PLASTIC REDUCTION AND RECYCLING IN CONDOMINIUMS

Sponsored by Less Plastic Thailand

Affiliated with Bachelor of Science in Applied Chemistry (BSAC) and Worcester Polytechnic Institute (WPI)

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Abstract

Thailand was deemed one of the largest producers of plastic pollution in the world in 2019, generating around 27 million tonnes of plastic waste annually. The excessive plastic consumption in conjunction with lack of recycling within the country caused avoidable environmental issues and economic fallout. Partnering with Less Plastic Thailand, our team observed plastic waste habits and identified waste sorting issues, assessed other organizations strengths and weaknesses, and tested methods to increase plastic reduction and recycling efforts in the Regent on the Park 2 Condominium as a proof of concept. We recommended a full list of proof of concept guidelines and successfully proven research suggestions which included how to approach a condominium, systemic change, and marketing strategies to aid in Less Plastic Thailand's plastic waste reduction and recycling campaign within condominiums.

Acknowledgements

We have been fortunate enough to receive valuable advice through each step of this project. We would like to thank our professors and advisors, Ajarns Ester Boucher-Yip and Sumalee Passaretti from WPI for their help in preparing for this project, Ajarns Svetlana Nikitina and Brigitte Servatius from WPI and Ajarns Numpon Insin, Supawan Tantayanon, and Siripastr Jayanta for their advice during the project. This would not have been possible without your assistance. Next, we would like to thank our sponsor, Last Plastic Thailand, especially Samornmitr Lamsam, the head of Less Plastic Thailand, and Metha Senthong, coordinator of Less Plastic Thailand, for providing us with a goal and giving us the tools to reach it. Many of the changes we implemented in our condominium were based on ideas Less Plastic Thailand had used or considered using before this project. In this same vein, we must express our gratitude toward the other organizations which we interviewed. Each one helped us round out the trends and find where the biggest issues among multiple organizations were. Extra thanks to Varoon Varanyanond, assistant manager of Chula Zero Waste, for taking the time to meet with us and letting us ask additional questions. These interviews gave us a much better feeling for the status of Thai recycling. Last, but certainly not least, we wish to thank the staff of the condominiums we were able to observe. Speaking with the administrative committees of the Regent and the Park complexes and the H Condominium gave us a much better grasp on what the policies for recycling typically look like, and speaking with the maids gave us a better understanding of the scale of the issue. A big thank you to everyone who helped our project along the way!

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The editing and proofreading of this paper was a joint effort shared equally by all members of the team. We do not wish to assign editing credits of particular sections to any particular members.

Executive Summary

Background

Plastic waste has become one of the most pressing environmental issues all over the world. In 2019, Thailand ranked 6th in the world for marine plastic pollution. Thailand produces an increasing amount of about 2 million tonnes of plastic waste per year or around 12% of the total waste, according to TDPC (Thailand Department of Pollution Control), of which only 20% is recycled. This low recycling rate translates to environmental problems such as high greenhouse gas emissions through the landfill disposal process leading to climate change, and excessive plastic debris in the oceans that affect the fish population. These issues also lead to growth of waste piles in landfills which become waste mountains that can be seen all over the world. Our sponsor, Less Plastic Thailand, is a non-profit organization located in Bangkok, Thailand. Their main purpose is to increase engagement with plastic reduction and recycling in households located in Thailand.

Project Objectives and Goal

According to Thailand's Pollution Control Department, the annual rate of increasing plastic waste in Thailand is approximately 2 million tonnes per year. Of this, only 0.5 million tons can be properly reused while the remaining 1.5 million tonnes accumulate in dumping sites as well as improper locations. This is in part due to the increasing population of Thailand, especially in cities like Bangkok. As more people concentrate in urban areas, more condominiums are occupied. For this reason, it is important for condominiums to have effective and efficient waste sorting systems.

This project focused on plastic waste reduction and recycling in the Regent on the Park 2 condominium and applied the results from the study to increase the amount of properly sorted plastic waste in other condominiums. The project mainly focused on finding the understanding of the residents in the Regent on the Park 2 condominium, proposed the solutions to discover, and implemented methods that Less Plastic Thailand could use in other condominiums in the future.

Project Methodology

The following methods were used to fulfill the project objectives and goal:

Interviewing Other Organizations

The methods utilized to gather the information on these programs included research, interviews, and questionnaires. To break down these organizations, we took into account the

general purpose of the projects, target demographic, place of operation, and what they perceived to be their accomplishments and obstacles. The interview took place via an online platform because of the limitations of the pandemic. The questionnaire was available to the organization at any given time that they found most comfortable to submit, and a single submission per program was collected.

Finding a Target Condominium

The importance of focusing on a single condominium in our case study was essential in order to implement changes within the condominium on a smaller, more manageable scale. Our team specifically was interested in a condominium that was smaller than 100 rooms with an administrative committee that was willing to implement changes to their plastic waste sorting system.

Observe the Condominium and Interview the Administrative Committee

Identifying the problems that already existed in the condominium was a big step to begin with. The problems were found by observing the area around the condominium and interviewing the administrative committee. The interview allowed us to understand their perspective on the issue and what steps they have taken to manage the plastic waste.

Conduct a Survey on the Residents

The residents survey was used as a tool to collect the information from the residents that assessed their views and understanding about plastic waste reduction and recycling.

Analyze and Evaluate the Data from the Survey and Interview Results

After our team has collected the data from the condominium, the information was analyzed to assist the condominium in making their recycling system better and to create recommendations for Less Plastic Thailand.

Design Solutions for Condominium

The solutions were designed based on the data that we analyzed. In order to encourage the residents of the condominium to increase plastic waste reduction and recycling efforts, the implemented solution is assessed to evaluate the effectiveness of the proposed solutions.

Results and Findings

Other organizations interviewing helped our team gain a better understanding of the structure of other Thai plastic reduction and recycling programs, with the starting of small programs and focus on the change of systemic.

From our observations in our targeted condominium and other condominiums, we found that almost all condominiums that we observed have issues in a waste management area. The most obvious was the bins, with several problems. This caused the residents to place the waste into incorrect bins, which made the sorting even more difficult. The condominium administrations were also a problem in the sorting of the plastic wastes, because they put all the responsibility on the maids or the residents. This problem was worsened by a lack of understanding about the plastic waste management process by the administration.

Conclusion

Based on the cooperation of WPI, BSAC, and Less Plastic Thailand, and based on our findings during the process, we came up with the solutions and methods to solve and improve the problems of waste management. After a lot of interviews with the plastic waste organizations in Thailand, we aimed to focus on studying and improving the plastic waste management in the condominium as it had various types of people, and the size and characteristics of the area allowed us to study and collect the data comfortably. We attempted to use systemic change to improve and solve the issues, and based on the results, it was clear that the implemented solutions were working very well, as we could see a significant improvement in plastic recycling of the condominium. However, each location has its specific characteristics and issues, the implemented solutions might not be done successfully in every place. Knowing the area, people, habits, and the issues are things that must be understood to achieve the goal we set. The findings, accomplishments, and obstacles from each section are also the key facts of this project. Ideally, this information might be helpful to not just our sponsor, but to whoever reads this report, allowing our sponsor and others to develop ideas or solutions of their own, in order to improve the plastic waste issues in condominiums and elsewhere.

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Chapter 1: Introduction

Thailand is one of many countries that experiences low efforts in participation of the reduction and recycling of plastic waste. Less than a fifth of plastic waste generated in Thailand is properly recycled, and much of the plastic is not even brought to a landfill. The excess plastic use and lack of recycling within the country causes problems that could be avoided such as environmental issues and economic fallout. However, social aspects and factors such as lack of motivation to reduce and recycle plastic waste and barriers including the time commitment and complexity involved in sorting waste makes it difficult to aspire change.

Plastic waste programs, such as our sponsor Less Plastic Thailand, create awareness of the negative side effects of excess use of plastics and provide motivation to encourage the reduction of plastics and recycling. Less Plastic Thailand was recently founded by a group of activists in Bangkok in 2019. They play an active role in their community by releasing guidelines for plastic reduction and recycling, including how to sort waste, where to buy the bins, and who to contact in order to have your recycling properly collected. In addition, they create cartoons to educate people, mostly children, on the importance of reducing and recycling plastics and the proper way to handle plastic waste. The many partnerships they have obtained with community groups have allowed them to continue spreading this information and their influence among the communities in Bangkok. However, they still require help in increasing active participation in their program.

Our sponsor, as well as other plastic reduction and recycling programs, encourage participation through means of education, raising awareness, and encouraging enthusiasm for helping the environment; however, many of these programs' efforts are often ignored. Several of these programs also have low funds and resources and are stuck on how to continue their missions. With the abundance of plastic waste being generated everyday by households alone, the need to act quickly arises both for the wellbeing of the environment and the people of Thailand. These programs contribute towards these efforts but households are often unwilling to act despite the harsh long and short term effects of not reducing and recycling their plastic waste. Educating residents on how to properly sort plastic waste, as well as implementing effective strategies and ideas of other successful plastic recycling programs can highlight these issues and help to inspire change within households to drive them to participate.

This project specifically evaluated various plastic reduction and recycling programs and surveyed the residents of the Regent of the Park 2 Condominium in order to propose a set of

recommendations to provide to our sponsor, Less Plastic Thailand, on how to educate and encourage plastic reduction and recycling sustainably in condominiums. Along with the guidelines that will be provided to our sponsor, an infographic flyer was created for the purpose of educating the Regent of the Park 2 Condominium residents on how to properly sort waste in their specific condo. By distributing a survey to the condominium residents, conducting interviews with various Thai plastic reduction and recycling programs, and through site visit evaluations, our project investigated ways in which to increase condominium plastic reduction and recycling efforts and adventured ways to make it sustainable. The survey discovered the limitations of the waste sorting system implemented in the condominium as well as determining which specific scenarios would encourage residents to increase their individual recycling efforts. The interviews revealed various plastic reduction and recycling programs' biggest strengths and weaknesses, as well as their organization's successful and unsuccessful marketing strategies all of which will be reported back to Less Plastic Thailand in the form of recommendations. Utilizing the information collected, a formal set of guidelines will be given to our sponsor effectively informing them on how to educate and encourage plastic reduction and recycling sustainably in condominiums, along with an educational flyer that will be hung up within the condominium to show the residents how to sort their waste properly.

Chapter 2: Literature Review

2.1 Background

Plastic waste is one of the great threats to human survival in this modern world. Plastics are used with little regard to consequences and the full extent of these consequences may not be fully understood for years to come. Thailand is one of the largest producers of plastic pollution in the world, According to Coconuts Bangkok website (Kamolvattanavith, 2019), Thailand produces around 27 million tonnes of waste or the equivalent of 6 million elephants per year. Despite this, there is a low daily plastic recycling rate of approximately 15% and a significant portion which is not properly disposed of at all (Wichai-utcha & Chavalparit, 2018). These low numbers translate to environmental problems such as high greenhouse gas emissions through the landfill disposal process leading to climate change, and excessive plastic in the oceans that affect the fish population. These issues also lead to growth of waste piles in landfills which become waste mountains. These waste mountains are difficult to reduce as the different types of waste that compose them take different amounts of time to decompose. For example, according to the GoingZeroWaste (Kellog, K., 2019) and Peace Corps (n.d.) websites, it is stated that a single plastic bottle can take up to 450+ years in a normal environment, 1000 years in landfill, to degrade, and “one million” years for a single glass bottle. In terms of social issues and recycling there is a large connection between socio-economic class and the availability of resources, such as access to recycling facilities, people have in regards to recycling. There are also other issues such as personal commitment and investment for recycling. Our sponsor, Less Plastic Thailand, is a recently founded non-profit organization based in Bangkok, Thailand with the purpose of increasing engagement with plastic recycling. With hard work and intellect, this small group of activists have used media and contemporary art to help to educate the Thai community on the effects of plastic on the environment and what they can do to lessen that impact.

2.1.1 Thailand’s Plastic Consumption and Mindset Towards Waste

According to Thailand’s Pollution Control Department, the annual rate of increasing plastic waste in Thailand is approximately 2 million tonnes per year. Of this, only 0.5 million tons can be properly reused while the remaining 1.5 million tonnes accumulate in dumping sites as well as improper locations (Wongruang, 2018). This is in part thanks to the increasing population of Thailand, especially in cities like Bangkok.

A few notable policies have been considered to reduce plastic waste in Thailand. For instance, one of the major plastic pollutants is plastic shopping bags. In an article from the Bangkok Post (Wipatayotin, 2018), it is noted that it is common practice for market vendors to use multiple bags for their goods at the request of their customers, especially fish vendors, who may use up to 3 bags for a single fish, two for the fish itself, and one for the ice to keep it cool. To combat this, the city of Bangkok instituted a plastic bag ban at the beginning of 2020. Many people were very upset by the ban, especially market vendors who say that they will serve their customers before they reduce the amount of bags that they use. Foreign customers were also noted to be carrying reusable bags, which was typically looked upon admirably by the vendor, but was uncommon. Other related recycling policies include the reduction of plastic cap seals on water bottle caps which must be removed before drinking, and the reduction of foam containers at markets (Wipatayotin, 2018).

Though recycling and environmentally friendly practices are considered noble by Thai people it is notable that relatively few of them participate in the recycling process. In a previous IQP in Bangkok, students from a mission school and their parents were interviewed about their attitudes toward plastic waste and their interest in reducing how much they use and increasing how much they recycle. It was noted that most families use a water filter at home, but 13.5% didn't use one at all and 7.1% only used a filter sometimes (Molstad, et alt. 2018). This likely means that these families consume significantly more plastic bottles of water and are less likely to carry reusable water bottles around with them. A majority also said that if a program was instituted by the school to help reduce plastic use that they would try to follow it. This suggests that people are willing to change their habits and they would likely be receptive to a recycling-focused public education campaign.

In Thailand there are some cultural factors with which plastics have an association. An example is that cap seals for bottled beverages are seen as more hygienic, despite lack of evidence. Plastic bag use continues largely because they are seen as convenient, and the best way for people to package their goods. The culture of takeout food and delivery is a very important one in Thai culture and it often involves a lot of plastics for transportation, with the amount of takeout food only being increased due to the COVID-19 pandemic. These are all factors that contribute towards the plastic waste issue in Thailand and is something we seek to address in our project.

A majority of waste management programs don't focus solely on recycling, but also on reuse and reduction. These strategies are collectively known as the 3 "R's." Any plastic waste

recycling program will likely act on all three of these goals and not just recycling itself. This means that while our project has a focus on plastic recycling, it is not the only goal, with the reduction of plastic use in general and the introduction of more environmentally friendly reusable materials also being a focus for our sponsor. As discussed earlier, a main area that can benefit from reduction is the use of plastic bags. These bags are not recyclable, but they can be reused for household needs or even replaced with reusable bags.

2.2 The Impacts and Issues of Plastic Consumption and Waste

This section addresses the environmental and social problems that are associated with the lack of participation in waste management and the effects that occur as a result of these issues.

