking part in the project have stopped buying bottled water. Nine households installed filters and one opted for the refillable 19L bottle with a pump dispenser. This household also preferred the water filter but as they were renting it was not possible to install the filter without consent from the owner of the apartment. Therefore, they chose the next best option. See Table 3 for a summary of findings from this trial.

Table 3. Findings from water bottle trial

Alternative	No. of households trialing	No. households completed	No. of households continuing
Water Filter	9 households	9 households	9 households
19L refill water bottle with dispenser	1 household	1 household	1 household
Tap water	None	None	None

This behavior modification was easy for the households as this did not require changes in their daily behaviors. The only change is in the product without personal behavior changes. Involvement of households was mainly during the installation, after which the household members consumed water as usual. The only impact households noticed was a difference in taste, but all households said the taste was not bad, just different and they got used to it. Based on annual water bottles consumed, this means annually an estimated 411kg of plastic bottles will be removed from the waste stream from this intervention.

The main benefits households highlighted about this intervention was the financial savings, less hassle in terms of delivery of water bottles and no plastic bottles to dispose of in the waste. Based on the cost of buying bottled water from one of the households, they would save about MVR700-1000 per month by using the water filter instead of buying bottled water.

All households that bought water bottles either bought and brought the water cases themselves or had it delivered by shops or producers to their doorstep. Both had their own hassles which households were happy to get rid of. If they bought and carried the water cases, this involves transporting them by motorbike as well as carrying these upstairs or in lift to their flats. All households lived in upstairs flats. This was quite labor-intensive, time-consuming work.

“The biggest advantage is no longer having to carry bottled water cases to the house. It is difficult to ever forget the work I had to do carrying it.”

For those that had water delivered, finding suitable delivery times, especially if the people in the house went to work was an issue. Often deliveries were not made during the given time, and they had to wait for the delivery for a longer time or schedule for later. Some who have water delivered sometimes have to buy their own water due to delivery delays. Given these issues the replacement, especially the water filters were very welcome.

Households also highlighted the alternatives saved space where usually stacks of water bottle cases will be kept in the small apartments. The filter is a fitted unit within the kitchen cupboards. For the household which opted for the 19L refillable bottle, initially they chose to continue using bottled water as space was a concern for them with the dispenser base taking space in the kitchen (Figure 8). However, during the course of the project Handy Industries introduced a new product which is the 19L bottle with a pump to dispense water and this can be placed on a kitchen benchtop. The household based on cost comparisons chose to use this option as the cost of the refillable bottle was cheaper than the bottled water. The household found this option more convenient and said this is better than when they used to bring plastic water bottles.



“We got a tap for the wastewater so that we can use it, for purposes such as washing dishes.”

Figure 8. 19L Water dispenser with pump

Some households noted that there is some excess water that gets generated by the water filter. The households had conceived creative ways to use this water without wasting it.

The water filters had a big positive impact on others such as e.g. neighbors tasting it and inquiring about the project. There was interest to buy, but this led to mentioning initial high cost which made people reluctant despite the numerous advantages.

4.2.2 Plastic Bags

The use of reusable bags for shopping in place of plastic bags was challenging both in terms of creating personal habits and systematic challenges in stopping the use of plastic bags (Table 4). All households said they tried to use plastic bags and in the initial days they kept a reminder to use the bags. However, to continue using was difficult, and the main reason given was forgetting to take the bag or the bag not being on hand if they were shopping while outside.

“I am still struggling to get used to this. It's only after I go to the store and buy something that I remember that I don't have the bag.”

Some households devised different methods to remind and encourage use. For example, putting the bags on a hook on the door of the apartment so that they can see the bags when they leave the apartment. Others tried to remember keeping the bags in the motorbike or car. Households also suggested that having several bags for one household and keeping it in various places might help use them more.

Table 4. Plastic bag trial summary

Alternative	No. of households trialing	No. households completed
Cloth bag bundle	12 households	12 households



Figure 9. Waste disposal in Male' City

All households mentioned that the tote bag style bag was too small for use in grocery shopping, but it was very convenient for other uses such as taking childrens' books to tuition class, using it as a baby bag when going out to put baby's bottles, diapers and other necessities, and taking picnics. All agreed that the foldable bag was more convenient as they were bigger and convenient in terms of strength - it was sufficient to carry a medium load of groceries. These were not suitable to carry some of the bulkier, heavy items like large detergent bottles, staple items like rice, flour, sugar. Some aspects of the design also need to be considered for shopping and this needs to be studied in detail and trialed in a focused study.

All households made varying levels of effort in trying to use the bags, but they all unanimously agreed that this will not be something they can continue after the trial period.

“We can't entirely stop using this”.

