Original Research

Key Factor to Inhibit Individual from Recyclable Waste Separation

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Abstract

Waste problems are present around the world. Many studies have been trying to solve waste problems and reduce the amount of waste, but waste problems are at a standstill nowadays in many places. Knowledge about household waste management has been given to many people in many societies [1-3]. Many concerns are brought to the attention of those around them. This study focuses on the pain point that has an influence on the failure of waste reduction participation. The data collected by observation on three homes, focused on the activities to support waste reduction by reusing the reusable waste and separating the recyclable waste for sending them to be recycled further. In the three homes in this study, there are people with knowledge and awareness about waste reduction in society and around the world. They try to support waste reduction in their homes. The results show that the important point is the knowledge and awareness of waste problems and the intention to participate in waste reduction in the community and indirectly in the world of the key man of the home or community.

Introduction

Waste problems are still present around the world. There are many activities to promote and support people in the world to reduce the amount of waste in order to decrease waste problems. From giving knowledge about the effects of waste problems on the environment around the world to raising people's awareness in order to increase their participation in decreasing the amount of waste everywhere around the world, there are many recycling methods promoted and used in many places around the world, but some recyclable waste is still in disposal sites in landfills or somewhere else. Even though there are waste-to-energy projects to use the waste to steam for electricity production in many places, a significant amount of waste is still present around the world. Sweden uses about 52% of the waste to produce energy. About 42% of the waste is recycled. Only one percent of the waste is sent to landfills [4]. Waste-to-energy technology is in Japan, South Korea, Northern Europe, and also in Southeast Asia. The first waste-to-energy plant in Thailand was opened in 2016 in Bangkok. In 2021, there were 24.98 million metric tons of solid waste produced in Thailand. Only 16%

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was recycled. There are still many problems related to waste and waste-to-energy projects [5-7]. Waste-to-energy projects need to work with a good machine and a good path from getting the waste and taking the waste to the machine to produce energy. Where waste goes, it can produce pollution in the environment, and the people around those places will have an effect. This leads to more resistance to the waste-to-energy project. Moreover, there are some waste pickers who mainly get income from picking the recyclable waste from dump sites to sell to the recyclable waste buyers. If waste-to-energy projects are used, the recyclable waste can also easily be put into the machine with the other waste to produce energy, so there is no more waste for waste pickers to earn money for their living expenses. This is the big picture of the fact that the waste problem is still around. In waste-to-energy projects, if the machines used in the projects are not good enough, they will produce more pollution for the environment and have an effect on the health of the people around them. This requires a budget. If it is invested by the government in a good machine and a good track that can prevent pollution production in the environment around it, using the waste as a big source of energy instead of using nuclear or fossil fuels is very interesting.

As the big budget problem is still there, we should select other methods to reduce waste; we do not need to spend the money. On the other hand, the participants can get the money from the project, which should be much better. Let us get back to applying the 3Rs: reduce, reuse, and recycle. To reduce the use of materials is to reduce the amount of material, the main idea is to use a product that can deal with waste that can be decomposed in nature, resulting in less pollution for the environment. Reusing recycled materials instead of using new materials is a good way, as seen in [8]. The use of natural products is becoming increasingly popular. The next R is reuse. Reusing the material that can be reused instead of disposing of it in the bin as waste is one way to reduce the amount of waste. More reusing, less waste.

Trying to reduce waste around the world using the 3Rs is the main method. Starting from trying to give knowledge to the people and try to get their participation to use the 3Rs. Once they gain knowledge and raise their awareness, they are willing to use the 3Rs to save the world, even if it means paying for the recycling, as seen in [9]. But there are problems, which are the major obstacles that make them impossible to apply to the 3Rs, such as in [10].