2.2.1 Marine Pollution from Plastic Waste

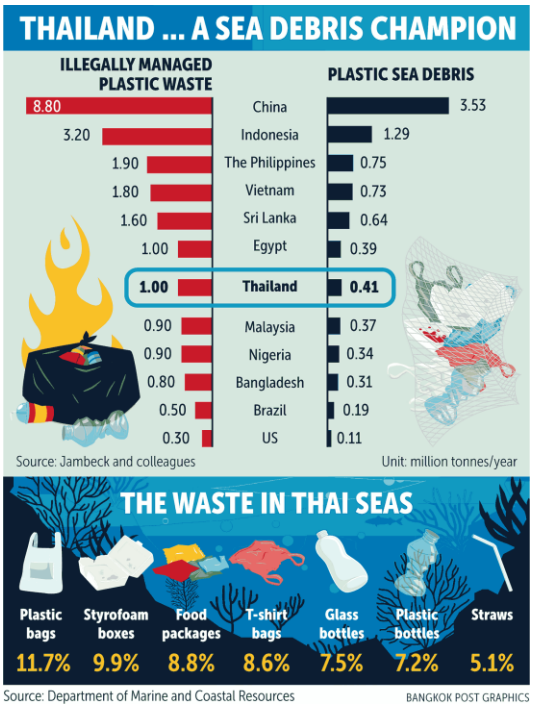
Plastic waste pollution leads to environmental problems such as climate change and excess greenhouse gases. These problems further impact communities within the environment and living conditions that range from ecosystems to the quality of air we breathe. Thailand is one of the largest contributors to plastic wastes in the world (Thailand produces about 2 million tons of plastic waste per year) which is contributing to the plastic pollution and ultimately climate change. This information can be used to help persuade people to increase their recycling activity.

One of the largest problems that Bangkok, the capital of Thailand, has been facing for many years now, is the amount of waste the public and businesses accumulate. The amount of waste itself is very large, about 9,900 tons daily to be exact, and only about 13% of this waste is being recycled per day (Atthirawong, 2016). The waste that is disposed of in a landfill goes through a process called decomposition which directly produces greenhouse gases like carbon dioxide and methane. These greenhouse gases are emitted into the environment, contributing to climate change. The extensive rice paddies in Thailand are directly impacted as a result. Specifically, the rice yield in Thailand is negatively influenced by the rising temperature because rice requires a lot of water to grow and climate change causes fresh water scarcity. Since Thailand is one of the largest producers and exporters of rice in the world, this will greatly affect them economically as a country (Arunrat, 2020).

Another environmental factor is the effect of plastic in the ocean. About 0.41 million tons of plastic enter the ocean each year, and Thailand is the 6th largest global contributor of plastic sea debris. Plastic in the ocean affects marine life, especially fish, through entanglement or ingestion of the plastic which usually leads to death. This will again affect Thailand

economically because Thailand is one of the world's top 10 major fishing countries (Derraik, 2002). Therefore, the lack of participation efforts to recycle translate to issues such as rising sea levels, extreme weather events, animal species, among others. Waste management has been deemed one of the national determined contribution measures for reducing greenhouse gas emissions (Thushari, 2020). Thus by increasing participation in recycling, these issues can be ultimately avoided.

Figure 1. Thailand...A Sea Debris Champion Infographic. A TDRI study of the sources of sea waste in Thailand during February to July 2019.



(Department of Marine and Coastal Resource, 2019)

2.2.2 Social Issues that Impact Plastic Consumption and Waste

There are a few different issues that affect the amount of plastic reduction and recycling that occurs within places like Thailand and Bangkok specifically around the world. One of the biggest contributing factors to the amount and effectiveness of plastic reduction and recycling is the income of the city and or country as a whole (Ferronato & Torretta, 2019), with special regard to the incomes of different areas and people within these places. This income issue is one of the most important because the amount of money available directly contributes to the resources which are available to assist in plastic reduction and recycling. The types of issues that it drives include the composition of the waste generated, which includes the amount of plastic

within the waste, the time which the people have to properly sort and manage their own waste, as well as the resources that are available in the different socio-economic areas of the city (Ferronato & Torretta, 2019; Chiemchaisri, Juanga & Visvanathan, 2007).

The composition of the waste generated within Bangkok, as well as the rest of Thailand is typically over 40% food waste, with the second most common material being paper, followed by plastic, with plastic being on average 13% or more of the waste generated (Chiemchaisri, Juanga, Visvanathan, 2007), as shown on *Table 1*. This composition of waste can affect how much plastic needs to be recycled as well as the availability of resources that enable plastic recycling. Typically the lower income an area is the less plastic there is in the waste. However, in urban environments such as Bangkok that percentage is skewed, as Bangkok has far higher waste generation rate than other areas of Thailand due to its massive population when compared to other regions of the country (Areeprasert, Kaharn, et al, 2018; WPR, 2020). This is extremely relevant because although the overall percentage of the plastic waste produced is lower, the actual overall amount of plastic waste generated by Bangkok is higher than in other regions of Thailand.

As a point of comparison, as of 2020 the United States produced approximately 35.6 million tons of plastic waste per day (EPA, 2020). Compared to the population of the United States, an approximated 331 million people (US Census Bureau, 2020), this gives a 1:9 pounds of plastic waste to population ratio, meaning each person creates .11 lbs of plastic per person per day. Of this plastic waste produced, approximately 8.5% of the waste is recycled (EPA, 2018). When comparing these numbers to Thailand, which has a population of approximately 69 million people and a plastic waste generation of approximately 8 million tons which provides an approximate 1:8.5 ratio of pounds of plastic waste to population ratio, or .12 lbs of plastic per person per day (WPR 2015; Wichai-utcha & Chavalparit, 2018), which is overall quite similar to that of the United States. The difference, however, is in the relative percentage of plastic recycled and or reused within the country. The US has a lower percentage of plastic waste recycled, at around 8.5% while Thailand has a percentage of approximately 13% of plastic waste generated being recycled prior to the COVID-19 pandemic (Wichai-utcha & Chavalparit, 2018). While this is a point towards Thailand having a good recycling system as it is better than the US, it is also a little bit misleading. Compared to other countries with populations even smaller than Thailand such as Taiwan and Sweden (discussed later in the chapter), Thailand has a very low recycling rate. This is compared to the US, where there is just over a 5% difference in recycling rate despite the population difference. Based on this, both Thailand and the US have low

recycling rates, which means it is not necessarily linked purely to population size. This does mean, however, that Thailand should be able to increase its recycling rate by learning from these countries that have higher rates of recycling.

Table 1. Waste Composition and Rate of Generation: The table shows the composition of the solid waste generated within Bangkok as well as other provinces in Thailand, as well as the waste generation rate. Municipal solid waste management in Thailand and disposal emission inventory.

Waste composition (%)											Generation rate
Province	Food waste	Paper	Plastic	Glass	Metal	Rubber/ leather	Textile	Yard waste	Ceramic	Others	kg/capita/day
Bangkok	43	12.1	10.9	6.6	3.5	2.6	4.7	6.9	3.9	5.8	1.5
Angthong	42	13.5	12.4	4.0	3.5	4.1	7.2	9.8	1.9	1.6	0.6
Chiangmai	54	11.0	15.1	9.6	2.1	0.9	2.6	1.2	2.1	1.4	–
Chiangrai	45	10.0	12.0	10.0	5.0	2.0	2.0	10.0	–	4.0	1.1
Kanchanaburi	50	17.7	19.7	2.4	2.0	0.3	0.9	4.6	1.4	0.9	0.9
Nakornratchasima	44	20.1	21.0	6.4	2.6	0.5	2.3	1.6	0.9	0.6	1.2
Nakornsawan	53	13.2	13.7	0.3	0.4	0.1	0.2	15.7	0.6	2.9	0.6
Nonthaburi	52	6.8	28.4	4.3	0.6	1.9	2.1	1.3	1.4	1.2	0.6
Pattaya	41	25.0	17.6	4.5	1.3	–	2.6	6.0	–	2.0	1.0
Petchburi	55	11.3	19.3	0.6	3.9	4.0	2.7	2.6	0.3	0.3	0.9
Phitsanulok	58	5.0	26.2	1.7	1.1	0.7	2.2	3.5	0.5	1.1	0.9

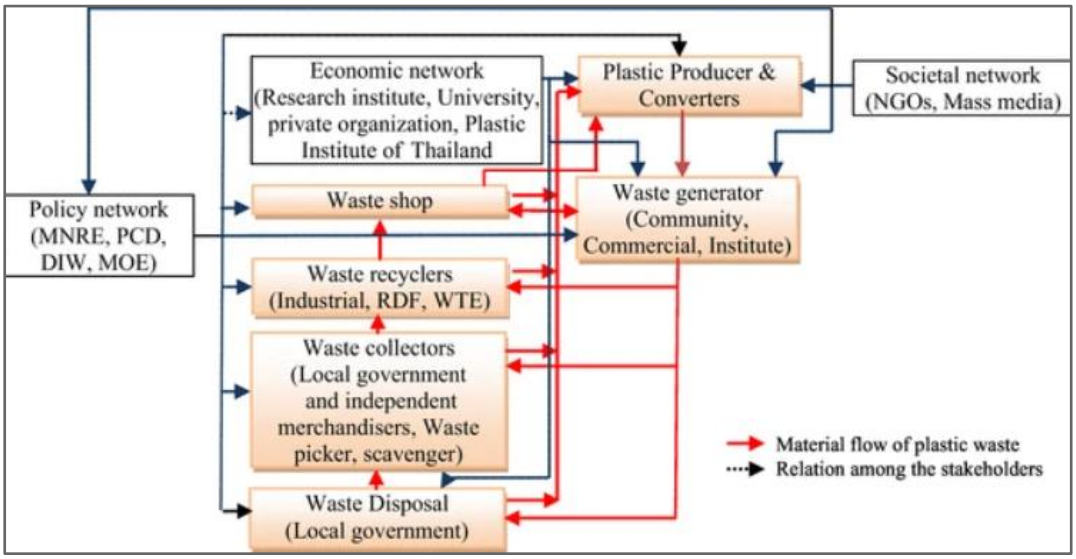
(Chiemchaisri, Juanga, Visvanathan, 2007)

Within Bangkok the demographics and locations of the population affect the amount of plastic waste that is generated. There are a variety of ways that different demographics are able to handle their plastic waste. There are two main ways in which plastic waste is handled in Bangkok, regardless of the income of the population of the area. These two main ways are management by independent businesses and management by the government (Sukholthaman, 2012).

First, independent businesses involve two parts, the business themselves and the people which they hire to collect the plastic waste. This type of business is fairly common, and has also been shown to increase the overall amount of plastic that is recycled, reducing the amount of plastic that makes it into the rest of the waste management system by upwards of 60%, in some areas nearing 90% (Areeprasert, Kaharn, et al, 2018). This method of having third parties in between the producers of the waste and the final recycling of the waste (typically done by the government) is fairly effective but only works well in areas where the practice is common and there are enough businesses available that accept a wide enough range of plastic, as a number of them only accept specific types of plastic (Areeprasert, Kaharn, et al, 2018).

The second most common way that plastic waste is handled is after it has been removed from the location in which it was generated. This method is most commonly handled by the government, whether that be the local government or higher up. Over half of the plastic generated within Thailand is ultimately handled and transferred to disposal sites by the local governments (Wichai-utcha & Chavalparit, 2018). The most common places that plastic ends up are either in landfills, where some of it is picked up by trash pickers which recycle or resell it, or at plastic waste disposal plants. These plants, however, only manage a relatively small percentage of the plastic generated that is not recycled earlier in the chain. This means that a large amount of the plastic generated is not being disposed of properly, which means it ends up not being recycled and also contributing towards pollution. Therefore, by recycling at the consumer level, more can be done with the plastic.

Figure 2. Plastic Flow in Thailand. The figure below shows the general flow of plastic waste in Thailand, including the groups or other organizations who contribute to the management of the plastic.

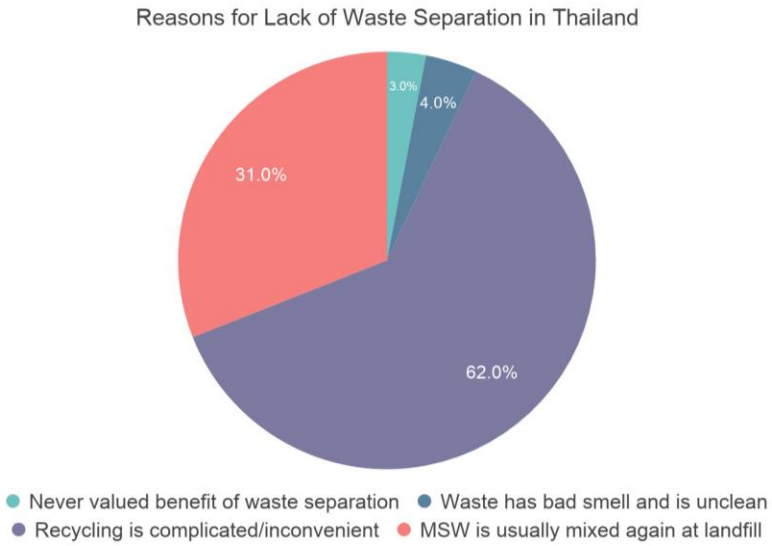


(Wichai-utcha Chavalparit, 2019)

The time commitment involved is another significant factor that affects participation numbers and ultimately involvement in plastic reduction and recycling programs. The time commitment associated with reducing plastic consumption and sorting waste, and therefore plastic recycling programs, is one of the leading contributing factors to the public's lack of engagement with the 3 "R's", reduce, reuse, and recycle (Challcharoenwattana, 2018). The process is time-intensive as it requires proper education of sorting waste, time to sort and prepare the waste, and time to dispose of the recycled items properly. Therefore, the overall time commitment that is required to effectively manage waste properly is a huge contributor to the

Thai public's lack of participation (Challcharoenwattana, 2018). Along with the time commitment needed to participate, the complexity of the recycling protocols is another reason that adds to the time component and inevitably affects involvement. The research article "Analysis of socioeconomic and behavioral factors influencing participation in community-based recycling program: A case of Peri-Urban Town in Thailand ", analyzed key factors leading to lack of participation in order to provide recommendations to community-based programs. *Figure 3* reveals the percentages of their key findings, and out of the factors they looked into 62% of people were unwilling to participate in recycling programs because they felt recycling is too complex and inconvenient. The complexity of the recycling program adds to the time as the more steps the program consists of, the more time is required to properly manage waste. The complexity aspect varies from program to program, therefore an understanding of the necessary steps is crucial to determine the key reasons to change in order to develop a successful program.

Figure 3. Reasons for Lack of Waste Separation in Thailand. The pie graph below represents the reasons for not separating waste defined by the research article, Analysis of socioeconomic and behavioral factors influencing participation in community-based recycling program: A case of Peri-Urban Town in Thailand.



