

TRIALING HOUSEHOLD WASTE SEGREGATION IN ISLAND COMMUNITIES OF THE MALDIVES

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and the lack of space in households for keeping separate containers. We also observed that coordination with the Island Waste and Resource Management Centres (IWRMCs) was vital for successful household segregation.

Keywords: Maldives, waste segregation, trials of improved practices

Abstract

Waste management in the small island communities of the Maldives is challenging due to the fragility of the low-lying islands and the logistical complexities of a geographically dispersed setting. The Soneva Namooona team is developing a holistic sustainable waste management model that is suited to the context of such islands. In this article, we present the findings of household-level waste segregation trials implemented in four islands in Baa Atoll using the Trials of Improved Practices (TIPs) research method. Thirty-eight of 45 households successfully completed the trial, and we observed participants' high willingness to segregate. The main challenges included difficulty in communicating and coordinating new segregation behaviors with household members

Introduction

For decades, waste management has been one of the biggest environmental problems for the Maldives. Management of waste in small island communities poses challenges in storage and disposal of waste. Boat transfer to a larger management facility is expensive due to the highly dispersed nature of the islands. As most communities are very small, with only a few hundred inhabitants, the amount of waste generated in an individual island is not enough to make frequent collection economically feasible. Unsegregated household waste is either burned or dumped at Island Waste and Resource Management Centres (IWRMCs) until the facilities overflow, leading to health and safety hazards. Islands generally lack an integrated system of sustainable waste management.

In 2019, Soneva Fushi Resort, in partnership with local islands in Baa Atoll, launched

Figure 1

Waste Piled at IWRMC and Being Burned

(Photo by Soneva Namoonna)



Soneva Namoonna¹, an initiative that engaged local communities to develop a sustainable waste management model around the core principles to reduce, recycle, and inspire. The initiative later developed into the Soneva Namoonna NGO. Through a grant from the United States Agency for International Development's (USAID) Clean Cities, Blue Ocean (CCBO) program, Soneva Namoonna partnered with four islands to research household segregation and identify a segregation method most suited to the culture and context of each community within the four islands. In order to develop a sustainable waste management model, we assessed the island waste management process starting from household waste generation to disposal methods at the IWRMC. As a first step, we conducted

¹Namoonna in the local Maldivian language Dhivehi means "an example" or "exemplary."

Table 1

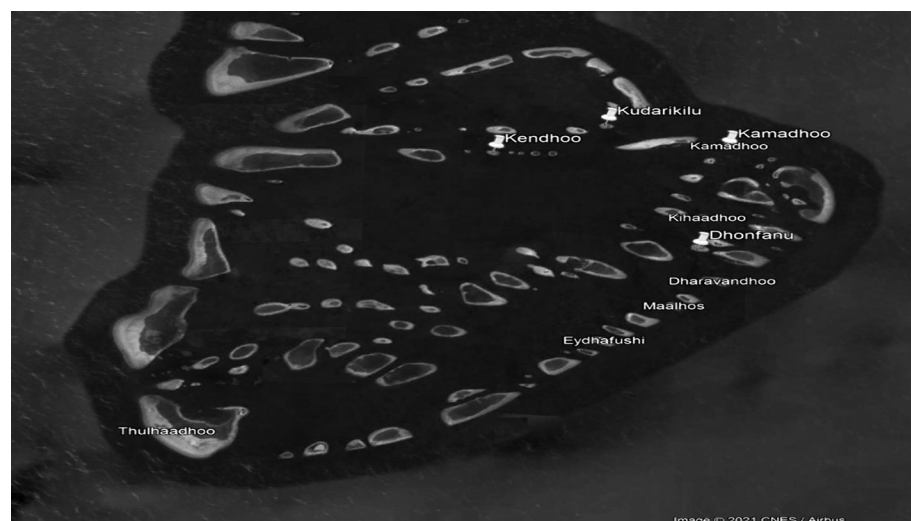
Demographics of the Study Islands

Island	Dhonfanu	Kamadhoo	Kendhoo	Kudarikilu
Area (ha)	17.5	20.2	17.9	16.3
Population	593	542	1340	400
No of Households	116	139	200	87
No. of occupied households	78	115	170	85

Figure 2

Map of Baa Atoll Showing the Four Case Study Islands

(Credit Appears on the Map)



formative research to understand current practices, focusing on improving household waste segregation. In this article, we present the findings of the household waste segregation research conducted in these communities using the Trials of Improved Practices (TIPs) method. TIPs is a research method that combines research and implementation to see what behaviors or policies should be promoted reflecting participants' preferences.