The reason given was the need for plastic bags as the WAMCO household waste collection guidelines require waste to be taken out in plastic bags for collection. Some households reported that though they can take reusable bags for a few days but once they run out of plastic bags, they will have to use the plastic bags from the shops. Since shops provided plastic bags freely, it was a free source of plastic bags. Otherwise, they have to buy plastic bags just to take out the trash. These sentiments were also echoed in the larger household survey done in Hulhumale. In terms of project success, this is an alternative which cannot be successful unless the broader systemic issues are addressed.¹

During the stages of looking for alternatives the SIGS team tried to make compostable plant-based bags available for households so the issue of bag requirement for WAMCO collection will be addressed. There was one local company importing and distributing such bags, mainly for the tourism industry. However, their bags were quite expensive, MVR19 per bag, which is more than five times higher compared to current plastic bag costs. The company was facing the issue of having to pay 400% import tax as the bags were being treated as plastic because of the look of the bag.

¹It has been announced that a fee of MVR2 will be charged at shops, but this has not yet started nationally. Few shops have begun to charge fees such as STO. This addressed free availability but does not address the issue of people still needing plastic bags.

Our supply of alternatives was considerably delayed in trying to see if the company can get the duty exempted in which case the bags would be less than MVR4. Since they were having delays submitting required documents to the EPA, we proceeded with the project without the compostable bags. We believe, with compostable bags more households would have been willing to continue. Such systematic challenges need to be addressed..

4.2.3 Disposable Diapers

Initially, all households with babies and toddlers were interested in learning about reusable diapers. The most attractive part about this alternative for mothers was the economic benefit in terms of not having to continuously buy diapers (Table 5). Unlike for the filters, the mums did not find the initial cost so high, as nowadays there already is a lot of spending that comes with having a baby. Only four of the babies continued for the trial. Some of those who did not try were mainly because the babies were toddlers now and they were trying to potty-train them. Three of the children that agreed to try reusable diapers were 18 months to two years and the fourth was around six months.

Table 5: Economic benefits of using cloth diaper

Product	Average cost per unit	Estimated cost in one month	Estimated cost in one year	Estimated savings per year
Disposable diaper	3.36	806.4	9676.8	-
Cloth diaper	300	1690	no additional cost	7986.8

Note: Calculations are based on the use of 240 diapers per month

² First Cry Parenting, 2021

The findings from those who completed the trial is summarized in Table 6. Trialing was very hard for the mums to put into their daily routines. We found that trialing was difficult for the working mums (two of the mums) and the mum who did not go to work was the first to complete the trial period. One of the mums who went to work was able to trial but the other mum who had two children found it challenging to trial due to various everyday issues. The whole family had several rounds of flu, which were very common after the Covid-19 restrictions were lifted. In addition, she had extra work burden due to a co-worker taking leave and adding this to having to take care of the children, she was very burdened and not able to continue the trial. She also takes her two young children from Hulhumale' Phase 1 to Phase 2 when she goes to work, as her parents look after the kids while she is working. She does not drive so she does this on public transport. However, she wants to continue the reusable diaper for the younger child but the older since she will potty-train soon, she does not want to continue for the elder. These are very big challenges that made trialing itself difficult. We feel this option will be more suitable for non-working mothers or those who have regular help to look after the children. None of the mums had maids or domestic help and those who went to work relied on parents or other family for support and this was an additional burden they did not want to give to the volunteer caregivers. One mum said

“it may be an easy thing to do for people who have maids or helpers. I don't have any hired help and do all my own household work. I struggle to find time for everything.”

Table 6. Findings from diaper trial

House hold	No. of children	No. of trial completed	Interested to continue	Reason to continue/not continue?
HH02	02	02	No	Not suitable due to hassle and home environment
HH04	02	00	No	Could not start trial due to hassle

Only the mum that did not go to work said she will continue. However, she faced issues of leaking which made her stop. We discussed the issue of leaking which was brought up by one other mother with the supplier. One of the things we found common was that both children were two years plus, and they may be too old to be using the product. Both the other mums found continuing difficult and some issues that were of concern was the difficulty in washing and drying the diapers as it was a continuous task they had to do every day, which needed to be put into the daily routine. One participant said

“We live on the 2nd floor apartment and go up to the terrace to put clothes to dry. If we are using diapers, we have to wash and hang it up for drying every day in the morning. This is not easy when we have to go to work. One day we forgot to take it up for drying and left them in the bucket in the toilet. When we came back from work the diapers were smelling a bit.”

Drying diapers during rainy days was also an issue that was identified. As people in Hulhumale mostly live in small apartments there is not much room to dry diapers in the apartment. Especially for extended families where living spaces are shared, it is not very easy to have diapers drying.

“My sister-in-law gives tuition [in the living room] so she will have students coming to the house so we cannot hang diapers there for drying.”

She further added that drying in their room is not an option as there is not enough sunlight.