(Challcharoenwattana, 2018)

2.3 Introduction to our Sponsor: Less Plastic Thailand

Less Plastic Thailand was created by Aaron, Nisha, Pan, and Nina who are the founders, and Mark and Giacomo who are the original co-founders, and it consists of other members who

share the goal of increasing recycling and reducing plastic waste. It is a non-profit organization located in the capital of Bangkok, Thailand. Their recent upshoot in prevalence in 2019 has been meaningful to the management of plastic waste to some extent. Their key method for information dissemination has been social media, in particular the use of cartoons, in order to attract an audience of all ages. Their website is also a source of information regarding recycling and waste sorting, and has a breakdown of their waste management system. Currently, Less Plastic Thailand relies on online tools to work with each other simultaneously across the world to produce fast and impressive results. Presently, Less Plastic Thailand has created many campaigns and has cooperated with many companies in recycling and managing different types of waste. Regardless of their efforts, Less Plastic Thailand struggles in ensuring the commitment of Thai people when it comes to reducing, reusing, and recycling plastics. According to their website, they have only gotten 30 households and 4 condominiums to work with them on their waste management system. Our team has been assigned to work with Less Plastic Thailand to find an innovative way to engage the public in these practices and therefore increase the reduction of plastic use. More information regarding Less Plastic Thailand can be seen in Appendix A.

2.3.1 Less Plastic Thailand Partnerships and Achievements

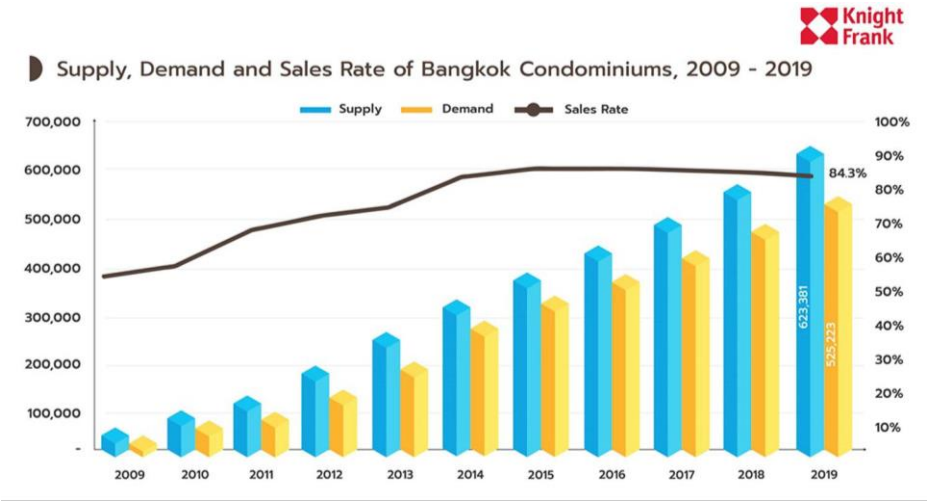
Based on the Less Plastic Thailand Website (n.d.), presently, Less Plastic Thailand has created many campaigns and has cooperated with many companies in recycling and managing different types of waste. Firstly, they are coworking with Chula Zero Waste to produce educational animations about the issues and solutions to waste pollution. Their videos are simple and basic so that primary and secondary school kids can easily understand and learn from the videos. For example, their video “Pacific Garbage Patch” gives information about how microplastics get into our food supply. They have also created a lot of activities for students and other age groups led by the Trash Ranger group. Trash Ranger is the team that was created to encourage young and older students to collect and sort the trash. Secondly, Less Plastic Thailand has also worked with big companies like ThaiBev. They have worked together to develop a project called “Hae Dak Kuad” to save PET bottles from ending up in the sea. ThaiBev sponsored 40 cages in the Pope’s Mass 2019, and now Less Plastic Thailand is using these cages from the waste. Thirdly, together with Thai Chamber of Commerce, Less Plastic Thailand is investigating ways to encourage an adoption of circular economic practices across businesses throughout the country. These practices are aimed at getting the most effective use and

maximum value from the resources by reusing, reprocessing, and repurposing. In this way, not only will the company profit, the impact from waste on the environment will also be reduced. They also have worked with the company “INDORAMA” to recycle and reprocess waste water bottles, PET, or thermoplastic, which can be recycled and reprocessed to produce PPE, or Personal Protective Equipment, which is used in the hospital to help medical staff to fight with COVID-19 pandemic. Finally, Less Plastic Thailand has also worked with BITEC company to create a project called “Green Venue" which is supported by the Circular Economy of the Thai Chamber of Commerce. It is a campaign that promotes ways green exhibitions can conserve energy and how to be environmentally friendly.

2.4 The Condominium Lifestyle Trend in Thailand

As people's lifestyles have changed over the last decade, people are trying to find a new way to live which is suitable and comfortable for them. Meanwhile, the population has greatly increased. Condominiums are smaller and more densely packed, and they are often located closer to the amenities. This is particularly true of downtown areas with their large number of cultural activities, shopping, entertainment, and job opportunities which could reduce their time spent en route to their destinations (Knight Frank Thailand, 2020). Given the attributes of the rail expansion and the lifestyle of modern people who increasingly desire convenience, there are hundreds of new condominium and apartment projects under construction in Bangkok. In 2019, there were 623,381 new units entering the market. The average annual total sales rate was around 84.3% in 2019 (Sarikaputra R., Knight Frank Thailand, 2020), indicating that the people living in condominiums are likely to have higher payer jobs which would leave them with more free time, such as to sort their waste.

Figure 4. Supply, demand and sale rate of Bangkok condominiums from 2009 to 2019. Show the bar graph of supply, demand and Sale rate of Bangkok Condominiums from 2009 to 2019.



(Knight Frank Thailand, 2020)

2.4.1 Idea of Successful Solution in the Modern Condominium

2.4.1.1 Condominium Under Plus Property Company Limited

According to the Propholic website (Boonyotin ,2020), the Plus Property Company has control of over 200 properties and has been involved in condominiums, town houses, and villages for over 20 years. They have recently begun a new waste management system that they call their “Green Mission."

Firstly, the company provides more specific bins in the form of cage bins. These include bins for plastic bottles, metal, glass, and paper. For the residents’ convenience, the company puts the bins throughout the condominium. The design of cage bins allows people to see the waste inside them, encouraging proper use.

Figure 5. Bin Recycling Station. A cage bin recycling station found on the streets of Bangkok.

(Boonyotin, 2020)

Secondly, the administration of the company created campaigns to educate and promote the waste sorting in their condominiums. These included campaigns to promote sorting waste, reduction and reuse some types of plastic waste, and encourage the reuse or refusal of plastic bags at stores. These campaigns also encourage the sale of recyclable waste to generate extra income, potentially as a reward to the residents for recycling properly. The administration also provided some machines called “Refun Machines” which allow residents to directly exchange plastic water bottles for money. The campaigns also suggest installing composters in the condominiums to help to control organic waste generated.

Figure 6. Refun Machine. The Refun Machine in use, collecting plastic recyclables in exchange for money.

(Boonyotin, 2020)

2.5 Types of Waste

There are several forms of waste which are classified into five main categories according to our sponsor. These five categories consist of organic waste, recyclable waste, hazardous waste, infected waste, and general trash. In Thailand, each category of waste is usually separated by the color of the bins which are green (organic), yellow (recyclable), orange (hazardous), red (infected), and blue (general).

2.5.1 Organic Waste

Organic waste, such as food and paper, is the type of waste that can be broken down using microorganisms by either aerobic or anaerobic digestion during composting. The major issue from this type of waste is the chemicals that are released after the matter is broken down. When waste is piled up in a landfill, oxygen can not reach the waste causing it to undergo anaerobic decomposition and generate methane. Methane is 25 times worse than carbon dioxide as a greenhouse gas. However, if harnessed methane can be a valuable resource. According to SoCalGas (n.d.), it is stated that the burning of methane generates significantly less CO2 and other pollutants than other hydrocarbons, such as fossil fuels, coal, and gasoline. In addition, methane can also be processed to make fertilizer by combining it with nitrogen in the air (Yara, n,d.). However, these processes require large amounts of money, often requiring funds from the government. This type of waste can also often be composted, a method Less Plastic Thailand encourages.

2.5.2 Recyclable Waste

Waste that falls into the category of recyclables is not only plastics, but also includes glass, paper, and metal. However, plastics are a major problem for the environment because some types of plastic release harmful chemicals. These chemicals can leak into groundwater or other nearby water sources that people usually consume for drinking water, potentially leading to sickness. Excessive use of single-use plastic is also an environmental concern as most single-use plastics are not recyclable, which means these plastics are likely to end up in landfills or improper places such as the ocean. According to The Thaiger (n.d.), Dr. Thon from Kasetsart University stated that “50% of all plastic waste found in the ocean is one-time use plastic bags.” In 2019, a campaign called “Everyday Say No to Plastic bags" was created to reduce the amount of plastic bags used, encouraging the use of reusable cloth bags as an alternative. The campaign

reduced the usage of over 2 billion plastic bags, or 5,700 tonnes of plastic as of January 2021, saving over 400 million baht.

Harrow Chiropractic (2014) classifies plastics into 7 types. 4 of these types of plastic are commonly harmful to the environment; PET, PVC, PS, and polycarbonate. PET (also known as polyethylene terephthalate, PETE, or polyester) is the most common, found in meal trays, various types of containers, and plastic water bottles, among other products. It contains phthalates which can contribute to cancer, skin problems and menstrual issues due to its endocrine disrupting ability.

The other 3 types of plastic are more easily recyclable. These are HDPE, LDPE, and PP. HDPE (High Density Polyethylene) is the type that is most commonly used, found in products like containers for milk, juice, and other liquid containers including some plastic water bottles.

2.5.3 Hazardous Waste

Hazardous waste is a type of waste that can cause harm to human health and the environment. Hazardous waste is found at all levels of society from industrial to household. It includes things like batteries and cleaning chemicals as well as a large number of different harmful liquids, gases, and solids. The United States EPA classifies hazardous waste into four categories based on its properties; ignitability, corrosivity, reactivity, and toxicity.

2.5.4 Infectious Waste

According to the World Health Organization infected waste is waste contaminated with blood or other bodily fluids, cultures, or stocks of infectious agents from laboratory work. This includes waste from autopsies and infected animals from laboratories, or waste from patients with infections like swabs, bandages, and disposable medical devices.

2.5.5 General Waste

General waste is anything that cannot be recycled or recovered easily. This type of waste includes: plastic bags, non-recyclable containers, mixed waste including food scraps, tissues, contaminated packaging, wood, and napkins (SUEZ, n.d.). According to SUEZ, it is stated that in Australia and New Zealand, this waste gets processed at Advanced Resource Recovery Technology (ARRT) facilities, which use anaerobic degradation to compost and convert organics found in general waste into soil conditioners or soil enhancers, which are substances that can be added to the soil to enhance its properties (Usry, n,d.).

2.6 Waste Management in Thailand

This section explores the general waste management in Thailand specifically explaining the waste sorting process after the waste collector picks up the waste and the waste management process in an average Thai household.

2.6.1 What Happens Behind the Garbage Truck

According to The Matter website (2019), it is stated that many people, especially Thai people, have a misconception about what happens after the waste truck picks up their trash. A lot of Thai people think that after the waste collector from the government has picked up the trash, the waste ends up mixing together. This is not true. This misunderstanding leads to poor waste sorting behavior as people think that there is no point to sorting the waste. The truth is that the waste collectors normally sort the waste behind the truck, and the reason they put it together is because they have to do it against the limited time they have. From the Waste Journey EP.2 by เถื่อน YouTube Channel (2021), it said that almost every trash truck has a recyclable waste bins in the middle of the truck. After the recyclable wastes are sorted, it is then sold to the company who acts as a middle man and delivers the sorted recyclable waste to the factory that will process the waste. In addition, they also stated that the waste collectors behind the truck receive around 600-700 baht per day by doing this.

Figure 7. Recycling Garbage Truck. The Recycling Bins on the Back of a Garbage Truck.

(เถื่อน, 2021)

According to the video from Pepsi Thailand, it shows that sorting behind the truck is not very effective because the waste collectors do not have much time and have to keep picking up wastes from other places so some of the recyclable waste may end up mixing and get crushed behind the truck, but the waste collectors do their best to sort out the recyclable wastes as much as they can. Therefore, the most effective way is to sort since the beginning of the pathway, and this allows the waste collectors to sort easier, faster, more efficiently.

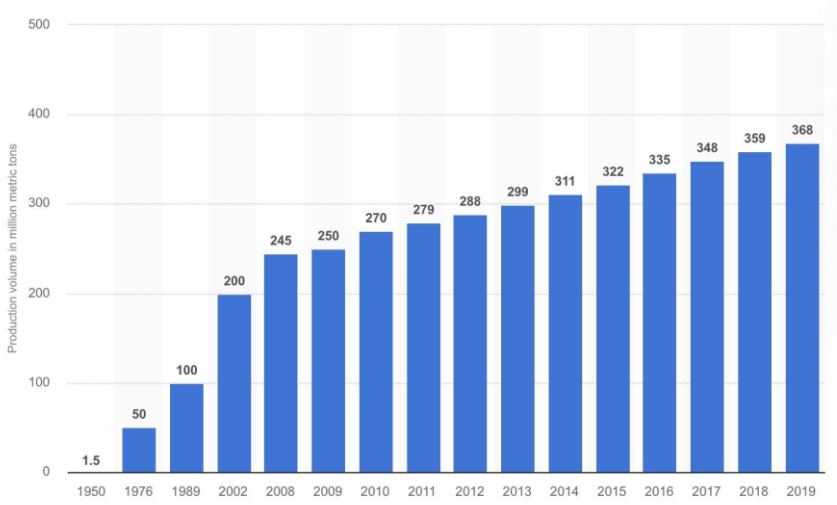
2.6.2 Recyclable Waste Collector or Saleng

According to Waste Journey EP.2 by "เถื่อน" channel on YouTube (2021), it said that there are over one million Salengs around Thailand who pick up recyclable wastes from the public bins or the recycling station in front of household, which most of the wastes are not being properly sorted. Therefore, Salengs have to unpack the trash bags, bring out the recyclable wastes, such as paper, plastics, and others, and do a better sorting at their home. The income for Salengs are mainly from selling recyclable wastes, and if the waste is well sorted, like separating the lid from the plastic bottle, Salengs will gain more money. Therefore, the better the sorting, the better the price and the higher the income.

2.6.3 Plastics Recycling Process

Plastics are ubiquitous in modern life beginning from the product of human ingenuity and innovation to make life unbelievably simple for everyone. Since the development of plastic, it has become a popular material and is seen everywhere, used in a wide variety of ways due to its properties. Being lightweight, durable, inexpensive, and malleable allows plastic to be made into a huge range of products. Global plastic production has been rapidly increasing since 1950. In 1950 the world produced only around 2 million metric tonnes per year. Since then, annual production has reached 368 million metric tonnes in 2019 (Tiseo, 2021).

Figure 8. Worldwide Plastic Production. This graph shows the amount of plastic production worldwide from 1950-2019.



(Statista, 2020)

One good way to control the production of plastic is to recycle the plastic that has already been produced and use it to make new products. Plastic recycling process is broken up into a few distinct steps consisting of collection, sorting, washing, resizing, identification, separation, and compounding. Generally, the steps remain the same for most types of recycling facilities. Recyclable material should be rinsed by the consumer before disposal to ensure that waste is easily processed.