Case Study Islands

The four case study islands included in this research are Dhonfanu, Kamadhoo, Kendhoo, and Kudarikilu in Baa Atoll (Figure 2). Table 1 gives the

demographic details of the four islands.

Background and Literature Review

Social and behavior change requires targeted communication to bring about desired "positive behaviors" (Gurupada et al., 2016). Rather than disseminating information and raising awareness, behavior change communication focuses on strategically designed programs to influence behavior change (Gurupada et al., 2016). It is best practice to carry out formative research to understand the current situation and behaviors of a target community before designing any social and behavior change interventions

(Gittelsohn et al., 2006). Understanding people's attitudes and perceptions through formative research is important so that sustainable behaviors can be introduced in a manner that considers participant groups' perspectives and in a context that makes sense to the people who will practice these behaviors.

Rooted in anthropology and commercial marketing, and pioneered in the health field, TIPs is a formative research method that allows planners to design appropriate interventions and programs in a participatory manner. The TIPs method is described in detail in this issue in the article by Krieger et al.

Sewak et al. (2021), in their review of waste management interventions, identified that participatory approaches, which inform interventions of user needs and perspectives, were lacking in 86% of interventions. Past studies have identified a lack of meaningful community participation and consultation in environmental conservation in the Maldives. Malatesta et al. (2015) describe IWRMCs in the Maldives as being designed and developed by top-down policies which do not reflect local knowledge and traditional practices of island communities.

Waste segregation is an essential first step to sustainably manage waste. In Baa Atoll, waste from households arrives at the IWRMC without much segregation and is often burned together as mixed waste. Our experience with island waste management has seen better success when segregation is done at the source. Research also shows that segregation at the household level is associated with behaviors such as higher levels of recycling (European Commission, 2015). Household segregation also

reduces costs for Island Councils (IC), with less worker time allocated to the secondary segregation of waste. Our work in other islands in the Maldives shows that when households segregate waste, waste is cleaner and easier to manage and process at the IWRMC. The involvement of households can help island residents to develop a sense of individual and community responsibility, diminishing the perception that waste management is the sole responsibility of the people employed at the waste management centers.

Method

Using the TIPs method, we asked households to select and try new and/or modified waste segregation behaviors that would improve solid waste management for their communities. In the first visit, we obtained information on how waste was being segregated; what kind of containers households used to store the different categories; what role different members of the household had regarding solid waste management; and how waste was transferred to the IWRMC or designated collection points. Based on this information, we identified current good practices and risky behaviors and developed segregation menus of more environmentally supportive behaviors for the households to trial.

The menu we developed for each island varied depending on the context of the island. We discussed the menu with the ICs and Women's Development Committees before presenting choices to the households so that the IWRMCs could support the menu chosen. The ICs facilitated implementation of the menu to be trialed by arranging collection schedules and

required collection facilities for the new categories of waste.

We presented the proposed menus during the second visit and negotiated with households to choose a behavior to trial, including a start date, duration of the trial, and a date for the third visit to collect feedback. We agreed on a means of communication (through Viber or WhatsApp) with each household; these platforms were used to ask questions and send pictures of progress. The objective of the final visit was to obtain feedback on the households' experience of the trial and see if the agreed behaviors were executed, modified, or unable to be performed. The households gave feedback on their experience: if they were able to do the trial or not, if they changed any agreed behaviors, and if so, how and why.

Sampling

We used a stratified sampling approach to include small and large households. We classified a family with more than five members as a large household and five or fewer household members as a small household. We obtained a list of households from the ICs and selected households randomly from individual housing blocks to ensure an equal distribution of households that were close and far from the IWRMCs. If members were not available from the selected house, the adjacent house was chosen.

We used the number of occupied houses in the island to determine the sample size. We proposed a sample size of 12 households from the less populated islands of Dhonfanu and Kamadhoo and a sample of 15 and 20 households, respectively, from the larger islands of Kudarikilu and Kendhoo (Table 2). We found a high level of

segregation in Kamadhoo on the first visit and therefore proposed to trial households taking some of the waste to collection points in the island. However, as these proposed behaviors were not in line with the IC plans, it was not possible to conduct a TIPs for Kamadhoo. The IC was happy with the high standard of segregation and did not feel they would be able to provide continued services for proposed

TIPs collection points. Therefore, in total, 45 households from three islands participated in the TIPs.