We are wondering. A lot of knowledge and pollution awareness is promoted in many places around the world. In Thailand, there are many projects to raise awareness about waste pollution and teach people about how to separate waste to make it easier to manage. At least for applying the 3Rs: reduce, reuse, and recycle. To reduce, many projects promoted the materials using reduction, such as in many coffee shops, where if the consumers take the coffee containers to buy some more new coffee without taking any new coffee containers from the coffee shop, they will get the reduced price. Many other projects for reducing the use of plastic bags do not give customers new plastic bags. If the customers want to get plastic bags to hold their bought stuff, they have to pay money to the shop to buy the plastic bags instead of getting them free as ever. To promote reusing the materials instead of throwing them away as waste, many projects try to promote reusing the materials. For example, plastic bags, by reducing using new plastic bags. These projects lead to many people who do not want to pay more. They are trying to reuse the plastic bags in their hands, so these projects support reusing materials as well. The use of recycling. This step is needed to get the participation of many people to collect and send the recyclable waste to the recycling sites. Before the waste can be sent to recycling sites, the recyclable waste needs to be separated properly from the other waste. Some people around participated in the waste separation very well, as seen in [11], while some did not. There are some factors related to disposal behavior, such as norms [12]. However, many problems and difficulties are found in waste separation around the world, such as seen in [13-18]. There are some tracks needed, such as the waste pickers' track, the waste buyers' track, and sending the recyclable waste to the recycling sites. For the waste pickers' track, they wander along the road to pick up recyclable waste and collect as much as they can hold, then sell them to the waste buyers stations, which are very close to them for less travel and transportation costs. There are a limited number of waste pickers in society. Even with the participation of all waste pickers in the community, not all recyclable waste in the community can be collected. Due to the waste generation is made all the time of consumption. For the waste buyers' track, some waste pickers are waste buyers too. Waste buyers will buy a bigger amount of recyclable waste at a time, which is much more than waste pickers wandering into the community. Moreover, waste buyers can have a waste buyers station where they buy the recyclable waste from waste pickers or other people who collect the recyclable waste well enough. It is about time and cost to pick up the recyclable waste at recycling sites; a decision support system was ever developed for this matter, as seen in [19].

From now on, we can see that many places, such as hospitals and shops, participate in projects reducing new materials to waste, such as plastic bags, and support the project of reusing the materials instead of disposing of them. These projects force the people in the communities to participate in reducing the use of new materials and reusing the materials. For recycling, it is now mainly leaning on waste pickers and waste buyers to collect recyclable waste and transport recyclable waste to recycling sites. However, as we know that waste pickers and waste buyers in each community cannot pick up all recyclable waste at the recycling sites, the participation of the individuals in the community is needed. As seen in many activities, there are many

projects set up to provide knowledge about how to separate the waste in order to select the recyclable waste and collect it from the people in the communities and to support transporting the collected recyclable waste to recycling sites.

In our previous work [12], we used machine learning to find out the related factors to waste separation behavior. In that work, we found that the important related factors are the household norm and the punishment at the household. As seen in the fact that the norm and the punishment, there are some people who do not need to follow the norm or do not get any punishment even in the criteria that must. We think that there are some implicit factors related to this matter. In our another previous work [19], we developed a decision support system for reducing the time and cost of collecting recyclable waste for the communities that already well participated in recyclable waste separation.

In this study, we focus on finding out the factor that affects the situation: the fact that one's waste separation behavior is good enough with the full intention to support waste separation and to send the recyclable waste to the recycling track but finally cannot get it done for long.

As seen in many projects, starting with raising environmental awareness and then giving knowledge about waste management and how the individual can support waste management such as waste separation, using the 3 Rs: reduce, reuse, and recycle, mainly focusing on reducing the amount of waste. We see that many projects are launched and then stopped; many projects cannot be continued, and many projects continue with difficulties. There are many recycling sites, many projects are to reduce the waste, such as waste-to-energy. But a large amount of waste is persisting. Even though the pathway from disposing to recycling or producing energy is prepared. The projects cannot continue because of the gap that we want to find in this study.

To find the gap, we need to get details that may be sensitive and cannot be answered by using a questionnaire. Then we decided to use the observation. Observing the world, the countries, the provinces, and districts could be difficult. We decided to start from the smallest community, which is the household.

The research goal of this study is to find out the gap at the household level that makes many waste management projects unable to continue.

At the household level, the problems found are shown as follows:

1. In the case of waste separation, after the people separate the waste, the separated recyclable waste cannot be sold to the waste buyers or given to the waste pickers. This is the question: Why do they not send the recyclable waste to the waste buyers or recycling sites?
2. In the case of reusing materials instead of disposing of them, many people can reuse only some materials they have, not all. Why? This is the second question.