2.6.4 Waste Management in Thai Households

In Thailand, a main issue in the waste management process is the lack of sorting performed by the people. Many kinds of waste are intermixed, creating an issue for people who would like to see plastic waste recycled. This gives rise to the trash pickers, people who sort through the landfill waste and sell the recyclables to a recycling program, similar to the people in America who do much of the same, and cash in the recyclables for the deposit. Thailand doesn't use a deposit system, but recycling plants will buy plastics off of people and businesses that act as middlemen. These trash pickers are one of the only groups that may stand to be harmed by the full success of our project. However, they could get a job working with plastic recycling outfits, seeing as they've been doing similar work independently for years.

In an ideal world, all this trash is sorted and brought to the proper place. The plastics and other recyclables are brought to their respective facilities, the organic waste is composted, by outside agencies or by the people who produce it, and so on. Less Plastic Thailand also has

several contacts including regular trash collectors who resell the plastics for money and Saleng drivers, private trash collectors who collect and sell the plastic waste, as well as having plastic drop points throughout their area of operation. However since most of the waste in Thailand is not properly sorted, a majority of it ends up in a landfill with the rest of their trash. Seeing as only about 20% of plastic waste in Thailand is properly recycled, our project aims to increase that number (Gheewala, 2011).

2.7 Examples of Waste Regulations in Other Countries

It is expected that solid waste produced in municipal areas will rise from around 2 billion tonnes in 2016 to 3.4 billion tonnes in 2050. Among the world's richest nations, the amount of waste generated, per person, per year, far outweighs amounts in all other global regions. On average, 2.2kg of waste per day is generated by someone in North America, compared to just over 0.5kg in South-East Asia. Wealthy nations, which account for just 16% of the world's population, produce 34% of the waste, whereas low-income countries, which account for 9% of the world's population, generate only 5% of the global waste. Not only is this massive amount of pollution fueling the breakdown of the atmosphere, it also overwhelms other vital ecological life support systems (Rapid Transition Alliance, 2019). To counter climate change, tackling waste is important. Landfill sites where the strong greenhouse gases, methane, and other pollutants are dumped with a lot of household and business waste must be addressed. With more reuse, recycling and avoiding waste in the first place, it can be avoided or greatly reduced. Thailand could utilize these examples to learn how to reorganize their recycling programs on the governmental level.

2.7.1 Taiwan

In 1987, a small group of ten Taiwanese women met under the name Homemakers United to speak about their environmental issues. Just over 3 decades later, their actions resulted in enormous changes in the mindset of their country to recycling and waste. Taiwan today boasts a world-leading 55 percent recycling record, and daily waste disposal has fallen significantly from 1.14 kg per person in 1998 to less than 0.4 kg per person by 2015 (Homemakers United Foundation, 2020). The island produces half as much waste as the US per person. This tiny environmental community stopped the incineration of millions of tons of waste and launched their nation on the road to zero waste.

Taiwan gathered only 70 percent of its garbage back in 1993, with the remainder polluting the atmosphere by littering or burning. The nickname 'Garbage Island' was given to the nation. Its booming economy and rising consumption levels meant more and more waste was generated. The reaction of the government was a massive incineration program. However, by taking their supporters and even their garbage into the offices of the Environmental Protection Agency (EPA), Homemakers United demonstrated that 40 percent of municipal waste could be recycled and 35 percent composted, and demanded a municipal recycling system be established.

Today, an integrated framework ensures that producers, importers and customers all pay for waste collection, recycling and disposal. Yellow garbage trucks blasting classical music pick up trash several days a week for households. There are more than 4,000 pickup spots five nights a week in Taiwan's capital Taipei with mobile apps that allow users to monitor the trucks and warn them whenever a garbage truck is nearby (The News Lens, 2019). These trucks are supplemented by open-bed recycling trucks to collect raw food waste from homes, cooked food waste, and other categories, including composting and recycling plastic and paper. As part of the Pay As You Throw (PAYT) system, individuals must buy official blue bags for disposal. Under the Extended Producer Responsibility (EPR) scheme, which measures the real cost of disposal of any commodity, manufacturers and importers must also contribute. Proceeds go into a fund that pays for the recycling system itself.

The government then developed a long-term waste management strategy that at the individual and corporate levels implemented the principle of individual responsibility or "polluter pays". Homemakers United has maintained pressure through a deliberate attempt to focus the minds of the population on waste reduction. The Recycling Fund made sure that it was possible to pay for all this work. The Recycling Fund of Taiwan raised NT$7 billion in 2012. Since 1998, the fund has bought over 1,300 municipal recycling vehicles and sponsored 273 storage facilities for 326 municipal collection squads (Smithsonian Magazine, 2019). A toll-free line alongside a website was set up for inquiries about what and how to recycle. A national competition for a recyclable symbol for Taiwan, which is now used on all recyclable goods, has been held. To update businesses on waste initiatives, an e-newsletter for producers and importers was released, with 13,144 subscribers to this e-newsletter by the end of 2011, plus recycling manuals, leaflets, posters, stickers, and CD-ROMs for the general public. Recycling bins for particular items such as batteries have been installed in popular public locations, including convenience stores, colleges, and neighborhoods. In the annual Dragon Boat races, they also added a recycling feature, encouraging contestants to use recycled materials when constructing

their boats. To foster a zero waste mentality among those taking part in the huge annual procession, the enormously famous Mazu religious festival was used.

Recycling is taken seriously and repeat offences will result in public shaming by releasing video recordings from surveillance cameras with the identity of the perpetrator blurred out. The authorities believe that this functions as an incentive for the criminal not to breach the laws again. While other countries might anticipate issues relating to civil liberties in implementing similar shaming schemes, depending on how it is performed, they might be wary of their desirability and probability. Fines are often imposed on those who violate the system, and up to half the value of fines received can be given as incentives to show breaches, such as rewards for reporting illegal fly-tipping.

Homemakers United continues to keep the government responsible for environmental concerns. This generated tremendous pressure to prioritize environmental concerns for city mayors (Homemakers United Foundation, 2020). And before it enters the recycling grid, the latest campaign is to reduce waste intake and packaged products in order to create a zero-waste circular economy. All of these strategies employed by Taiwan could be put in place by Thailand, and the value of community organizing is shown in the story of Homemakers United.

2.7.2 Sweden

Most people see things they throw away as waste they want removed. The citizens of Sweden, by contrast, see resources. The innovative Swedish approach to reusing garbage makes it one of the greenest places to live in the world. In 2019, the average material recycling rate was 68 percent for all types of packaging, according to the method of measuring material recycling rates used for reporting to the EU (Natur Vards Verket, 2020). Not only did the Swedes surpass their target of a material recycling rate of 55 percent for the total packaging waste, but their deposit system and futuristic mindset sets them years apart from other countries. This makes them an excellent example in the progress of recycling and the development of a circular economy.

Swedes found that many vital products are hard to dispose of. Therefore, a new movement that seeks to ensure everything can be reused somehow arose from this struggle. Along with this idea and others, the Swedish government even established a new economic model that focuses on products that can be reused completely, a so-called cradle-to-cradle approach. They went as far as including a special advisory, back in 2018, that would help make the circular economy a key part of government policy (Hinde, 2020).

At the forefront of this movement was the need to change behavior in all citizens. Older generations found recycling abnormal given their upbringing and thus took the most convincing. The main protagonist in this movement is a startup from Stockholm. Beteendelabbet, which means behavior lab in Swedish, has tried to find innovative solutions to sustainable living over the years. Their goal consisted on transforming the Swedes' lives with services that people need to make it easy to do the right thing. They believed that they needed to make it possible for consumers to share and reuse all kinds of gadgets, clothes and furniture, even in workspaces and homes. With hard work and pressure, the idea of a healthier community was heard. In 2017, the Swedish government reformed the tax system so that people could get cheaper repairs on used items (Hinde, 2020). Swedish companies, such as H&M, switched up to promote recycling, for instance, giving customers discounts upon handing in old clothes. Along with that, researchers are working on finding new clothing materials that are less damaging to the environment.

In the process of switching over to a greener way of living, leaders found themselves realizing that a good starting point is to look at how they can change their habits and everyday behavior. Therefore, the concept of nudging came along, in which they would make small changes to people's surrounding and lifestyle to help them live sustainably. With their research, they were able to identify the three biggest contributors to their carbon footprint: the amount of meat consumed, the amount of stuff thrown away, the amount of travel by flying. In order to address the large amounts of waste created, the Swedes had implemented a can and bottle deposit system that gives people money back when they recycle, starting 1984 for aluminium cans, and 1994 for plastic bottles. Each year Swedes recycle 1.8 billion bottles and cans that would otherwise be thrown away using the so-called pant system (Pantamera, 2019).

Sweden's reuse revolution would not be possible without changing people's motivation and desire. It's hard to pinpoint each single person's reason behind recycling and participating. Could be either thinking about the future of their planet for the children and other generations to come, while it could also be fright of legal consequences on the government's part. Given this, the Swedish Waste Management Association believed their optimal way of making a change was to facilitate the circular activity. This means things such as motivating and guiding citizens and consumers to change their behaviour to be more sustainable, but also making the infrastructure available for people to do the necessary sorting for themselves. Their approach not only concentrated on where the product finally ends up as waste, but they found themselves transforming everything from production to consumption and use of products. Today, Sweden is one the countries that leads by example towards improving the world's health.

After extensive investigation on waste management in other countries, there is a visible common factor that pushes society from one side to the other; motivation. No country, regardless of their culture, location, etc had a zero-waste guidelines set in the beginning. Even though some countries have implemented new rules many years ago, does not mean it's too late to reverse the damage in other countries. One of the greatest examples of the damage of plastic being reversed is Taiwan. The amount of waste produced was immense and therefore Taiwan was known as the 'Garbage Island'. However, it was its own citizens that took this issue into their own hands and proceeded to gradually make changes in their livelihoods for a common good, a green future. Examples like this show that Thailand is capable of this change, but currently lacks the commitment of its people. With that being said, many other countries went through the same struggles and overcame them. From the research done, motivation and education are key, and it can be in several stages. The safest path to developing this motivation, is to first learn about the community in question. It is in our best interest to understand how the citizens of Thailand feel about recycling currently and how to encourage them to think about recycling in a way that is more cohesive to our goals. With that said, the ideas of a circular economy, peer pressure, and providing better recycling services could be the way to go for Thailand as well.

2.8 Communicating Reduction and Recycling of Plastic Waste

This section explains effective advertising and promoting strategies through the use of social media platforms and through physical means. Social media is an online marketing tactic while physical tactics include strategies such as face-to-face encounters through meetings, flyers, etc. It is important to recognize these successful strategies as they can be implemented within the marketing plan of recycling programs to improve their number of participants in their program, and ultimately help reach Less Plastic Thailand's goal of increasing recycling rates within condominiums.

2.8.1 Effective Physical Advertisement of Recycling and Reducing Plastics

Due to the COVID-19 pandemic, the use of an online social media platform is heavily relied on and is currently the most favorable method to advertise as in-person encounters are not feasible among many countries. However, the CDC currently updated Thailand as a "Level 2: Moderate Risk of COVID-19" which implies in-person activities could potentially be attainable in the near future (CDC, 2021). In addition to online strategies, the application of certain physical marketing strategies such as community-based social marketing programs is proven to

increase recycling efforts. Strategies such as automatic curbside distribution of recycling containers along with face-to-face contact are the most effective methods to encourage recycling efforts. These strategies were chosen to overcome barriers stopping people from participating such as inconvenience, social norms, and lack of education. Face-to-face communications lead to an increase of positive attitudes towards recycling, and make the consumer feel involved and more likely to participate. The curbside distribution of recycling bins removed the time commitment needed to collect a container for recyclables and therefore made it easier to participate (Haldeman, 2009).

2.8.2 Successful Methods for Promoting Information Through Social Media

An effective persuasive strategy is crucial in order to develop and promote any business (Pain, 2019). Good marketing strategies encourage growth within the organization and provide opportunities for insight on your business. One current method of creating an effective marketing presence is through the use of social media platforms.

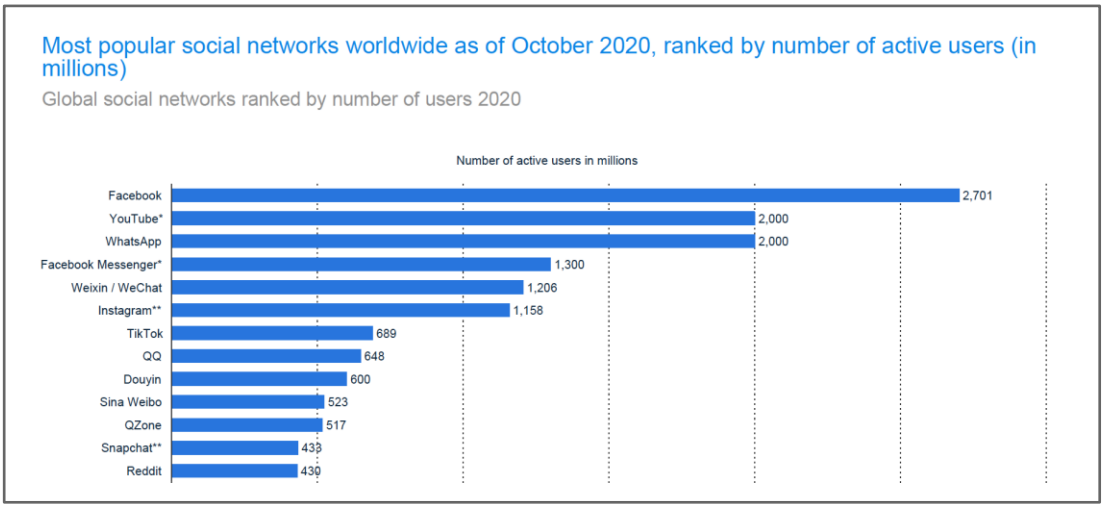
2.8.2.1 Social Media Information

Social media has become a major part of the daily lives of consumers (Voorveld, 2019). It was estimated that the daily average time spent worldwide on social media and messaging applications was 145 minutes a day (H. Tankovska, 2021). That is over two hours a day people spend scrolling on social media. It is predicted that there will be over 4.4 billion social media users by 2025. In recent statistics from Hootsuite (2021) in January 2021, the total number of active social media was around 4.2 billion users, with Facebook being the most popular with almost 2.74 billion active users. This means that around two of every three people on social media are Facebook users. This means that using social media apps, especially Facebook, is beneficial for businesses to engage people and to keep the businesses relevant.

Figure 9 shows the most popular social media applications worldwide. Focusing on these applications tends to be the most effective use of time for businesses. Computer-Mediated Communication for Business states that there are seven key factors that go into developing compelling messages that include: identity, conversion, sharing, presence, relationships, reputation, and groups (Pain, 2019). An identity is important for the audience to understand the creator and relate to them. Once that identity is created, sharing meaningful content will create an active social media community that strengthens the relations between organization and consumer. Manifesting a community relies on a strong reputation through building trust that

occurs over a period of time. Commitment to utilize these seven key factors takes effort and time.

Figure 9. Popular Social Media Platforms. Most popular social media apps as of October 2020. Active users are listed by the million.