Findings

Current Practices

Before the start of the project, household-level segregation was practiced in the four islands, though the levels of segregation

varied between four and eight categories (Table 3). Food waste was separated in all islands and disposed of in the surrounding lagoons. All islands also separated diapers and sanitary pads together as one category. Kendhoo and Kudarikilu had two more categories: the island of Kendhoo collected metal cans, glass, and plastic bottles together; in Kudarikilu, plastic bottles were included in the category for *Andhaa kuni*, or the waste that is burned in the IWRMCs. Kamadhoo had the highest level of segregation with eight categories, including thin plastics, garden waste, and separated paper/cardboard. In addition to these everyday waste streams, bulky items such as furniture were collected separately on an as-needed basis in all islands.

Table 2

TIPs Sample Size in the Four Study Islands

Island	# of Households (1st Visit)	# of Households (2nd Visit)
Dhonfanu	12 (6 small, 6 large)	12
Kendhoo	20 (10 small, 10 large)	20
Kudarikilu	15 (7 small, 8 large)	13
Kamadhoo	12 (6 small, 6 large)	0
Total	59	45

Table 3

Current Level of Household Segregation in the Study Islands

Island	Segregation Level	No. of Segregation Categories	Segregation Categories
Dhonfanu	high level	6	<ol style="list-style-type: none"> 1. Food waste 2. Diapers and sanitary pads 3. Plastic bottles 4. Glass bottles 5. Metal cans 6. <i>Andhaa kuni</i>*
Kendhoo	medium level	4	<ol style="list-style-type: none"> 1. Food waste 2. Diapers and sanitary pads 3. Plastic bottles, glass bottles, and metal tins and cans 4. <i>Andhaa kuni</i>
Kudarikilu	medium level	4	<ol style="list-style-type: none"> 1. Food waste 2. Diapers and sanitary pads 3. Metals, cans, and glass bottles 4. <i>Andhaa kuni</i>
Kamadhoo	high level	8	<ol style="list-style-type: none"> 1. Garden and organic waste 2. Glass bottles 3. Plastics 4. Metal 5. Food waste 6. Diapers and sanitary pads 7. Thin plastics 8. Paper/cardboard

* burning waste—a mix of thin plastics, yard waste, paper, and residual

In Dhonfanu and Kamadhoo, we found good practices in segregation by households, with little or no mixing of waste types; and all households washed and cleaned glass, metal, and plastic containers before disposal. In contrast, in Kendhoo and Kudarikilu, we found mixing of waste categories, as well as some houses not properly cleaning metal, glass, and plastic containers.

Except for Dhonfanu, all islands offered a household collection service by the IWRMC. In Dhonfanu, households took the waste to the IWRMC or collection points. At the time of the study, Kamadhoo island did not charge a fee for the household waste collection, while in Kendhoo and Kudarikilu, a monthly fee of MVR 100 (about \$6) and MVR 150 (about \$10) was charged, respectively. Collection of food waste, diapers, and menstrual products occurred daily, while collection of other waste streams varied, ranging from every other day to twice a week with various schedules. Due to the hot climate in the Maldives, food and other perishable items rot very quickly. In our experience with these and other islands, it has become a habit in Maldivian communities to dispose of these perishable items immediately or on the same day.

It is interesting to note that in Dhonfanu, where people took their own waste to collection points, the community had the most positive attitude towards managing waste. They did not mind taking waste to collection points. Household members showed a sense of island pride in connection to their level of segregation. Several household members echoed the sentiment that “this is not difficult to do,” or “Anything will be hard to do

when you first try but if you keep doing it you will get used to it and it will become easy.”

Households in all islands self-organized to find containers for the different waste categories. Many repurposed containers instead of depending on the IC to provide containers. Some of the containers included empty cardboard boxes from shops, gunny bags used to pack staples (rice, sugar, and flour), large yellow oil containers, and empty Styrofoam boxes (obtained from nearby resorts). Households said, “It was not difficult to find containers and many shops will give empty boxes if you ask.” One household member from Dhonfanu mentioned that she and many others from the island sew two empty gunny bags together and made a bigger ‘jumbo bag’ to store some of the waste. In contrast, in Kendhoo, a larger and more urbanized island, many households had store-bought containers for waste segregation. With more shops established on the island, community members have more choices to buy different types of bins. This demographic difference also suggests that when individuals have more options for new items, they feel less obliged and constrained to recycle and repurpose materials. In addition, compared to the other islands, in Kendhoo, a smaller percentage of the population works in resorts and hence has less access to reusable containers such as Styrofoam boxes, chlorine buckets, large yogurt buckets, etc.