Participants agree this would be something more successful if tried in the islands where there is more room for washing and drying. This will be something easy for even working mothers in small islands as it is easy to come home for breaks and the travel time between work is also not so much. This statement by one of the mums summarizes the main challenges in trialing reusable diapers.

“For me, I would have continued if I was living on an island, had space to dry the diapers, if I was not working and had more time at home or had domestic help.”

Overall, this trial was not very successful but as mentioned by participants, we feel this has more potential for success in island communities. In islands, disposal of diapers is very challenging, and it is more visible as waste compared to GMR where all the waste goes to Thilafushi, and it is out of sight. In some islands, diapers are buried in the ground or near the beach while other islands burn them openly in the waste management centers. Some of the islands where diapers are segregated, these often end up as large piles of diapers that are so visible as a problem. A future project focusing on diapers in island communities would be good to try.



Figure 10. Waste disposal in Male' City

4.2.4 Disposable Menstrual Products

This was one of the most challenging trials to implement. All the women showed high enthusiasm to learn about alternatives to menstrual pads and we had information sessions for them to learn about the products and how to use them. We collaborated with Samiyya’s Choice and Zero Waste Maldives to conduct these sessions. Zero Waste Maldives has been actively working on introducing alternatives to menstrual products and hence, their involvement was very beneficial for SIGS and the participants. We even had other family members and friends of participating women interested and inquired if they could attend the session. We welcomed others to join. These sessions were very successful, and we hoped it would prove to be a long-lasting change.

The interest in menstrual cups was low with only seven of the 19 women (37%) interested in the trial. Out of 19, 18 of the women and girls (95%) wanted to try the menstrual pads. Some tried both the cups and pads. One of the participants did not want to try as she had tried pads before and did not find it convenient to use and she was not comfortable using a cup. So in total 18 of the 19 women were interested in trying alternatives. Table 7 gives a summary of the trials and if people wanted to continue.

Table 7: Menstrual products alternatives findings

Alternatives	Agreed to trial	Completed trial		Interested to continue	
		Nos	%	Nos	%
Cup	7	05	71	02	40
Reusable pad	18	12	63	09	75

The hardest part for the women, though interested, was actually trying it out. While 71% completed the menstrual cups trial only 67% completed the reusable pad trial. Many forgot during their periods, which meant we had to wait another month for them to trial. For some of the working women, they wanted to wait for a time when it was less busy at work. For example, one of the women is a schoolteacher and she was very genuinely interested to try but school days had been especially busy for her. In addition, she was studying a course and they moved house during the trials and all this added to her inability to trial the pads. This was understandable as for the women this was something different, and they needed a calm, less hectic time to try it. We worked with them to suggest different options for them to just trial, such as during nighttime only or during light, spotting days.

Another woman who was not able to try either the cup or the pads said her busy schedule of everyday commuting between work, picking children from caregivers, dropping them to school with using walking or bus transport and the full evening schedule of cooking and feeding the kids means she has very little time to rest and at the end of the day is very tired. She basically has no energy to try something she feels will need more mental preparedness and relaxed timing. She really appreciated the opportunity to try and is keeping in mind to try every month, but it seems the days just go by. These are real challenges and a finding from this is that though people are very concerned about the environment and want to contribute to reducing the problem, changing everyday lifestyles especially even trying something new is hard.

We found there is more interest from the women to continue cloth pads. Those who tried menstrual cups and even those who want to try but have not started find the idea of inserting the cup a bit uncomfortable. One said “I’ve been thinking to do this. Just thinking and thinking but not managing to take that first try. My friends who tried said it's only the first time that it is difficult and once you try, it is not uncomfortable”. Many who did not want to continue said they have not totally closed up to the idea but are thinking of trying in the future, but they are not ready at the moment. One who tried said the cup felt too comfortable and she got worried that she was not wearing any protection and it might leak. None who tried said there were leaks but the idea of leaking was the issue because the cup did not feel like it was there.

For those who tried the pads and did not want to continue, a big barrier was washing and drying the pads. As one person mentioned, they share the toilet with other people including a teenage son.

So, she did not feel comfortable keeping pads to dry in the toilet. At the same time, she hangs her washing inside the apartment to dry so this common family space was not a comfortable place for her to display something so private. This is an issue for people living in small apartments and sharing living spaces. These places don't have access to outside areas for hanging clothes and sometimes there are balconies that are visible from the road. So, privacy was an issue. One person commented that there was some irritation at first, but it got better. One found the pads leaked from the side a bit, but this may be because she had heavy flow. But she will continue to use pads during lighter days. Two of the women tried the pads when they were in the islands during school holidays and found it a positive experience to use. They said it was very comfortable to go swimming even wearing them as normal pads get very uncomfortable when they soak. In the islands there were plenty of open spaces to wash and hang to dry, especially inside the traditional open well and toilet areas where there were clothes lines where pads can be hung more privately away from the view of others. Similar to diapers, these may be more successful in island communities.