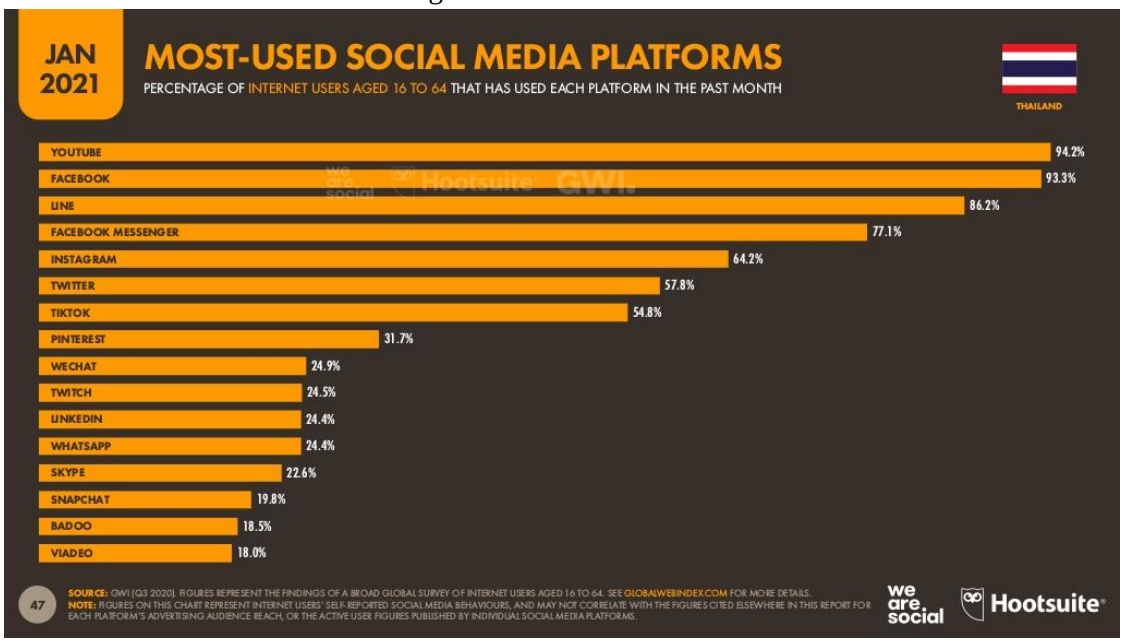


(Statista, 2020)

2.8.2.2 Social Media in Thailand

According to the Digital Report of Thailand from Hootsuite (2021), in January 2021, the total number of active social media users in Thailand is 55 million. The most popular application is Youtube, followed by Facebook and then LINE. Youtube is a video hosting service that is used worldwide and Facebook is the most popular social media application used worldwide. LINE however is a messaging app that is most popular in Japan, Taiwan, and Thailand. It also contains settings that allow posts similar to that of Facebook. Figure 10 shows the percentage of internet users in Thailand between the ages of 16-64 who interact with different social media applications at least once a month. More specific information regarding the age groups that are targeted with social media ads and the format of those ads can be found in Appendix E.

Figure 10. Social Media Platforms in Thailand. Most used social media platforms in Thailand between ages 16 - 64 in Jan 2021.



(Digital 2021 Thailand, 2021, p. 47)

Chapter 3: Methodology

This project aims to help Less Plastic Thailand promote and spread information regarding plastic waste reduction and recycling by providing a long-term educational plan and guidelines to be implemented among the members of a condominium community. With help from Less Plastic Thailand to focus our goals, we chose to concentrate on the communities of condominiums and the reduction and recycling of plastic waste within them. To achieve these goals, we developed a set of objectives:

1. Evaluating existing plastic waste reduction and recycling programs in Thailand.
2. Identify plastic consumption and waste habits in a Thai condominium.
3. Design the solutions and propose suitable strategies to help Less Plastic Thailand and advocate for increased plastics recycling among residents in the condominium.

3.1 Objective 1: Evaluations of Existing Plastic Reduction and Recycling Programs in Thailand

The first objective was aimed to look more closely at previous methods used within Thailand to identify systems, benefits, challenges, and evaluation measures within these programs. In order to accomplish this objective, we questioned and analyzed programs that focused on waste management initiatives, more specifically, decreasing plastic use, throughout Thailand. To break down these organizations, we took into account the general purpose of the projects, target demographic, place of operation, and what they perceived to be their accomplishments and obstacles.

The methods utilized to gather the information on these programs included research, interviews, and questionnaires. After researching different Thai plastic reduction and recycling programs, we contacted them via online messaging, and sent a formal invitation to participate and aid in our research. If the organization agreed to participate in a video call interview, a consent form plus interview questions were provided to look over prior to our meeting. However, if the organization was unable to meet for an online chat, we provided a consent form and an interview questionnaire so they could still participate in our project. The organizations that responded to our invite were: Trash Hero Thailand, Chula Zero Waste, Zero Waste Thailand, and Can Do Team. The interviews were held through Zoom, a video telephony software program, at the time the interviewee found most convenient. The questionnaire was available to the

organization at any given time that they found most comfortable to submit, which was a single submission per program.

There were several limitations in using these methods. Since we identified specific individuals to interview, we depended on their availability. As COVID-19 had limited the ability to travel for half our team, we had to work with a twelve-hour time difference. This made it difficult for the entire team to meet with several organizations given that their available times did not correspond with ours. For these organizations, a questionnaire was created for them to complete on their own time. The interviewers and the questionnaire asked the same questions, which can be found in Appendix A.

3.2 Objective 2: Identify Plastic Consumption and Waste Habits in a Thai Condominium

The second objective of our project consisted of determining the target condominium that would be used for our case study and identifying the plastic consumption and wastes habits of the residents living in this condominium. This target condominium was chosen based on key characteristics that made it feasible for the team to collect and analyze data, which will be further explained in Section 3.2.1. In order to identify the plastic consumption and waste habits in the target condominium, an observation of habits of the residents as well as a survey were used. These were important methods to assess the efforts and knowledge of plastic waste reduction and recycling in the condominium. An evaluation of the administrative staff was also crucial to understand where the management stood in regards to plastic reduction and recycling within their condominium. The purpose of collecting this data was to understand the condo's waste system from the staff and residents' point of views to recognize ways the system could improve.

3.2.1 Finding Our Target Condominium

The importance of focusing on a single condominium in our case study was essential in order to implement changes within the condominium on a smaller more manageable scale. The selected target condominium was chosen based on our findings we obtained from evaluating and researching numerous other condominiums. Our team specifically was interested in a condominium that was smaller than 100 rooms with an administrative committee that was willing to implement changes to their plastic waste sorting system. The data collected after implementing these changes was crucial to collect in order to see what waste management

methods would work specifically in a condominium. So therefore, willingness to implement chance in the condominium was the most important consideration when choosing a continuing to use in our case study. Other than condominium size and consent to change their waste sorting system, our team was very open to any condominium located in Bangkok that was willing to work with us.

3.2.2 Identifying Waste Issues and Waste Habits in the Target Condominium

Before we could work on solutions, we had to identify the problems that already existed in the condominium area. The examples of the things that were to be identified included what the problems are, who takes responsibility for those issues, how the waste management system in the condominium works, and other such factors. These things were found by observing the area around the condominium and interviewing the administration and the maids. After we gather the issues, we then can prepare and design for the solutions on things we want to fix and improve.

For the waste habits of the residents, we wanted to obtain a wider image of the waste in the condominium. Our team members performed observations of the condominium over the course of multiple days at approximately the same times each day. Observations were performed at the same time of day to gain a better understanding of the habits of the residents. A proper understanding of the habits of the residents was necessary to know what sort of information we would need to directly collect from the residents with the survey.

3.2.3 Interview Administrative Committee of the Target Condominium

The condominium administrative committees are the groups responsible for managing the condominium in specific areas. An interview with the administrative committee was performed to introduce our team to the committee as well as gain an understanding of where the committee currently stands in regards to plastic and recycling. The interview also allowed us to understand their perspective on the issue and what steps they have taken to manage the plastic waste. It also provided a chance for us to provide them the feedback from the residents as well as discuss what they might want to gain from the collaboration with our team. The full list of questions for the administrative committee can be found in Appendix C.

3.2.4 Conduct Survey of the Target Condominium Residents

After gathering information from the condominium's administrative staff, a survey was administered to the condominium residents via Google Forms to acknowledge their views and

input. Two versions of the survey were distributed: one in Thai and the other in English for the ease of the participants to choose which they felt more comfortable filling out. The goal of the survey was to collect information from the residents that assessed their views of the condo's current waste sorting system and understanding about plastic reduction and recycling by focusing on self evaluation questions and opinions on the waste sorting system in the condo. Specifically, questions on the survey asked the residents their opinion on the importance of recycling as well as selecting scenarios the residents would be more inclined to recycle in, such as more clearly labelled bins, having a money incentive, among others. Opinion based questions were asked to the users of the waste sorting system in an effort to gain honest feedback for future improvement, which were eventually implemented in the objective three methods. There were also self evaluation questions, like "Do you separate your plastic waste?" and "If not, why?", to pinpoint the reasons why residents were not sorting their waste and develop ways to better the system to increase plastic recycling within the condo. Many of the questions were intentionally nonspecific, using words such as "sometimes" and "often" to encourage a more honest response. We also asked residents to check off what type of plastic materials they used most frequently, as to determine what specific plastic waste we would consider targeting for objective three. The results of the survey exposed the issues of the waste sorting system already implemented in the condominium as well as ways the condominium could change their system in a way that the residents would be more inclined to recycle and sort their plastic waste. The full survey for the residents is found in Appendix B.1.

3.3 Objective 3: Design Solutions and Propose Suitable Strategies for Improving Plastic Waste Management in the Target Condominium

This section addresses the third objective which is to propose solutions that the condominium can implement within their condominium to help with their recycling issues that should also be able to be applied with some adaptation to other condominiums in Thailand. These solutions, as well as information obtained from other organizations will form the basis of a set of recommendations for Less Plastic Thailand to aid them in working with other condominiums. This will enable them to participate in Less Plastic Thailand's goal of increasing recycling and reduction of plastic waste.

3.3.1 Analyze and Evaluate the Data from the Surveys and Interviews

Once all of the data from the condominium has been collected, the next step was data analysis. Full analysis of the data can be found in Chapter 4. Based on the information collected from the other organizations in conjunction with the information collected from the condominium we performed two tasks, explored later in this section. Those tasks aimed to assist the condominium in making their recycling system better and to create a set of recommendations for Less Plastic Thailand to enable them to work with other condominiums more effectively in the future.

3.3.2 Design Solutions for the Target Condominium

After our analysis, we began to design the solutions for the condominium and implement them based on the previous section's findings (3.3.1). In order to encourage residents of the condominium to increase plastic reduction and recycling efforts, the implemented solution is assessed to evaluate the effectiveness of the proposed solutions. Based on the results collected, a recommendation has been created and will be given to Less Plastic Thailand on how to proceed with plastic waste reduction and recycling efforts in condominiums in Thailand.

3.3.3 Comparing Our Target Condominium with Other Condominiums

This analysis was done to compare the differences and similarities in the waste management systems of other local condominiums, as well as the issues within each by observing and interviewing those responsible for the waste station in the condominium. In order to get the most out of our comparison, we selected buildings that related to our target condominium, such as a condominium within the same associated company. We then interviewed the person in charge of the waste management in the building, and then we used the data to compare with our target condo.

3.3.4 Create a Set of Recommendations for Less Plastic Thailand to Work with Condominium Communities.

Based on the information that we obtained from our background research, interviews and questionnaires with other plastic reduction and recycling programs, and the methods that we applied to the Regent on the Park 2, a set of recommendations for Less Plastic Thailand to use to work with other condominiums has been created. The results of our work with the condominium

are used as a proof of concept on some of the recommendations that we will be providing to Less Plastic Thailand. Some recommendations are made based on proof of concept while others are suggested based on the experiences of other plastic waste management organizations. The specific recommendations focused on the following subjects: successful and unsuccessful social media tactics, marketing strategies, waste sorting systems, how to approach condominium management, and assessing the knowledge of the residents. The full set of recommendations can be viewed in Chapter 5.

Chapter 4: Results and Analysis

The goal of this project was to gain a better understanding of plastic use and waste management in Thai condominiums; to later suggest a plan to reduce plastic waste and consumption and increase recycling. In this chapter, we present and discuss key findings from our observations, surveys, and interviews as well as the results of our implemented methods.

4.1 Evaluations of Existing Plastic Reduction and Recycling Programs in Thailand

The process of evaluating existing plastic reduction and recycling programs helped us gain a better understanding of the structure of other programs, as well as determining common approaches and shortcomings. From the insight given by these organizations, we found three persistent themes that we believed were necessary for the success of a plastic reduction and recycling program. To obtain this information, we questioned several organizations including Trash Hero Thailand, Chula Zero Waste, Plastic Free NIST, Zero Waste Thailand, and Can Do Team. Each of these programs gave insight into the challenges and achievements they found while addressing issues with plastic. It was important for us to understand what factors strengthen and weaken an organization and believed that analyzing other well-rounded programs would guide us to understanding the requirements for community development projects and provide paths to explore various potential benefits and downfalls, both internally and externally.

4.1.1 The Effectiveness of Starting Small

After looking through the organization's responses to our questions and analyzing their input, we determined that the different strategies to reduce plastic are most effective depending on the size of the target audience. We found that community involvement, educational awareness, and waste separation programs work better with smaller populations. For instance, Plastic Free NIST was able to eradicate single used plastic such as cups, straws, and utensils in the NIST cafeteria, a smaller sample group, by introducing alternative materials. There are a variety of strategies that can address the plastic consumption problem in Thailand. Taxing, incentivizing single-use plastic, providing alternatives, and educating youth are some of the strategies that can successfully reduce plastic consumption by targeting the issue from multiple angles.

After targeting an audience, it is important to assess several components of its community. Chula Zero Waste highlighted that in order to implement effective change, first identify its plastic consumption and waste habits. That way, we can know what needs to be improved or changed. For instance, Chula Zero Waste analyzed its college community and what their biggest plastic consumption came from, which was single-use plastic cups. They were able to eradicate the plastic waste from single-use cups by first understanding this was an on-going habit in the target community, and then introduced its audience to reusable materials that could replace plastic cups. The organization managed to reduce the use of two million plastic cups by making a small impact that adds onto the greater effort of helping the planet.

Lastly, we found it is more efficient to work on addressing a specific type of waste rather than attacking several issues at once. Even though an organization would ideally want to manage all types of waste, the program had a better success rate if they start by addressing one single type of waste first and creating a proper system for it. Plastic Free NIST recommended refusing single-use plastic to help eradicate and eliminate the consumption of plastic and consecutively decrease the waste created from plastic. Their concentration on only single-use plastic waste allowed them to completely change the plastic consumption of the area. Smaller successes add onto each other making a bigger impact.

4.1.2 The Importance of Systemic Change

The most common weakness these organizations identified when discussing the future of their efforts was changing individual's habits and behaviors. Plastic Free NIST and Chula Zero Waste both indicated that they lacked cooperation and interest from college students when put through the education sector of their program. One of the most significant takeaways from the interviews was that individual behavior modifications are challenging and not as impactful as a systemic change. The Plastic Free NIST program, as well as Zero Waste Thailand, stated one of the initial weaknesses of their waste separation system was their target audience lacked the personal motivation to participate, therefore preventing the continuation and sustainability of such changes. Zero Waste Thailand noted the critical need for governmental legislation to enforce and encourage behavioral change. Several organizations found changing peoples' behavior a challenge given individual effort cannot be eliminated. Chula Zero Waste's assistant manager, Varoon Varanyanond, expressed that consumers are less likely to make environmentally conscious decisions even if presented with the necessary information to disclose plastics as harmful to the environment. Varanyanond further explained that to reduce plastic

waste and consumption drastically, the change should come from the production level to make the switch in behavior convenient for the consumer. In response, several organizations have focused on making reduction of plastic and consumption easier for civilians through system and infrastructure changes. We found this theme to be persistent in our target condominium as we implemented a system change and evaluated its performance, which will be explained in further sections.