These are the points that we want to find out in this study.

Material and Methods

At the household level, starting with making the individual participates in waste management to reduce the use of new material, reusing the used material instead of disposing materials to the bins, and separating the recyclable waste to send onto the track to recycling sites. Making individuals participate in waste management normally starts with raising environmental awareness and giving them knowledge of how to participate. The easiest way is to apply the 3 Rs. Once the individuals have good environmental awareness and want to participate in the projects, they should try to reduce the use of new materials, reuse the used material, and separate the recyclable waste and send it to the recycling pathway, such as sending to waste pickers, waste buyers, or recycling sites. Many studies find that even at the household level, there are many problems that cannot support waste management well enough, such as lack of space [20], be looking down on the poor [21].

Waste separation behavior of the individuals is one factor that influences the projects' participation. In our previous study [12] we found that the factors related to participating in waste separation are the household norm, and get punishment from the household. That means if the norm in the household is separating the waste, the household member will separate the waste; if the punishment for not separating the waste, then the household member will separate the waste.

Norm is the normal way that the people in that community do. Punishment will be applied if one does not follow the set rule in the community. But we can see that there are many people who do not follow the norm but are still comfortable in that community. The punishment, as well, will not be applied to some people as an exception. These factors are very sensitive and hard to get in detail.

Our study focuses on finding out the implicit factors that influence the success of waste management participation, especially in reducing the use of new materials, reusing the used materials, separating recyclable waste, and sending it into the recycling route.

We want to get into details, so we cannot look at the general. So we decided to study in focus groups where we could get the details of what was happening and the causes of the happening, which related to the specific points of our view.

We need to get into the details in depth, and the answer can be sensitive, which makes it hard to get, so we need to use the observation in real-life activities without any notification. Under the conditions that the person(s) get knowledge about waste separation, reduce, reuse, and recycle the waste, and they can participate in or support the activities, including reducing, reusing, and supporting recycling by waste separation and/or

sending the recyclable waste to be recycled in some ways,

To participate in waste separation is to dispose of the waste in separate bins, especially recyclable waste, from other waste types.

To support reducing the use of new materials by reusing the used materials in the same form again or reusing the materials in other forms.

We decided to observe three homes, which we can observe without any notification and get in-depth into the details. The members in these three homes are those who already have knowledge about waste management, and some of them participate in waste separation and reusing materials.

In the first home, there are four people. They gain knowledge about waste management, including waste separation, reducing the use of new materials, reusing materials, and recycling the waste.

In the second home, there is only one person in the limited space. The person gets knowledge about reducing the use of new materials, reusing used materials, and waste separation to separate recyclable waste from other waste types.

In the third home, there is only one person in the space. This person gets knowledge about reducing the use of new materials, reusing the used materials in the same form and other forms, and separating recyclable waste from other waste types.

Then we collect data about the behavior of the people toward reusing the used materials and separating recyclable waste through observations at these three homes.

Results and Discussion

In the first home, one member has tried to reuse the materials if possible and, if not, collect them to sell to the waste buyers or separate them into separate bins to make it easy for waste pickers to send them to be recycled. The other two people in this home are neutral and agree with the first member on reusing and collecting for selling to the waste buyers and also disposing of in separate bins. The fourth person's view is different from the three other people. This person thinks that people should not separate the waste to make it easy for waste pickers, should not reuse the material, and should not collect the recyclable waste for selling to waste buyers. The fourth person is the key man in this home. So, this person expresses her dissatisfaction with reusing materials, collecting the recyclable waste for sale and even separating the waste to make it easy for waste pickers. So in this home, reusing materials, collecting the recyclable waste for selling to waste buyers, and separating the recyclable waste to make it easy for waste pickers to send recyclable waste to be recycled can be made with some difficulties.

In the second home, the member always disposes of all the waste, including recyclable waste because of a lack of space in the home. At the disposal time, waste separation for recyclable waste is done. In this home, waste separation is supported to make it easy for waste pickers to send the recyclable waste to be recycled.

In the third home, the member always collects the recyclable waste to sell to the waste buyers. This home has a large space to collect a large amount of recyclable waste. This member also reuses the material if she get a chance to do so. In this home, waste separation is done very well, and also reusing the used material is done very well.