Another difficulty identified by working women was difficulty to change and clean pads at work. The idea of carrying a wet unclean cloth pad in their bags was not a comfortable idea. So, they opted to continue during evenings and weekends when they are home. These women expressed though they want to contribute to reducing plastics, there are certain levels they can put effort. So, they will continue when they can.

One of the participants explained that she was very happy to get this opportunity to try this for her daughter who recently started menstruating. Her daughter is allergic to plastic and faces many challenges even at school when having to sit on plastic toilets, plastic chairs or even drink from plastic bottles. All her life she has been adjusting to avoid plastic and she had been worried about her having rashes when she had to use menstrual pads. So, the cloth pad is a very good solution for her daughter.

One of the major pros for the women was the economic benefit of not having to continuously buy normal pads (Table 8). Going to shops to buy menstrual products is often a difficult thing for women and they are self-conscious when buying that people will be aware of when they have their periods. Hence, the idea of not going to shops to buy pads was also a culturally positive thing for the women.

Table 8. Economic benefits of using menstrual product alternatives

Product	Average cost per unit (MVR)	Estimated cost per year (MVR)	Estimated cost per 10 years (MVR)	Estimated savings in 10 years (MVR)
Disposable sanitary pad	4	1014	10140	-
Reusable cloth pad	83	660	2310	7830
Menstrual cup	430	430	430	9710

Note: Calculations are made assuming that 22 pads are used per cycle, with average 13 cycles per year ³



Figure 11. Cloth pads



Figure 11. Menstrual cup

4.2.5 Toothbrush

All participants tried the bamboo toothbrushes. Feedback received from participants is summarized in Table 9. While some liked the brushes, some found them uncomfortable and did not want to continue. Some of the issues identified by the households were a lack of variety in terms of bristle softness, color and sizes, and the brushes getting moldy.

The wooden brushes getting moldy due to the dampness in bathrooms was highlighted by many households and even some who liked the brushes. Two of the households said the apartments they live in have a lot of moisture in the air and the issue of items getting moldy happens to other items, such as wooden furniture, wooden cotton buds. Humidity and moisture in apartments is a common issue in GMR, as many apartments do not have good ventilation systems. The bamboo toothbrush material may not be suitable for the urban home environment in Maldives.

Another point noted for the alternatives to plastic toothbrushes were that there was some difficulty in using wooden toothbrushes. As regular plastic toothbrushes came with a lot of options and variety, it was challenging for some members to adjust to the wooden toothbrushes. The limited availability of options in terms of bristle softness and different colors was a challenge. However, they are willing to use it if more options are available. While some bristles had different colors and we tried to give different colors to each household member, there was not much variety. One household drew different colors and designs on the wood to identify each other's toothbrush.

Those that wanted to continue also asked where they could buy this. Since we said it was bought from an online supplier it was suggested by households that getting such things easily from supermarkets will be better for them to buy in the future. "It is easier to buy such things when we do the normal monthly shopping after we get our salaries." Toothbrushes are something bought from supermarkets with their normal household shopping, and they mentioned they probably would not go out of their way to look online for a toothbrush.

³ Menstruation facts and figures, Absorbent Hygiene Product Manufacturers Association

Table 9 Feedback on bamboo toothbrushes

Household	Liked	Gum bleeding issues	Moldy	Need different colors	Continue?
HH01	No, Bristles too hard	Yes	No	-	No
HH02	No	No	Yes	-	No
HH03	No, too soft	No	Yes	-	No
HH04	Only daughter liked the colors	Yes	Yes	-	Maybe for daughter
HH05	No, Bristles too hard	Yes	No	-	For vacations & short trips
HH06	No, too uncomfortable	Yes	Yes	-	No
HH07	Yes	No	No	-	Yes
HH08	No, suitable for kids	-	-	-	No
HH09	No, Bristles too hard. Daughter likes	No	No	Yes	Daughter will
HH10	Yes	No	-	-	Yes
HH11	Yes	No	-	Yes	Yes
HH12	Yes, bristles were very good	No	Yes	-	Yes

4.2.6 Alternative Bundle

We planned to give reusable containers, silicone lids and bottle brushes to all households. Though initially in stock, we were not able to purchase a set of silicone lids for all households since none of the online stores or shops had these in stock. Usually, they will bring in such things annually for Ramadan when there is a demand. The households were provided with containers and bottle brushes which they all found very convenient to use. The containers were especially easy as they can store food items with lids and can avoid using cling wrap for covering.