4.1.3 The Value of Successful Program Marketing

Efficient campaign strategies enhance and extend the reach of a plastic reduction initiative. However, almost every interviewed organization stated one of their greatest limitations is spreading the word about their projects to the community. Even though physical media is a classic strategy to spread information, these organizations also used a variety of media outlets such as broadcasting on social media platforms to further reach people. They found that their online platforms, such as Facebook, Instagram, YouTube, etc., were not as effective as they hoped they would be. Most programs used branding techniques to make their target audience conscious of their message, with a catchy, straight-to-the-point slogan. Trash Hero Thailand and Plastic Free NIST both employed the method of branding their program using logos, merchandise, and slogans. Their reusable materials also contain their logo to further advertise themselves. Organizations like Zero Waste Thailand and Chula Zero Waste struggled to spread awareness of their program when they used informational posters. The difficulties of targeting different audiences while also continuously creating more content and keeping the appeal and momentum was difficult for the organization members to balance. This highlights the advantages and drawbacks of different approaches to promotional campaigns.

Based on this information, marketing was determined to be a key factor in how effective a program could be. Marketing and advertising facilitate constructive engagement and recognition of a campaign, all of which are important for making long-term impacts. An important factor discovered is that when comparing different organizations with similar goals there was often a difference in their success with the same marketing strategies, meaning some organizations did not see much success while others considered them to be their most successful strategies. This difference in success can root from several factors regarding the target audience, therefore, it is important to first analyze the community to generate a greater reach.

4.2 Data Collection on Plastic Consumption and Waste Habits in the Regent on the Park 2 Condominium

After analyzing the responses from the Thai plastic reduction and recycling programs regarding their successes and obstacles, it was commonly acknowledged that community involvement and waste separation programs functioned better when implemented in a smaller population. Therefore, we selected the Regent on the Park 2 Condominium to use in our case study as this condominium did not have many rooms. An observation of the condominium was also conducted in order to gather details regarding the waste system currently in the condominium.

4.2.1 Our Target Condominium

After visiting and researching numerous condominiums located in Thailand, our team chose the Regent on the Park 2 Condominium, located in the city of Bangkok, as our target condominium. Our team collected data from residents, interviewed the administrative staff, conducted visits to observe the current waste system, and promoted sorting plastic waste at this condominium. The results and information gathered from this condominium was used as a proof of concept for our recommendations given to our sponsor, Less Plastic Thailand, on how to implement a plastic waste reduction and recycling program successfully in a condominium. This condominium was chosen based on three main aspects: location, size, and ease of communication. The location of this condominium was in an ideal spot as it was in close proximity to Less Plastic Thailand, about 1.9 km or a 5 minute bus ride, which would make partnering together more manageable. This condominium was also relatively small at fifty units in total. A small building was preferred because it made it easier to gather data from the residents and get information quickly. Lastly, the aspect that was most important to have in our target condominium was willingness to participate in our study and openness to try to reduce and recycle plastic waste.

4.2.2 Condominium Observation: Regent on the Park 2

The condominium observation and data collection on the Regent on the Park 2 was done to gather general information, such as room count, price per room, etc., as well as details regarding the waste management system. The specific data collected along with values are described below in Sections 4.2.2.1 and 4.2.2.2.

4.2.2.1 Condominium Information

The condominium that was chosen was the Regent on the Park 2, located in the central business district of Bangkok. Our research on the condominium found that it was completed in 1992. An interview and tour with the administrative committee provided additional information, such as the number of floors and rooms. The condominium has a total of 31 floors and 50 rooms, with each room having an area of 265 square meters, or about 2850 square feet. The price range per room is between 24-27 million baht (800,000 to 900,000 US dollars). The condominium only had three types of waste bins, general, recyclable, and hazardous waste. The waste was collected three times a week. In addition, this condominium also has only one recycling station, which means that every time the residents want to throw away their trash, they have to come to the first floor to do it.

4.2.2.2 Findings from the Observation

On site observations of the condominium noticed a few issues with its waste management system. Several of the waste bins for both recyclable and non-recyclable waste were improperly labeled, or had labels which were falling off the bin. The hazardous waste bin (Figure 11) was an example of such, with the English label not being correct. Other bins were labeled correctly but provided no further explanation about what should be included within the bins. This creates confusion about what waste goes in what bin. It was also discovered that the cleaning staff for the condominium would collect valuable plastic waste from the bins to sell if the waste was easy to see and not contaminated with food waste. However, the lack of proper sorting made this difficult to perform.

Figure 11. Hazardous waste bin mislabeled in English.

(Booneimsri, 2021)

4.2.2.3 Interview with the Administrative Committee

After observing the issues apparent in the waste room, our team spoke to the administrative committee. This interview was to develop an understanding of the administration's stances and policies on plastic waste. After speaking with the committee, a few things are worthy of note. Firstly, there were also no rules or regulations set in place by the condominium's administrative committee that directed people to correctly sort their waste. A representative of the condominium confirmed this by saying that proper sorting of the was dependent on the residents doing it correctly, with the condominium only providing a location for waste. Secondly, although the administration says they want to help, they are unfamiliar with the issues in the waste room and do not know what could be done to improve it. Thirdly, the administration noted that the biggest step forward in recycling and waste management was when the bins became labeled and color coded, which is advice we would take to heart as we moved forward with our project. Lastly, the administration said they were going to create some programs in conjunction with the changes our team made to encourage recycling and reduction of plastic waste. Ideally, this will help sustain the work we did, and potentially improve it. The full interview with the representative of the administrative committee can be found in Appendix C.

4.2.3 Residents' Survey Responses

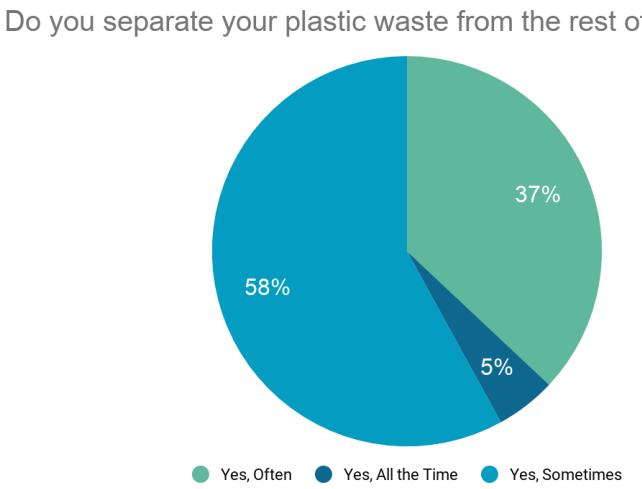
The purpose of surveying the residents of the Regent on the Park 2 Condominium was to grasp a better understanding of the current knowledge of the residents regarding plastic waste, to collect data about the specific plastic use in this particular condominium, and to assess the varying ways the condominium could improve their waste system such that the residents would be more inclined to recycle their plastic waste. After surveying the residents a few key patterns emerged from the answers.

4.2.3.1 Residents' of Regent on the Park 2 Condominium Opinions on Plastic

The survey given to the Regent on the Park 2 residents was administered online via Google Forms. One of the first issues with the online survey was that responses were difficult to obtain. The age of participants that completed the form ranged from 9-61 years old, however it was concluded that the general age of those living in the condo, reported by the administrative staff, were an older generation who did not all have access to a method to complete the survey online. This explained why the survey experienced low participants as a majority of them were

older and did not have internet access. A physical survey was suggested, however, due to the COVID-19 pandemic an online survey was performed in order to limit human contact. Overall we received nineteen responses, which was about 20% of all of the residents in the condo. Although we did not receive as many survey participants as we would have liked, results were still able to be obtained from the number that did complete it as trends were well defined and appeared consistent. The overall trends revealed that 53% of residents believed that recycling was important however only 5% separated their plastic waste from the rest of their waste "all the time", with the reasoning being "that there is no proper waste disposal mechanism to separate non-recyclables from recyclable materials where I live". Therefore, the majority of residents from the Regent on the Park 2 believed in recycling however there was an issue with the waste sorting system that stopped them from doing so. To explore the reason why, our team looked at the top response that would make residents more likely to recycle which was if "the waste and recycling containers are labeled more clearly". Thus, our team concluded that improperly labelled bins were one of the reasons residents were not sorting their waste. In order to pinpoint which bins were most important to label correctly and get additional bins for, the most often used plastic types were identified by the residents. The most often used plastic materials reported were plastic water bottles at 84% and plastic bags at 63% (participants could choose more than one option for this question). Finally, 63% of responses said they would consider reducing their plastic use in the future, and 84% of residents said they would consider recycling more in the future. Based on these results it was clear that an increase of clarity of the waste management system would be the most directly impactful for the residents and that if implemented residents would participate in sorting their waste more as they indicated they would consider reducing and recycling more in the future. The full list of questions that the residents were asked can be found in Appendix B.1 and the results of the survey can be found in Appendix B.2.

Figure 12. Pie Chart Displaying Self Evaluation of Residents with Percentages.



4.3 Designed and Implemented Changes for the Regent on the Park 2

This section is the action we took based on findings and issues we got from the interview, observation and survey. The changes that have been implemented for the condominium are explained in the following section.

4.3.1 Implemented Changes in the Regent on the Park 2

Our team came up with the solutions to be implemented in the Regent on the Park 2 based on our findings. Then, we discussed the ideas and solutions that we got from Less Plastic Thailand, and finalized them to make sure that these ideas fit the condominium. After that, we went to the condominium to apply these solutions.

4.3.1.1 Created Accurate Bin Labels

Based on our team's observations of the waste management area of the condominium, one of the most noticeable issues was that both the general waste bins and the recycling bins were improperly labeled. This problem was a simple fix that our team executed by creating proper labels for these bins, making the system easier for the residents to understand. The new labels were created for the existing waste bins in addition to adding two new types of plastic waste bins. Figure 13 shows the new bin labels for the existing bins. Each lists the proper type of waste for that kind of bin in both Thai and English. They also depict examples of the type of

waste that should be put into each bin. Figure 14 shows the team placing the new labels over the old labels so that they are no longer visible in order to prevent confusion.

Figure 13. New Labels Created for the Three Types of Bins.

(Booneimsri, 2021)

Figure 14. Correcting the Bin Labels.

(Srisoonthornpaisarn, 2021)

4.3.1.2 Added New Plastic Waste Bins

Based on the observations of the condominium as well as some of the results, there are not enough bins of the proper types within the waste management area of the condominium for the residents. Initially, there were only three types of bins, those for general waste, recyclable waste, and hazardous waste. Adding an additional bin type specifically for the PET type of plastic (the most common plastic for plastic water bottles) with informative labels about products that contain PET allowed for easier collection of it. Easier collection of PET plastic makes it easier to sell the bottles to Saleng waste collectors, which makes it easier for the condominium to keep its waste management area clean.

In addition to the new labels for the existing bins, two new bins were also added to the waste room of the condominium for specific types of plastic (Figure 15). They were created based on guidelines from our sponsor and in a way that makes it so that the waste is easy to separate and easy to see what is already inside the bin. This makes it easier for people to know what to place in the bins. Cage-style bins that have the waste visible encourage people to properly use them (Boonyayotin, 2020). The bins can also carry a large amount of plastic waste in an easy to move and cheap manner. The bins were also outfitted with labels of the specific plastics to be placed in them for additional clarity (Figure 16).

Figure 15. The Two New Waste Bins are located on either end of the waste management area.

(Vongviriyangkoon, 2021**)**

Figure 16. Labels for the New Bins.

(Srisoonthornpaisarn, 2021)

4.3.1.3 Informing the Residents Via a Physical Flyer

From the interview with the administration and the survey responses, we found that the majority of people who live in the condominium are mostly elderly. The residents also expressed their willingness to reduce and recycle plastic waste more in the future if there was a basis for implementing changes that would continue to have an effect in the future. However, due to the fact that there was relatively low participation in the fully digital survey and no online communication between the administrative committees and the residents, we have come to the conclusion that a form of physical promotion of information would be most effective for this condominium. Additionally, based on the survey responses, it was also determined that the creation of more specific waste bins in addition to better labeling of existing bins would help residents to recycle. As such new bin labels for existing bins as well as two new plastic waste bins (explored further in section 4.3.1.1 and 4.3.1.2) were created.

As social media is not very effective with the residents, the final step was to create a promotional poster for the condominium in the form of a flyer. The purpose of the flyer was to promote and inform the residents that the condominium now had two more new bins, which are high-value plastics bins and low-value plastics bins with the examples so that they understand which types of plastic should be in which bins. This flyer (Figure 17) provided information about the two new bins but also the specific types of plastics that should be placed in those bins.

Figure 17. The flyer that was created to inform the residents of the new types of bins.

(Booneimsri, 2021)

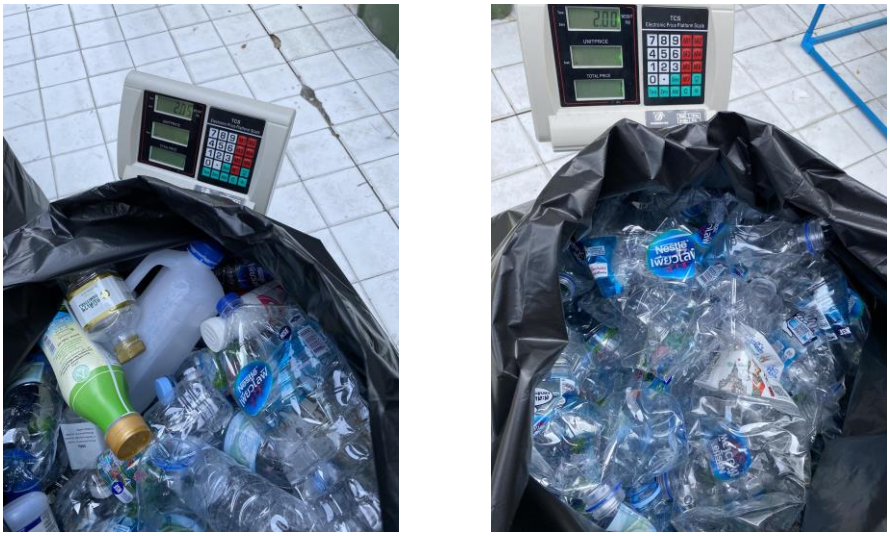
4.3.2 Results and Findings in the Regent on the Park 2

This section contains the results and findings from the Regent on the Park 2 condominium. It contains analysis of the mass of waste collected from the new bins that were implemented. The results were compared to the previous data collected by the condominium to determine the effectiveness.

4.3.2.1 Results Collected from the Regent on the Park 2

The results from the two new bins were split according to bin type, high-value plastic waste and low-value plastic waste. The data was collected over the course of approximately two weeks (12 days) from the 26th of February to the 9th of March. The figure below shows the collected high-value plastic waste.