From observation of the waste management behaviors of the people in the first home, we can see that out of the people in the home, only some people who would like to support waste reduction are not enough to achieve success in waste reduction because the key man does not support these activities. For the second home, due to the lack of space, collecting the recyclable waste for selling cannot be made, but waste separation can be made easily. For the third home, reusing the used materials instead of disposing of the waste, and separating the recyclable waste for selling to the waste buyers, can be made easily and effectively. For the second home and the third home, the key man of the home and the member are the same person. So the waste separation activities and reusing of the used materials can be done by the member easily.

The key man is not happy with the separated recyclable waste bins, collecting them to sell to waste buyers, or even collecting the reusable materials for reuse in the future. There are many reasons that make people unhappy with this, such as they look down on the waste collector as the poor [21-27], or it is not their duty or it is not the task they should do [1, 2, 18, 28], or they see that the collected recyclable waste in the home takes more home space, and it is visual pollution.

This study gets the answers to the set questions. The answer is the key man in the household.

Even though many people who are not the key man in the home really want to participate in reducing the amount of waste and try to do many things to reduce the amount of waste, if the actions are not accepted by the key man of the home, they can do little or almost nothing.

The key man in the home is the most important. He or she has an influence on the other member(s) in the home. We think that even the home member(s) do not want to support reusing and/or separating the waste for recycling, but if the key man in the home really wants to reuse the materials or to support separating the recyclable waste to be recycled, almost all materials in the home that can be reused will be reused, and the recyclable waste will be separated and supported to be recycled at the recycling sites properly. This is because the key man has an important effect and authority in the home and can control the activities of the other members of the home fluently and effectively.

If we want to get more participants in projects to support waste reduction, we should focus on the key
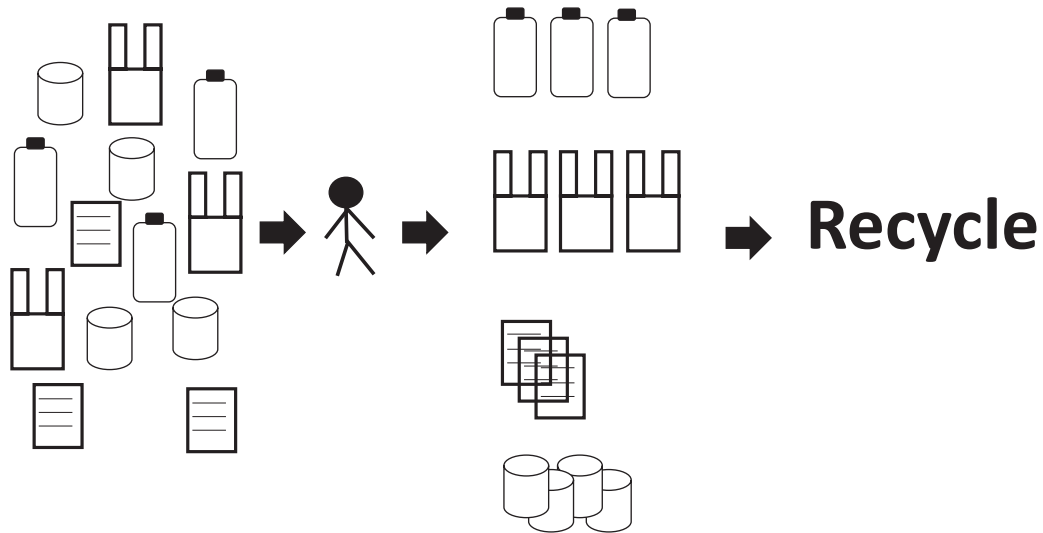
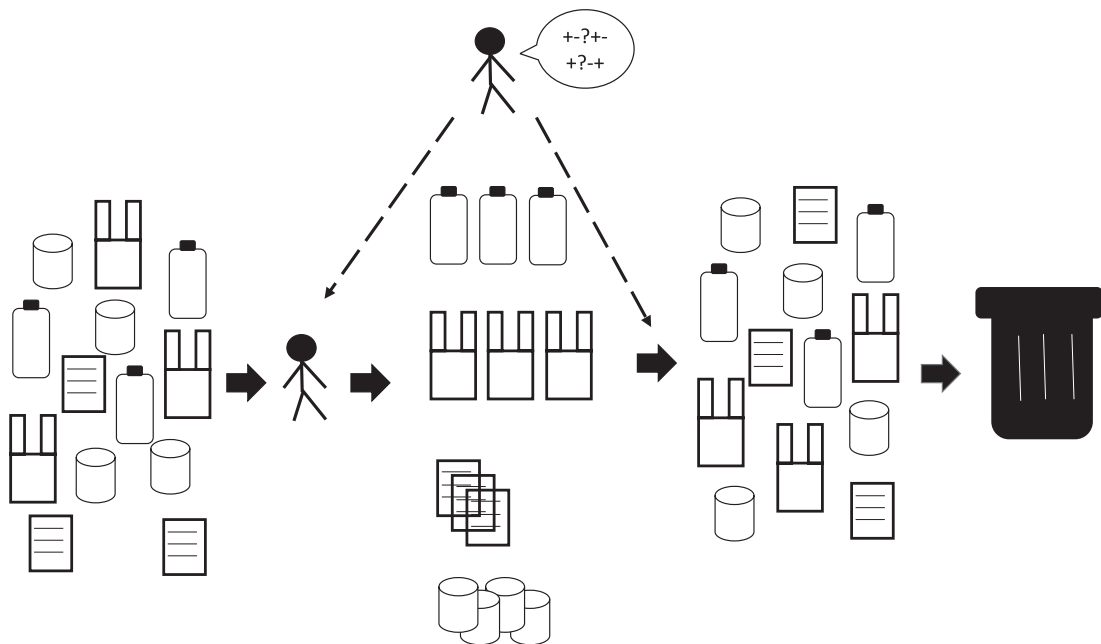Fig. 1. Waste separation for sending to be recycled.