Figure 12. Alternatives to Single Use Plastics

4.2.7 Recyclable Plastics

All households agreed to participate in this trial, where all recyclable plastics from the households were to be segregated and taken to Parley collection points, or collected by the SIGS team. However, this trial was not continued as segregation of waste at household level came into effect in the GMR on 1st June 2022. Under this change, households must separately take out recyclable plastics (water and beverage bottles, shampoo and other plastic bottles used at home) for roadside waste collection. This means, now all recyclable plastics from houses will be removed for recycling in the future too. Instead of our original trial, we decided to trial how much recycles are produced from the households to see if any information useful for municipal collectors can be generated. We gave households large red plastic bags, used for waste disposal, and asked them to fill each bag with recyclables before taking it out and let us know how long it took to fill the bag (See Table 10). Since households have been used to taking out waste daily, many households took out all three categories of waste everyday instead of keeping it till a bag was full. This was also due to lack of space in the apartments.

From the feedback, households with more children and using bottled water took less time to fill the bag, ranging from⁴three to six days. Some of the households which installed the filter said it took them a long time to fill the bag, ranging from one to three months. We noticed in the households where there were no small children, it took longer to fill. Apart from PET water bottles the typical items were empty toiletry bottles, cleaning products, beverage bottles, cooking oil among others (Figure 14).



Figure 13. Bag filled with recyclable plastics



Figure 14. Recyclable plastic waste from a household

⁴ At the time, some of the households were waiting for water filters to be installed. Hence, we were able to capture recyclable plastics with PET water bottles with the households which did not have the filter yet.

Table 10. Result of Recyclable Plastics Trial

Household	Time taken to fill bag	Type of water used during trial	Household size
HH01	5-6 days	Tap	5
HH02	2 months +	Filtered water	9 (2 young children)
HH03	3 months	Filtered water	5
HH04	-	Filtered water	4 (2 young children)
HH05	3-4 days	Bottled water	5
HH06	33-38 days	Filtered water	4 (1 toddler)
HH07	Unable to try	Filtered water	2 (no children)
HH08	2 months	Filtered water	4 (no children)
HH09	5 days	Bottled water	4 (2 young children)
HH10	-	Filtered water	5 (no children)
HH11	6 days	Filtered water	4 (3 young children)
HH12	2-3 days	Bottled water	4

5. Discussion

Our main finding from this project was that in order to create sustainable behavior change, it is important to consider how much people can and are willing to change. Based on SBC approaches, structures of society, social groups, shared meanings and rules, and social relationships should be considered to bring change (CCBO). We found that there were multiple factors which influenced the participants' ability to change, including the economic environment, living conditions, habit and hassle, and systemic challenges.

5.1 Economic Environment

All households which tried the water bottle alternatives were happy with the cost savings. However, all stated that the initial capital required for the systems was high and not affordable. They said it is not that households do not understand the economic or environmental benefits, or they do not want to change but initial costs are too high. During initial interactions SIGS gave them the option to pay in monthly installments for over a year as part of the project and this had been agreeable to all households. They said such a mechanism would enable many households to install water filters. One household mentioned that their neighbor was very interested in the filter and even came to taste the water and had asked how they could participate in this project. For their neighbor too, the initial cost is not affordable, but a monthly payment would be doable. They mentioned that many motorcycle sellers also give such options for people to pay and this is very successful for the business. So, if businesses or even the Government offered such a scheme for households, there will be many people changing. Especially with the new settlements in Hulhumale Phase 2, many people live in high rise buildings and delivery or buying of water bottles is not convenient as the lifts are very busy. It should be noted that taking heavy loads, such as cases of water, continuously up the lifts would even cause long term impacts on these buildings.

In terms of access, there are a number of local businesses selling water filters, dispensers and other products which are good alternatives. Despite this, one issue we faced during implementation is that stock runs out and we have to wait for it. This may have been due to our trial period coinciding with the settlement of people into the Hiyaa Flats in Hulhumale Phase 2

With people moving into 6,872 apartments in 16 housing towers, there has been a lot of demand for water filters during this period. Businesses would not have gotten time to bring supplies as the dates for recipients to be given the apartments had been changing for a couple of years. So in future, the lack of stock may not be an issue.

More than affordability, the accessibility of other alternatives was the issue. For SIGS also it was a challenge to find local alternatives as there were not many established shops. For example, there was only one local supplier of reusable diapers and this was also a small online social enterprise. We must contact the owner of the business directly in order to purchase from them. The business also supplied reusable menstrual pads which was almost the only one with a variety of options. While Zero Waste Maldives also supplied them, their business is more focused on menstrual cups. As the suppliers are small businesses they do not have a physical shop nor do they have large stocks available. This was challenging for us in order to procure the alternatives for the trials.