Figure 18. The PET bottles in the New High-Value Bin.



(Vongviriyangkoon, 2021)

Prior to the addition of the new labels and additional bins, the maids who worked at the condominium were the ones that were in charge of sorting the different types of plastics from the recyclable bins. They would then provide the information about what plastics they retrieved from the bins to the administrative committee before they sold the plastic. As a result the only data the administration had on record was data for the high value plastics, as the maids did not bother selling the low value plastic. Using the data that the administration provided from the last month (a 31 day period from the 15th of December 2020 to the 14th of January 2021) a total of 31 kg of

PET bottles and 9 kg of other high-value plastics were collected. This means that the average per day was 1 kg/day for PET and 0.29 kg/day for other types of valuable plastics.

During that twelve day collection period there was 17.57 kg of high-value plastic waste, which consisted of 13.52 kg of PET plastic waste and 4.05 kg of other high-value plastic waste. For low-value plastic waste there was 5.85 kg. This created an average of 1.46 kg/day of high-value plastic waste, 1.125 kg/day being PET and 0.33kg/day being other high value plastic waste. The low-value plastic waste had an average of 0.49 kg/day.

Table 2. Data from 12 days after the new bins were set up (February 26th 2021 to March 9th 2021).

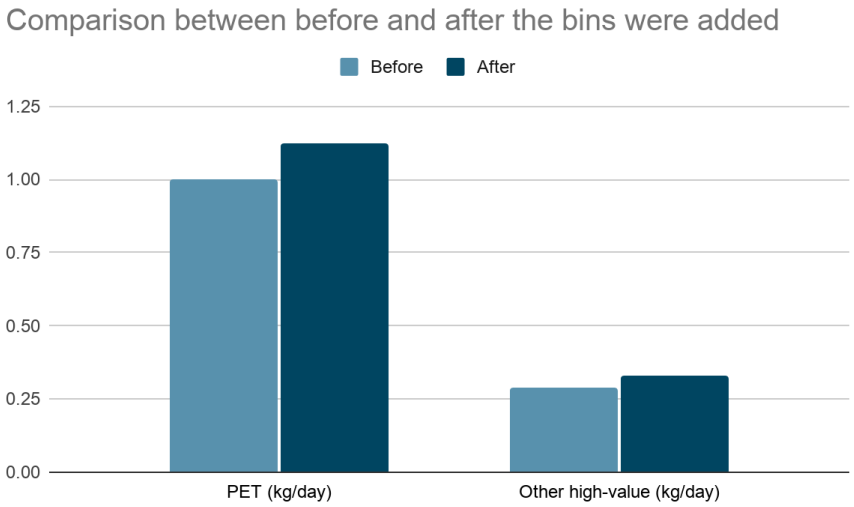
Type of Waste	Examples	Mass (Kg)	Mass/Day (Kg/Day)	Percentage (%)
1.High-Value Plastics	PET (transparent)	13.52	1.125	57.73
	Others (translucent/opaque)	4.05	0.33	17.29
	Total	17.57	1.46	75.02
2.Low-Value Plastics	Single use plastic (plastic bag) / food container/straw/etc	5.85	0.49	24.98
Total Amount of Waste	From the 2 types of plastic waste collected.	23.42	1.95	100

Table 3. Data from Administrative Committee (December 15th 2020 to January 14th 2021).

Type of Waste	Examples	Mass (Kg)	Mass/Day (Kg/Day)	Percentage (%)
1. High-Value Plastics	PET (transparent)	31	1.00	77.5
	Others (translucent/opaque)	9	0.29	22.5
	Total	40	1.29	100
Total Amount of Waste	From the one type of plastic waste collected by the administration.	40	1.29	100

Tables 2 and 3 show the difference in kg/day of the different types of plastics based on our collected data compared to that of the condominium after the new bins were implemented. The kg/day of PET increased from 1.00 kg/day to 1.125kg/day, which is a 12.5% increase. The other types of high-value plastics waste showed a 13.8% increase, going from 0.29 kg/day over the 31 days to 0.33 kg/day over the 12 day period. PET is noted separately as it is the most commonly reported high value plastic waste and has a relatively consistent value. Other high value plastics such as HDPE and PP are not used as consistently and have values more subject to change over a given period of time.

Figure 19. Mass of collected plastic types per day. Showing the before and after of implementation of the new bins.



As seen with the results of the data collection, the average daily collected plastic waste increased in all categories compared to the previous data from the condominium. As the data collected was taken over a time half as long as the data provided by the administration it can be inferred that the daily average of sorted waste would continue to show an increase. This benefits the maids of the condominium as they do not need to do as much work to sort the plastic waste. Even if the waste does not continue to be sorted as heavily with the new bins in the future, it still creates a percentage of plastic waste that the maids do not need to manually sort from the other types of waste which means that the benefits of the new bins are worthwhile compared to the low cost and risk factor of implementing them.

4.3.2.2 Yearly Recycled Plastic Waste Predictions

The daily average plastic waste analyzed in the previous section was used to then predict the amount of plastic waste that would be recycled in a year.

Figure 20. Projection on Yearly Recycled Plastic Waste. The Before column represents what it would be prior to implementation of the new bins, the After shows what it should be after implementation.

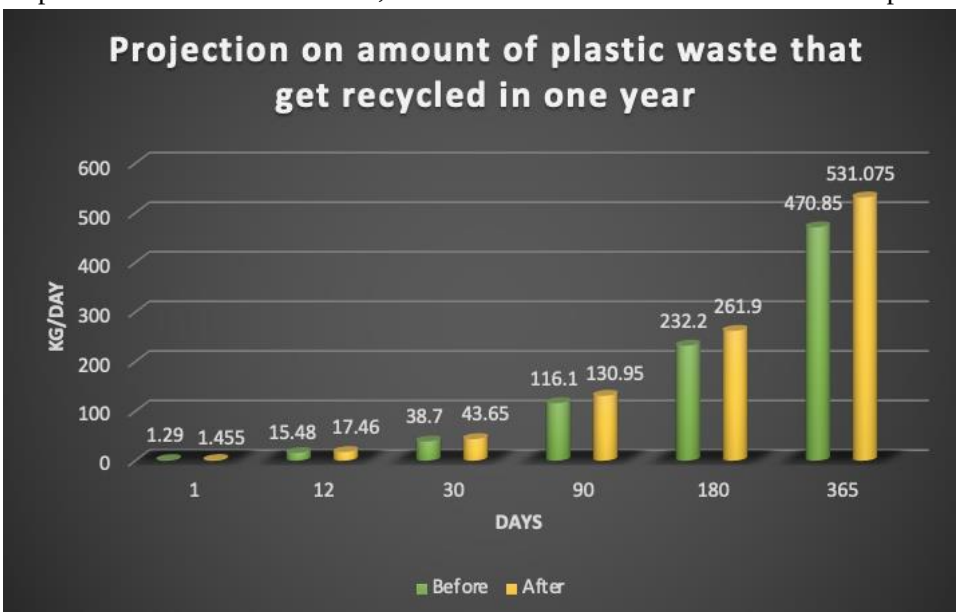


Figure 20 shows the prediction on the yearly average recycled high-value plastic waste from the collected data. The Before column represents the prediction based on the month of data given to the group by the administration and the After column represents the prediction based on the two weeks of data collected by the group after implementation of the new waste bins. As the prediction is for all high-value plastic waste it is the combined amount of both PET plastic as well as the other types of high-value plastic. As can be seen after implementation of the new bins an additional 60kg of plastic waste should be properly recycled, increasing from 470.85 kg/year to 531.075 kg/year.

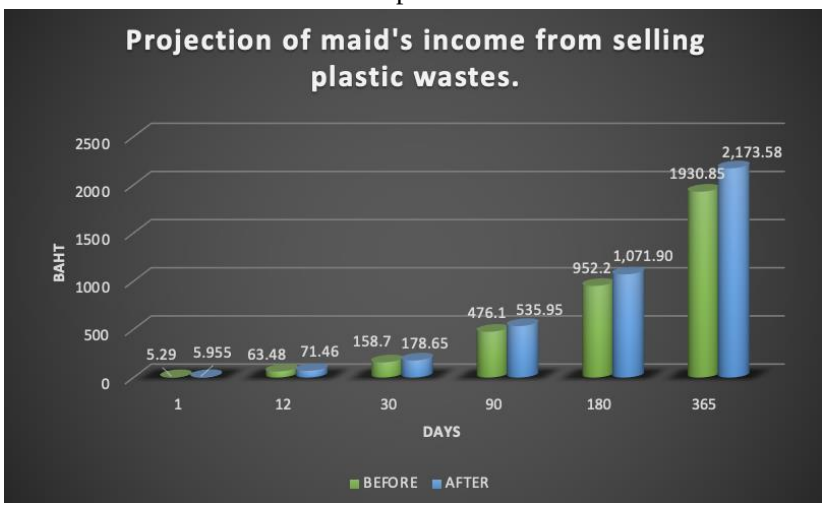
4.3.2.3 Prediction of Maids' Future Income

As the maids are the ones who benefit from the selling of the plastic waste collected from the condominium, the amount of waste that is generated can be used to predict how much money the maids will earn from selling it. Each type of plastic waste that is collected is segregated and sold to the recyclable waste collectors, or Salengs, with the prices shown on Table 4.

Table 4. Price comparison of plastic waste.

Type of Waste	Examples	Price/Unit (Baht/Kg.)	Volume/Day (Kg./Day) from Condo	Net Price (Baht/Day)
1. High-Value Plastics	PET (transparent)	5	1.125	5.625
	Others plastics (translucent/opaque)	1	0.33	0.33
2. Low-Value Plastics	Single use plastic (plastic bag) / food container/straw etc...	-	0.48	-

Figure 21. Prediction of maid's yearly supplemental income compared between before and after new bins were implemented.



Based on the prices for the different types of plastic waste in Table 4 and the daily average of plastic waste from Table 2, the yearly supplemental income for the maids of the Regent on the Park 2 can be predicted. PET plastic can be sold for 5 baht per kilogram, and other high-value plastic waste can be sold for 1 baht per kilogram. Using this information the maids selling the plastic waste could gain an additional almost 250 baht per year, which translates to approximately 20 extra baht per month.

4.4 Observations and Interviews with Other Thai Condominiums

For this section, several other condominiums were analyzed. Similarly to the Regent on the Park 2 the waste areas were observed and questions were asked to the administration and

maids. Three other nearby condominiums were selected; two other condominiums under the Regent on the Park name, Regent 1 and 3, as well as another condominium owned by the LivingPlus company which owned the Regent 2, the H condominium. All of these condominiums are located near the Regent on The Park 2, which provides comparisons to how other local condominiums work.

Figure 22. Regent on the Park 1.

Figure 23. Regent on the Park 3.

Figure 24. H Condominium.

(Vongviriyangkoon ,2021)

4.4.1 Regent on the Park 1 Condominium

The Regent on the Park 1 condominium is larger in size than the Regent on the Park 2. There are around 81 units in this condominium, and it has only one waste room, which is located on the first floor and is for all of the residents in this condominium. As seen in Figure 22 there are no proper labels on bins and large amounts of unsorted waste. The administration also said that the trash normally gets collected once per week which results in the large piles of trash seen. The administration did not allow for a full viewing of the area, requiring a request letter for more information to be gathered. As a result the maids in the Regent on the Park 1 were not able to be asked any questions regarding how they manage the waste there.

4.4.2 Regent on the Park 3 Condominium

In the Regent on the Park 3 condominium, there are 73 rooms and 29 floors, and each floor has its own waste room and one large main waste collection room on the first floor. However the waste rooms on each floor do not have any sorting or labels, there was just a small bin for the residents to place all types of waste into. The administration informed us that the maids of the condominium are the ones responsible for sorting and otherwise taking care of the waste, which is the same as in the Regent on the Park 2. According to the maids the extra waste rooms on each floor are not very helpful as they only contain a single bin (as shown *Figure 27.)* because when that bin is full residents leave their waste on the floor nearby. This did cause the administration to implement regulations to attempt to stop this but they were ineffective as there is no way to prove which rooms left the waste on the floor due to a lack of any sort of security or camera to view the area. This in turn gives the maids more work, as they then also have to clean each waste room on every floor.

Figure 25. Regent on the Park 3 waste room, as found on each floor.

(Vongviriyangkoon ,2021)

Figure 26. Regent on the Park 3 waste room regulations.

(Vongviriyangkoon, 2021)

On the main waste waiting, there was only a single type of bin for all the waste to be combined in, as seen in Figure 25. The maids typically opened the bags to attempt to sort out the recyclable waste that was inside and said that per maid they normally get around 100 baht per week by selling the recyclable waste (including plastics, glass, aluminium, etc.) to the recyclable waste collectors or Salengs. This process is lengthy however, as there are waste stations on every floor and the waste is not sorted at all. The administration stated that they did not care to add additional bins or proper labels, as the waste would just be mixed again upon the collection by the government waste collector and it was not worth the administration's time or effort. This is verifiably false, and is one of the largest misunderstandings about recycling in Thailand. Based on these findings, it shows that the administration has a lack of knowledge and does not have a plan to improve sorting in the condominium.

4.4.3 The H Condominium

The H condominium was a more recently constructed condominium compared to the three Regents on the Park, constructed approximately 15 years later, although it is still owned by the same company as the Regent on the Park 2; the LivingPlus company. There are a total of 276 rooms on 32 floors, and each floor has its own waste room with two categories of waste bins, wet and dry (Figure 27), as well as a single waste collection room on the first floor (Figure 24).

Figure 27. An Example of the Waste Rooms on Each Floor.

(Vongviriyangkoon, 2021)

The interview with the administration and the maids revealed that the waste in this condominium is not sorted after being collected on each floor, which is different than in the Regent on the Park 3. According to the maids this is because they do not have time to sort the waste after collecting it, as due to the number of floors they have a lot of work to do per day. They also stated that if they had the time they would be sorting the waste. Provided the waste is at least properly sorted into wet and dry waste however, it is still more useful than not sorting the waste at all. This is because the waste collectors can more easily separate the recyclable waste from the dry waste while wet waste can be sent to the proper facilities to be sorted.

4.5 Proof of Concept of the Implemented Methods in a Thai Condominium

Based on the methods and the results thereof that were implemented into the Regent on the Park 2 in conjunction with the methods and strategies that were obtained from the other organizations, a list of guidelines and recommendations for Less Plastic Thailand was able to be created. The methods that were implemented into the condominium, both the ones that our team came up with on our own in addition to the ones that our sponsor assisted us in developing are a proof of concept for Less Plastic Thailand to demonstrate that these methods should work in other condominiums. The rest of the recommendations that were created based on research and interviews provide Less Plastic Thailand with useful strategies and methods for other projects that are not just limited to those in condominiums.

Chapter 5: Recommendations and Guidelines

This chapter contains an overview of the different recommendations that were created for Less Plastic Thailand. The recommendations were split into two separate categories. Firstly, there are those that were created from the experiences that the team had working with the Regent on the Park 2. These recommendations include the methods that worked as well as the methods that did not work or did not work as intended. This provided a proof of concept for these, which allows Less Plastic Thailand to know the effects of them. The other category of recommendation is the ones created based off of background research as well as the interviews with other organizations. As these recommendations were not directly researched by the team, there is no direct proof of concept from the team for these. However, they still have evidence of their effectiveness due to the other programs that utilized them.