Fig. 2. Waste separation cannot support recycling due to key man disagreement.

man of the home. Once we get the key man agreement on the project, we will get full participation from everyone in the home, or at least almost all members in the home. As the key man, he or she has so much power over the members [29-34]. Homes are communities. Every community has at least one key man. We think that the key man of the community should be the same as the household.

The effect of the key man on the success or failure of the project. The key man is not necessarily the head of the household or community. The key man is one who can control others in the household or community both directly and indirectly. If the key man agrees with or accepts any action or any project, that action or project

can continue fluently. On the other hand, if the key man does not agree with or does not accept any action or any project, that action or project cannot continue.

The key man at the first home does not agree with waste separation in the household, then the key man makes a quarrel every time waste separation until the others want to stop the quarrel, then they just follow the key man. This makes the waste separation stop. The key man did not agree with reusing the used material, then the quarrel was made every time of the others' reusing the used materials. So the others want to stop the quarrel, then they stop reusing the used materials. The key man does not agree with reducing the use of new materials, the key man always quarrels about reusing

the used materials instead of using the new materials. The others want to stop the quarrel; they just follow the key man to stop using the used materials. This is the effect of the key man's disagreement on the actions supporting waste management. Even though many people in the household really want to support waste management, if the key man does not agree, then supporting waste management in that household cannot be done.

This study found that the key man is an important factor that affects the failure of supporting waste management.

We draw the facts found in Figures. In case a home member separates the recyclable waste for sending to be recycled, the big picture of this event is shown in Fig. 1. But in case waste separation is done with disagreement of the key man in the home; we call this event as the key man effect, the big picture of the event is shown in Fig. 2.

Conclusions

The individual's knowledge about waste problems and how to reduce them, as well as the awareness of the environment, is not enough to support waste management projects. The key man in each home is the key factor in supporting reusing the reusable waste or recyclable waste separation. The other factor is the place that collects the recyclable waste for sending to the recycling sites. The place is not necessary to be at each home; it can be somewhere that serves for placing the recyclable waste to wait for waste pickers or waste buyers to take it all to the recycling sites. So, giving knowledge about waste problems to raise environmental awareness and also how to support waste reduction should focus on the key man in each home or community. Giving knowledge and raising waste problem awareness to any person who is not the key man of the home or community has less effect on waste reduction participation.

Acknowledgments

Conflict of Interest

The authors declare no conflict of interest.

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