For both diapers and pads, we had to wait to get access to the seller to purchase items. As both the suppliers also had other jobs apart from their business, this meant they traveled out of Male' and we had to wait some time to be able to contact them. With the other smaller items it was mainly online businesses selling these items and the main issue was availability of stock. Some things which were available when we got the quotations were later not available. We were only able to secure silicone lids enough for all households after the trial period was over. A number of suppliers were contacted but they bring things according to demand and such household items are in demand during Ramadan. We started getting our alternatives in Ramadan 2022 but silicone lids at that time were already sold out.

The difficulty in finding alternatives was a challenge for us and this issue is identified by participants too.

“If we didn’t take part in the project we would not know about these alternatives and where to find them”

was the feedback received from almost all households. Those interested in buying some of the items, like toothbrushes. They felt it would be easier to buy these if it were available from supermarkets when they do their normal shopping. They may not put the effort to get just a toothbrush from online sellers. This was feedback received for the diapers and menstrual products also. It would be difficult to put effort into looking for the sellers and order online compared to buying something available on the shelf. Moreover, there would be people who are not familiar with using social media where these items are being sold.

5.2 Social Environment: Living Conditions

How we behave, our relationships, our gender and ethnic group, our education and work, the conditions and communities in which we live, and how we feel about ourselves are all elements of the social environment. In Hulhumale', many people live in small apartments with cramped spaces. Most lead generally busy lifestyles: balancing family and childcare while working full-time to earn an income to keep up with rising rent and living costs. Long work hours, and the commute from Hulhumale' to Male' for work consumes much time from peoples' daily lives. Juggling all of these in their daily lives makes it a great challenge to find time for other endeavors. The financial burden of rent and living costs is a barrier for most to hire domestic help - which would reduce hassle if it were accessible.

For many some of the alternatives which were tried were not suitable for the living environment, though they had high interest in continuing them. This was partly the reason why these trials were not successful, and most participants were not willing to continue. The cloth diaper and cloth pads had similar issues in terms of living conditions. As most of the households were small apartments, participants find it difficult to find the space to hang these additional loads to dry. The cloth diaper is something which would need to be washed daily. One participant mentioned that she already has difficulty drying her own clothes. During rainy days, she has to dry them under a fan in her room as the living room is occupied during the day as her sister gives tuition. It does not dry easily this way and is very time consuming.

“There is a smell in clothes due to not getting sunlight and perhaps not drying properly. We try to open the window but if it rains there is water getting in through the window.”

Having to dry the diapers was an additional struggle for this participant.

“My first thought when I learnt about this project and trying reusable diapers was that this will be very difficult for people living in Male area as we live in apartments and don't have open spaces for drying our clothes.”

These views were reflected by other participants who agreed to the trial.

Likewise, using the cloth pad came with these challenges, with the additional issue of menstrual taboo. Hanging the cloth pads to dry where it's visible to others was considered inappropriate as menstruation is culturally believed to be a private matter. While some participants themselves were embarrassed/shy to hang it to dry where others can see it, we also had a participant who was fine with hanging it to dry where it is visible to other family members. However, the participant's mother did not approve of this and was not happy with her from hanging it to dry in that manner. Another participant shared her bathroom with her teenage son and was not comfortable having her cloth pads visible to him.

Hectic, busy lifestyles are common for individuals living in Hulhumale' city. Most people in Hulhumale' live in overcrowded apartments. With Hulhumale' Phase 2 now being populated, the vast majority in Phase 2 reside in Hiyaa Flats, which are government housing units. These high-rise buildings of 25 storeys have small apartment units, and a capacity of 2400 people living in one building. People are constantly in a rush to get from one place to another – commuting to work in the morning, dropping children to school/daycare, and travelling back home from work. Living cost is on the rise with higher taxes and rent prices, increasing the financial burden of many. The obligations that come with the hustle and bustle of everyday life in Hulhumale' City is already time consuming and tiring enough without additional responsibilities.

Households found that our most successful alternatives, the water filter and dispenser, were very appropriate for urban living environments as this saved space. Where there used to be stacks of bottled water and spaces designated for empty bottles to be discarded, households are now able to utilize these areas for other purposes or have it as free space in the house. “We used to have empty bottles lying around the house which was so annoying. It's so satisfying that we do not have to deal with that anymore.” Aside from the financial benefits, the space that was being saved in the small apartments was a big plus point for the participants.