Gender Roles in Household Waste Segregation

On many of these islands, it is relatively common for women to stay at home while men go to work, and therefore, women

are mainly involved in the daily household-related work. Since a majority of household work generates waste, it is most often the women who handle and manage waste in the house. Nonetheless, all islands reported that other household members also participated in various levels of the household level waste management process. While women organized the different bins for the different categories of waste, all individuals put their own waste into the designated bins. For example, the food waste bin was usually located inside the kitchen² where most cooking and food processing occurred, so women usually put food waste in the food bin. The person who changed the baby would take the diapers to the designated bin. Children generate waste such as paper from school items, drink packets, or snack wrappings and put these items in the designated container. Some households may have dustbins inside the house for residual waste, which would be later combined with the *andhaa kuni*. In Maldivian language, *kuni* means waste, and *andhaa* means burn, and this translates to waste that is burned.

Some households also reported that children swept the courtyard and inside the house, sorted waste, and even helped take the waste to the IWRMC or collection points. Girls were more involved in sweeping and taking daily waste out, but all children helped in putting the waste in different segregated containers. The men were mainly involved in disposal of bulky items, as they load them onto the island pickup for transport to the IWRMC.

²In islands in the Maldives usually the kitchen or food preparation area is separate from the dining area.

Table 4

Proposed TIPs Menus for Separating Andhaa Kuni

Island(s) Menu #	Category 1	Category 2	Category 3	Category 4
Dhonfanu 1	Garden waste	Thin plastic	Paper/cardboard	Residual
Dhonfanu 2	Garden waste	Thin plastic	Paper/cardboard, residual	
Dhonfanu 3	Garden waste	Thin plastic, paper/ cardboard, residual		
Kendhoo/Kudarikilu 1	Garden waste	Thin plastic	Paper/cardboard	Residual
Kendhoo/Kudarikilu 2 (cotton buds and tissues Included with nappies and pads)	Thin Plastic	Garden waste, paper/ cardboard	Residual	

We further observed that women mainly enforced and encouraged segregation within their households. Mothers often reminded children to follow the household waste segregation system.

Developing and Choosing the TIPs Menu

In the three islands that continued with TIPs, we identified mixing thin plastics in the *andhaa kuni* as the main environmentally risky behavior that could be addressed by removal of the thin plastics. This mix of *andhaa kuni* contained thin plastics, green yard waste, paper, and cardboard. In Kudarikilu, the *andhaa kuni* also contained plastic bottles, which would add to the toxicity of the fumes during burning. Though recycling is an opportunity, the high transport cost may not make this feasible for communities, and focusing on reducing would be a better approach. Other risky behaviors that we observed in Kendhoo and Kudarikilu were mixing different types of waste at households and the poor level of cleaning of the separated metal, glass, and plastic bottles and containers.

Table 4 shows the TIPs menus offered to the households in the three islands. The highest level of segregation that we wanted households to trial was

to separate the four parts of *andhaa kuni* into garden waste, thin plastics, paper/cardboard, and residual (Menu 1 for all islands). We offered the highest level first, and if the households found it difficult, negotiations began about what possible behaviors they would consider taking on. After negotiation, if the household still found the level of segregation being requested “undoable,” we offered a lower level of segregation. In Dhonfanu, we offered three menus, with the lowest being only separating the green waste from the *andhaa kuni*. Since Kendhoo and Kudarikilu households had mentioned the lack of space as a challenge for them to segregate, only two menu options were proposed, as shown in Table 4.

All 12 households in Dhonfanu chose the first option, without needing much negotiation. In Kendhoo, nine of the 20 households chose Menu 1 with the greatest segregating categories, and 11 households chose Menu 2. We provided fabric bags for households to separate and keep the waste. In Kudarikilu, only 13 of the 15 households initially interviewed continued the TIPs. Six of these 13 households chose Menu 1, while the remaining seven households chose Menu 2. We found Dhonfanu households were already very enthusiastic

about segregation and made a great effort to segregate; this could be a potential reason for full participation in the trial. Three of the households in Kudarikilu could not continue due to unforeseen personal circumstances, such as a family death or travel. Two households did not continue due to difficulty in communicating with all members on how to do the segregation.

Feedback from TIPs

In total, 45 households participated in TIPs from three islands. The results of the trials are summarized in Table 5. Out of the 45 households, a total of seven households were unable to continue the segregation: five due to unforeseen circumstances, including travel; in two households, the household heads were unable to communicate instructions to the rest of the household with lack of cooperation from others in the household. One household continued with a modified behavior: the amount of green waste was so little that they put it in with the residual waste. Most participants (38/45; 84%) committed and successfully adopted the behaviors agreed to. A majority of participants said they intended to continue (89%) and will recommend (84%) the behaviors to others in the community.