5.3 Habit and Hassle

Another issue which was consistently highlighted by households was difficulty in creating a habit for using reusable alternatives, especially reusable bags. Creating a habit takes months and even years of practicing repetitive behavior. With the added stress from the busy lifestyles that most participants lead, they found it challenging to remember to use the reusable bags. “I forget to take the bag, because usually I'd need to go buy something while I am out.” Participants were interested in continuing this even though they cannot fully switch due to needing plastic bags for waste disposal. Attempts to build a habit were seen by many households, with many suggestions on how to remember the bags. Meanwhile, the use of cloth diapers and cloth pads was difficult for many of the participants who were working and already had little time for themselves. Caring for young children while being employed full-time requires much time management already - adding another time-consuming task such as washing and drying cloth diapers daily is not feasible. With the cloth pads, women need to consider that they will need to rinse their pad at work every time they need to change it and take it in a waterproof bag back home to be washed. For those commuting from Male' to Hulhumale' for work, this is very inconvenient and involves too much hassle. One participant mentioned that although reusable diapers were once normally used in Maldives, our lifestyles have changed since then, and our lives have gotten much busier. For these reasons, we believe that disposable options are needed as alternatives; such as pads made using organic cotton and plant-based bioplastics.

These products can be used as the women are accustomed to using pads - use it once and throw away - but without the negative impacts that come from using plastic based products. Such products exist in the market but are still in early stages and are currently not available in the Maldives.

The reduction of hassle was another reason why the water filter and dispenser were successful. Having these alternatives saved time for the participants as they no longer needed to buy bottled water and dispose of the used ones. This was especially difficult for those buying and carrying these bottles to high rise buildings such as Hiyaa flats. Another reason was that there was no need to create a habit and minimal behavior change was needed from the participants' side. The primary change needed was to replace the product used - PET bottles were replaced by water filters or the water dispenser. Following this, the participants carried out their daily routines with little change.

5.4 Systemic Barriers

The major systemic challenge identified was the issue with having to use plastic bags. Currently, all households in GMR need to dispose of their waste in plastic bags, which is managed by WAMCO. There are no alternatives for this so having plastic bags cannot be avoided. As most shops provide plastic bags for free on purchasing from the shop, it is a free source of waste disposal bags. Taking a cloth bag for shopping would mean that households will simply need to buy packs of plastic bags for waste disposal instead.

The announcement of the SUP phase-out plan by the Government of Maldives is an important step by policy makers to reduce SUP consumption. However, little attention has been given to ensuring that alternatives to the banned plastics will be made accessible to the public. For instance, a ban on water bottles 1 liter and below is included in the plan, but water filters are too expensive for most households to purchase in one go. Placing water filters/dispensers in public areas and providing water filters under a government scheme were some suggestions by households to address this gap.

6. Conclusions and Recommendations

“Sustainability Begins at Home: Helping Our Marine Environment (HOME)”, the HOME project, aims to bring about behavior and social change through engagement with households in urban areas to reduce their use of SUPs. Working in-depth with twelve households in Hulhumale, the objective is to study the SUP consumption at household level, identifying risky behaviors that can be minimized through alternatives and asking households to trial these alternatives to bring about a positive behavioral change to reduce the consumption of SUP. The twelve households are chosen to have various compositions, sizes, income levels and types of housing. A two-week waste audit conducted for the twelve households has identified that approximately 2,119 kg of SUPs are thrown away annually in the twelve households of which diapers and water bottles were the biggest contributors. Households have tried alternatives to water bottles, diapers, menstrual products, plastic shopping bags, toothbrushes, recycling plastics and other general household items.

One of the main findings was that changing behavior is extremely hard for people in their everyday lives. Though the need for behavior change was understood by all households and supported it, completely changing behaviors were challenging. Barriers to changing behavior include economic environment, living conditions, habit and hassle, as well as systemic challenges. For example, while taking a reusable cloth bag for grocery shopping was a hard habit to practice, the need to change habit was seen as irrelevant since the municipal waste collection from households required all waste taken outside for collection to be put in a plastic bag. Such systemic barriers need to be addressed centrally. Other barriers were the lack of information on available alternatives and access to them. Most households did not find cost an issue for most alternatives, except water filters and cloth bags. Even while diapers and menstrual products were costly the savings from avoiding future buying of these products was seen as an incentive. With water filters, although people can see the economic benefit over the long-term, the immediate cost was too high.

The household trials have provided us with many lessons learnt as well as insights into behavior change regarding SUPs. The long-term engagement intended for the project, though long for a project, was not enough for the required purpose.

One of the surprising findings for us was the low per capita waste generation figures obtained from households. The initial HOME project estimates of SUP removed through use of alternatives was based on estimates of 1.7kg per capita per day waste generation in Male from earlier studies while our findings gave a value of 0.25kg per capita per day. The high difference shows the urgent need to conduct baseline household waste audits to get a more accurate estimate as such figures are important for developing waste management strategies and implementing activities.

During the audits, we also identified that there are SUPs such as small milk packets and other food wrapping that are not accounted for as these are taken for school intervals. Future work can also focus on awareness raising in schools as these are places outside of homes where children spend a lot of their time. Schools also organize many activities such as field visits, school fairs and functions where SUPs are used. These are areas where in-depth studies can help identify feasible solutions to reduce SUPs.