Table 5

Results of the TIPs

Behavior	Did	Did Not Do	Changed	Deviations from Intended Behavior	Intend to Continue	Will Recommend
Separate from <i>andhaa kuni</i> : 1. Thin plastic 2. Garden waste 3. Paper/cardboard	22	4	1		25	23
Dhonfanu	11	1	0		11	10
Kendhoo	7	1	1	Mixed garden waste with residual waste as garden waste was very little. Some tissues were mixed with kitchen waste	8	8
Kudarikilu	4	2	0		6	5
Separate from <i>andhaa kuni</i> : 1. Thin plastic 2. Garden waste + paper/cardboard	15	3	0		15	15
Kendhoo	9	2	0		9	9
Kudarikilu	6	1	0		6	6

Note. In Kudarikilu, two of the households did not choose a segregation category and did not continue. One was due to a family death, and one was due to lack of communication with family members to agree on which to choose.

Successful trialing was highest in Dhonfanu (92%), followed by Kendhoo (80%) and Kudarikilu (77%). In Dhonfanu, all participants said they would continue with the new behaviors, while in Kendhoo and Kudarikilu, 85% and 92% said they would continue, respectively. The willingness of participants to continue was encouraging, and most participants did not find segregation difficult. Participants from Kendhoo, which is a very congested island, found the lack of space to keep so many categories of waste challenging. Some participants recommended collection points in the island for dry waste categories, so they would not have to store these until collection time. Compared to Kendhoo, houses in the other two islands were bigger, with more courtyard space for different bins.

Only two households had difficulty trialing the new segregation practices due to lack of communication and cooperation from household members. This is a

small percentage of the participants who trialed the segregation, but such issues will possibly occur in other households in the community. Therefore, it is important to understand the issue and find ways to address it. As programs through schools are highly supported in Maldivian communities, such communication can be passed down through students as a school activity. Since the household, rather than individual members, is the basic unit of household waste management, it could also be helpful to contact, virtually or in person, all household members both in TIPs and in communication efforts. Overall, there was consensus by all participants of the relevance and importance of implementing these changed behaviors, including the participants who were unable to comply. Some who were not able to continue were willing to continue trying in the future and to recommend the segregation practices to others.

We learned that for household segregation to be effective, household efforts need to be matched by practices at IWRMC, especially the collection practices. In Kendhoo, we observed many issues, such as difficulties with the collection schedule and system, as well as proper coordination and clear communication with the waste collectors. Households also reported that they saw IWRMC staff mixing the household's segregated waste when they collected it. In contrast, in Kudarikilu, things went very smoothly as the IWRMC accommodated their collection practices to the trial's menus. In an island setting, it is very important that both the household and IWRMCs cooperate and communicate well.

Further, IWRMCs need to have matched capacity to manage or dispose of each category of waste sustainably. The formative research conducted prior to TIPs showed that the IWRMCs required additional resources and support to manage waste more sustainably. Storing

large amounts of segregated waste for transfer for further treatment can be an issue on small islands which lack space. This issue was also highlighted by Malatesta et al. (2015) in their case study of Magoodhoo island in the Maldives.

Conclusion

The findings of our TIPs showed that island communities were quite willing to improve segregation practices. One reason for this could be attributed to the communities that were already practicing some level of segregation. The reported challenges to implement the trial included difficulty in communicating and coordinating with household members and the lack of space in Kendhoo, the more congested island. Waste management in islands can be most effective when segregation at households is matched with waste management capacity and strategies of IWRMCs.

The unique characteristics of island communities need to be considered when developing waste management strategies. The information collected through this TIPs research shows that though island communities can seemingly be similar, there are differences within each community that may impact how waste management initiatives can be implemented effectively. While the islands faced similar issues, slight differences in governance and leadership, community attitudes, presence or absence of a collection system, involvement of community, and spatial challenges, among others, are factors that can affect such initiatives. Instead of a one-size-fits-all strategy, waste management strategies and initiatives should be adapted to the particular characteristics and complement the assets of each community.

Soneva Namoonaa is developing a grassroots, zero-waste approach to small island waste management. It is encouraging to see from this research that households in the small islands we worked with are willing to undertake a high level of waste cleaning and segregation. With this foundational activity in place, and with the support of well-functioning collection systems and processing activities at the IWRMCs, Namoonaa islands can be confident that they are on the way to implementing more sustainable waste management within their communities.

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