Overall, from the trial of alternatives, we feel more interventions focusing on PET water bottles and diapers can have a high impact in reducing SUPs in the Maldives. While PET bottles are large in volume, diapers are the highest by weight. Our trials showed that in urban households, people are interested in changing to water filters, but the biggest barrier is the high initial cost. If the government or suppliers can provide installment schemes for payment, then there definitely would be a high interest to change. Diapers though were not very successfully trialed in the HOME project; the findings indicate this will be more successful in island communities where there is more space for drying. The disposal of diapers in islands is more challenging and the impacts such as burning and burning on beaches more easily visible.

5 National Bureau of Statistics (2018). Review report on water and waste accounts. <https://statisticsmaldives.gov.mv/nbs/wp-content/uploads/2020/06/Water-and-Waste-Account-Review-Report-NBS.pdf>

One of the biggest barriers we identified was the lack of alternatives and difficulty accessing these. Household feedback also showed that if alternatives were available in shops, they would have a higher probability to opt for these options, especially if it were cheaper or of a similar price. SIGS tried to discuss with businesses on how these can be brought into market and we understood from their feedback that there is also a need for businesses to learn on what types of alternatives are needed and where to get these from as well as the quality needed. This is a need identified by MOECCT as well. SIGS together with MOECCT are trying as a next step to fill this gap through an SUP Expo for businesses and the public. This would be highly beneficial to have more alternatives available in shops. With these lessons learnt, we feel there is more that is needed and can be done to reduce SUPs.



Figure 15. Reusable glass bottles

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Figure 16. Aerial view of Hulhumale'

8. Annexes

Annex 1 - Waste Audit Data

Table 1. Total annual waste generated per household

Categories	HH01	HH02	HH03	HH04	HH05	HH06	HH07	HH08	HH09	HH10	HH11	HH12	TOTAL (KG)
Organic	293.30	282.48	278.16	20.34	154.21	244.47	14.99	269.06	42.78	292.13	307.64	204.27	2403.84
Paper	20.13	8.42	19.89	1.20	20.70	11.60	17.44	0.08	29.04	5.94	30.22	9.59	174.26
Glass	18.02	32.22	39.58	0.00	15.04	20.54	3.13	0.00	8.21	16.45	7.74	6.80	167.73
Hazardous	0.42	14.78	3.23	0.00	0.08	0.00	1.33	1.46	0.00	0.00	1.83	0.00	23.13
Metal	7.53	26.18	26.41	2.79	18.35	31.03	3.42	8.03	18.25	15.59	21.43	7.93	186.94
Plastic	85.08	286.22	100.48	447.60	70.30	401.01	21.28	49.69	267.90	58.48	214.41	115.66	2118.11
Rubber	0.00	0.00	1.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.12
Textile	1.93	0.99	17.52	0.00	4.98	22.19	36.06	0.00	2.11	0.70	0.00	1.23	87.71
Wood	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.70	1.40
Total	426.41	651.29	486.91	471.93	283.66	730.84	97.65	328.32	368.30	389.29	583.45	346.18	5164.23

Table 2. Annual plastic waste generated by households.

Categories	HH01	HH02	HH03	HH04	HH05	HH06	HH07	HH08	HH09	HH10	HH11	HH12	TOTAL (KG)
Composite carton	9.67	8.40	7.98	2.29	6.75	0.00	0.00	0.00	9.99	10.32	2.92	0.99	59.31
Foam	0.81	3.08	2.22	0.00	0.18	0.00	0.52	0.00	0.57	0.00	3.13	0.34	10.84
Mask	0.00	0.23	0.78	0.00	2.41	1.62	0.08	0.00	2.82	0.47	0.16	2.74	11.31
Medium packaging	1.93	0.31	0.13	0.05	1.69	0.21	2.84	0.13	0.73	0.81	2.27	1.28	12.38
Nappies	41.84	191.63	0.00	423.53	0.00	269.60	0.00	0.00	152.87	0.00	109.11	0.00	1188.58
Parley collection	11.68	8.55	25.11	6.18	13.22	16.50	8.40	2.53	6.52	25.34	3.70	22.32	150.04
Sanitary pads	7.60	7.60	6.75	2.53	10.13	2.53	2.53	0.00	2.53	5.06	2.53	5.06	54.85
Thin plastic	7.93	25.58	19.84	6.96	9.73	9.15	4.95	13.14	24.46	10.92	14.34	21.51	168.51
Water bottle	3.57	37.54	32.28	6.05	26.72	84.99	1.80	33.89	58.22	2.42	63.61	59.96	411.07
Other	0.05	3.31	5.40	0.00	0.31	16.61	0.16	0.00	9.20	3.13	12.64	1.46	52.27
Total	85.08	286.22	100.48	447.59	71.15	401.22	21.28	49.69	267.91	58.48	214.41	115.66	2119.17