5.1 Experience Based Recommendations

The recommendations in this section are those based off of the direct process that the team performed in the Regent on the Park 2. These methods involve both the information obtained about condominiums from the administration and residents as well as the methods that the team used. As they are based off of the methods that were directly used and discovered by the team, the recommendations in this section have a direct proof of concept for our sponsor.

5.1.1 Administration Recommendations

The first category is the methods that were observed to work with the administration as well as those that are based on the information that was obtained from the administration, from both the Regent on the Park 2 as well as the administrations from the other observed condominiums. The method that would most often come first is the way to approach a condominium to get it to interact with recycling more. The condominium administration should be approached with the intent of showing that Less Plastic Thailand is going to do the majority of the work to encourage the administration to want to act. Approaching in this way is helpful as if the condominium does not feel as though it has to invest many resources into working with Less Plastic Thailand then it will be more inclined to participate in increasing recycling.

In line with the recommendation about how to approach the administration, it is also important that Less Plastic Thailand dispels myths that the condominium may have regarding recycling. The two most common myths are the belief that separating waste does not matter and

that it is not worth it to separate waste. Providing information about how separated waste is handled and continues to stay separated is helpful for dispelling the first myth. To dispel the second myth, providing information about the money that can be obtained from selling the waste in addition to informing the administration that keeping the waste separated helps to create a cleaner condominium. Having a cleaner condominium increases the value of the space as it makes it a more attractive place to live, which directly benefits the condominium.

Finally, assisting the condominium administration in increasing its communication with its residents is important. As was discovered in the observed condominiums, there is often a lack of communication between the administration and the residents. Often this is due to the channels of communication that are used. In the Regent on the Park 2 this is caused by a lack of use of online communication platforms by the residents, which is attributed to the older makeup of the residents. Convincing the administration to make use of the proper communication channels that the residents will engage with to reach out to the residents to inform and enforce recycling methods is important.

5.1.2 Implemented Methods Recommendations

The other methods we implemented that are a part of the recommendations are more straightforward, as they were heavily based on the suggestions that Less Plastic Thailand gave to the team, following methods Less Plastic Thailand currently uses to increase engagement that had not yet been implemented into a condominium. The first of these recommendations is to add new bin labels. They should be clear with obvious text informing people what belongs in the bins, and display infographics that inform people what the category of waste includes. This is especially important as unlabeled and mislabeled bins are one of the most common barriers to proper recycling for residents of condominiums.

Similarly, the new bins that Less Plastic Thailand designed that were implemented into the condominium also gave evidence of immediate effectiveness. Even if the administration of the condominium does not continue to work to fix recycling in their condominiums and only a small percentage of plastic waste makes it into the new bins, that is still a percentage of the plastic waste that the maids do not need to separate from the rest of the waste. That would mean that there would always be a minimum amount of effectiveness for the relatively cheap cost of the new bin types.

The final recommendation is that Less Plastic Thailand has to be willing to change their methods of interaction with condominiums more heavily than they might with other groups that

they want to work with. As working with a condominium means trying to work with a group of individuals who may not already be predisposed to recycling, it is important to use methods that will most likely incite interaction. In the case of the Regent on the Park 2, this method took the form of creating a physical poster to inform the residents of the purpose of the new bins as they were more likely to interact with that and learn than they were with a social media post.

5.2 Research Based Guidelines

The guides that were created from research can be applied to condominiums but they are also able to be used more directly outside of condominiums as well. As these guidelines were created based off of the interviews with other organizations as well as other research they do not have a direct proof of concept from the team. However, because many of them are based on the methods that the other organizations used there is still evidence of their effectiveness in the success and failures of the other organizations.

5.2.1 Social Media Guidelines

The key finding from the interviews with other organizations and other research regarding social media is that the most effective use of social media is to foster engagement first rather than trying to use it to solely provide information. To do so, the format of social media posts must be one that promotes that engagement. For social media, engagement can be gauged by the amount of views or likes that a post receives in addition to the amount of shares. In general, the most effective social media posts are short (typically less than 80 words) and have eye catching headlines. This is because people typically do not spend much time reading individual posts when using social media. As a result posts that force the viewer to click ‘read more’ buttons are typically interacted with less (Shleyner, E. 2018). For posts that include images or videos it is best that the primary image is one that is eye catching as that makes viewers more likely to click on the post to view the full image or watch the video. More information about the exact format for a Facebook post can be found in Appendix E.

The best way to implement videos however is combining the short eye catching post with a link to view the video separately. This forces more engagement if the viewer is interested which in turn makes them more likely to continue interacting in the future. If the video is going to be included within the post itself however, such as on Facebook, it is important that the video is able to be viewed and understood with no sound. That means including captions or subtitles to ensure that the information within the video is expressed regardless of sound quality (O’Neil,

2020). Similarly, it is important that the videos can be viewed on mobile devices with as high quality as it can be viewed on a proper screen, as many people use social media more on their mobile devices.

5.2.2 Physical Media Guidelines

The key findings from the interviews with other organizations and other research regarding physical media and its usage of promoting engagement with recycling is that it is good to have a variety. While things like posters and flyers that provide information are useful, it is also important to include other means of physical promotion.

One of the effective forms of physical media promotion that a few organizations used was branding. Including the logo or even contact information for the group on their products helped to increase engagement. This can be included on things like reusable bags, bottles, or even waste bins. Placing the logo in a spot on these items where it will be noticed by the ones using the items, or in the case of bags and bottles, the ones viewing them, can encourage them to think about the organization. This, in turn, can lead to contacting them or otherwise performing more research. Even if an individual does not directly reach out or research it spreads awareness of the brand of the organization, which allows for more recognition by more people.

The most important guideline regarding physical media, however, is the method that also involves the least media, which is talking with people physically. When possible it is one of the most effective methods to create engagement as it creates a situation where the person now both knows new information regarding the organization and its goals, as well as also people who are associated with the organization. Similarly performing events with people where they help to collect waste helps to form a lasting impact as it creates a deeper understanding of the effects of improperly recycling on a more personal level than would otherwise be obtained just from reading an informational post or flyer.

5.2.3 Systemic Change Guidelines

The final guideline is the most difficult to achieve but is also the most likely to impact lasting change, which is creating systemic change to encourage or enforce recycling. It is much easier to convince an individual to begin recycling than it is to convince an entire group. When possible, however, if that entire group can be changed it should be, and the most straightforward way of changing an entire group is changing it at the top. In the case of plastic waste and recycling, that change would have to occur at the production or distribution level. This would

involve either convincing manufacturers to switch to a non-plastic or more recyclable alternative or convincing businesses that purchase from manufacturers who cannot or will not switch to switch themselves. This would in turn force all of the individuals who interact with these groups to also change as the non-recyclable alternatives would no longer be available to them. This principle can be applied to a smaller scale however. In the case of condominiums as seen in the rest of the project, creating a change within the administration of the condominium enforces change within the habits of all of the residents of the condominium.

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Appendix

Appendix A: List of Questions for Existing Plastic Reduction and Recycling Programs in Thailand

Hello, we are students from Worcester Polytechnic Institute and Chulalongkorn University. We are working together on a research project regarding plastic reduction and recycling in Thailand. We will be asking questions about the local waste policies and programs, which will be used to improve the programs in the area. The specific purpose of this research is to gain a better understanding of plastic consumption and waste in Thailand. These questions should only take about 30 minutes. Participation is voluntary and if you do not want to answer a question, you may skip it. The results of this questionnaire will be published, the individual responses will not be published, only the program name. Your information may be recorded for follow up interviews. Feel free to contact us if you have any questions.

1. Provide a brief description of your organization and why it was created.
2. What method(s) are used to spread the organization's awareness? For instance, what techniques are utilized in each approach: marketing, outreach, community involvement, etc?
3. How much funding does your organization require to keep its normal function? Where does the funding come from? Does your organization depend heavily on funding?
4. What strengths does your organization have? What makes your organization stand out?
5. What are some of the most notable achievements of your organization?
6. What are the weaknesses of your organization? Which area of awareness spread does your organization need work?
7. What would you have done differently in your plan of action?
8. Where do you see potential for improvement?
9. What influence do you see your organization having as it goes on?
10. What are the current limitations your organization faces?
11. What are some challenges that your organization could face in the future?
12. What recommendations would you give to a new organization? Where and how to start?
13. What do you believe is the key change to reduce plastic?
14. What do you believe is the best mechanism for the sorting of recyclables from non-recyclables?

For more information about this research or about the rights of research participants, or in case of research-related injury, contact:

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Chulalongkorn team, Email: greendream.recycle6@gmail.com

IRB Chair Professor Kent Rissmiller, Tel. 508-831-5019, Email: kjr@wpi.edu

Human Protection Administrator Gabriel Johnson, Tel. 508-831-4989, Email:gjohnson@wpi.edu

Appendix B.1: List of Survey Questions for the Residents of the Regent on the Park 2

Plastic Reduction and Recycling in Condominiums

This is a survey for the residents of the "the Regent on the Park 2" condominium created by 3rd year students of the Faculty of Science (BSAC) Chulalongkorn University and Worcester Polytechnic Institute intended to gain an understanding of the plastic waste problem related knowledge of the residents. Thank you for your cooperation. Please fill out this survey using your own knowledge even if you live with others. All answers will be anonymous.

*Questions that can have multiple answers selected

1. Age: _____
2. Number of household members including yourself: _____
3. How important do you think recycling is?
    - □ Not important
    - □ Somewhat important
    - □ Important
    - □ Very important
4. Do you separate your plastic waste from the rest of your waste?
    - □ No
    - □ Yes, sometimes
    - □ Yes, often
    - □ Yes, all the time
5. If you answered "No or Yes, sometimes" in question 4, select which reason(s) why? *
    - □ I said "Yes" in question 4
    - □ It takes too much time

□ It is too confusing

□ It would just get mixed up again

□ There is no proper waste disposal mechanism to separate non-recyclables from recyclable materials where I live

□ Other: _____

6. Select the below plastic material you use most often. *

□ Plastic water bottles

□ Plastic food containers

□ Plastic cups, silverware, and/or plates

□ Plastic bags

□ Plastic straws

□ None

7. Please check off which you would be more inclined to recycle if… *

□ Having a recycling station on each floor of the condo

□ There is a money incentive

□ The waste and recycling containers are labeled more clearly

□ A recycling bin is provided to your room

□ None

8. Select which of the terms you are educated on. *

□ Microplastics

□ Single-use plastics

□ Micro-beads

□ None

9. Will you consider recycling more in the future?

□ Yes

□ No

□ Maybe

10. Will you consider reducing your plastic use in the future?

□ Yes

□ No

□ Maybe

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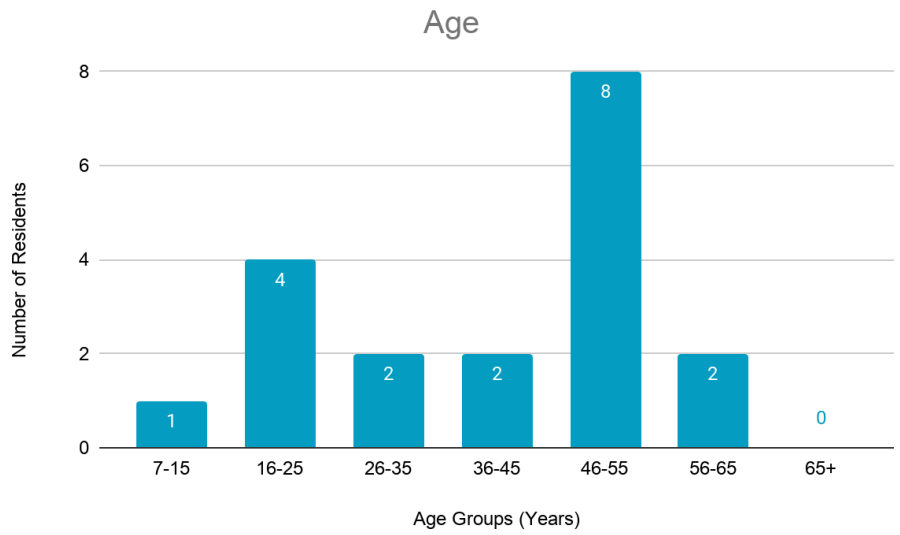
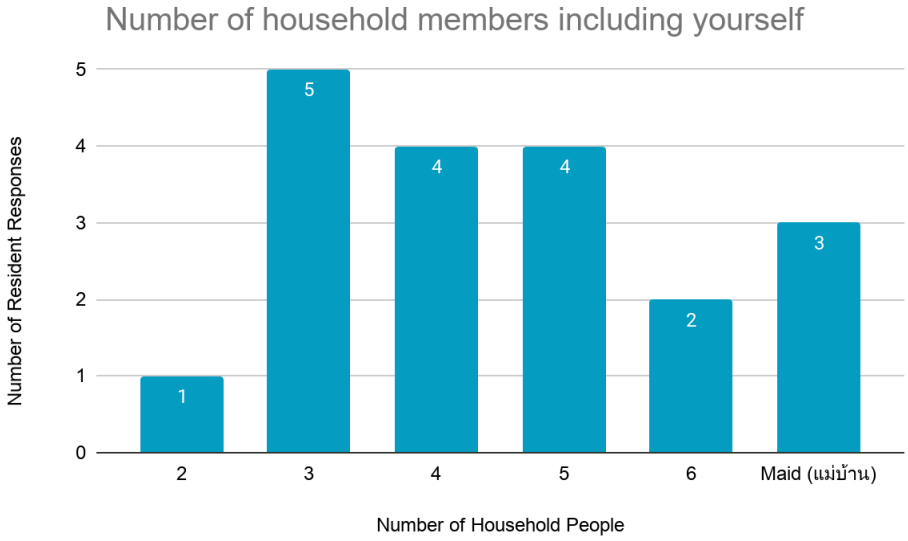
Appendix B.2: Residents' of the Regent on the Park 2 Survey Responses

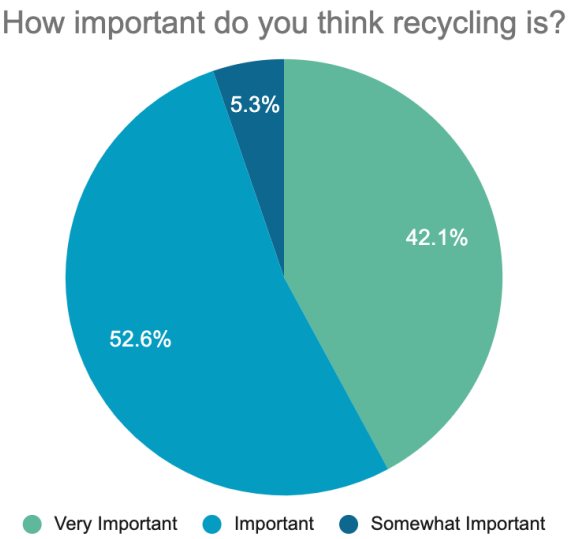
Question 1. Age [อายุ]



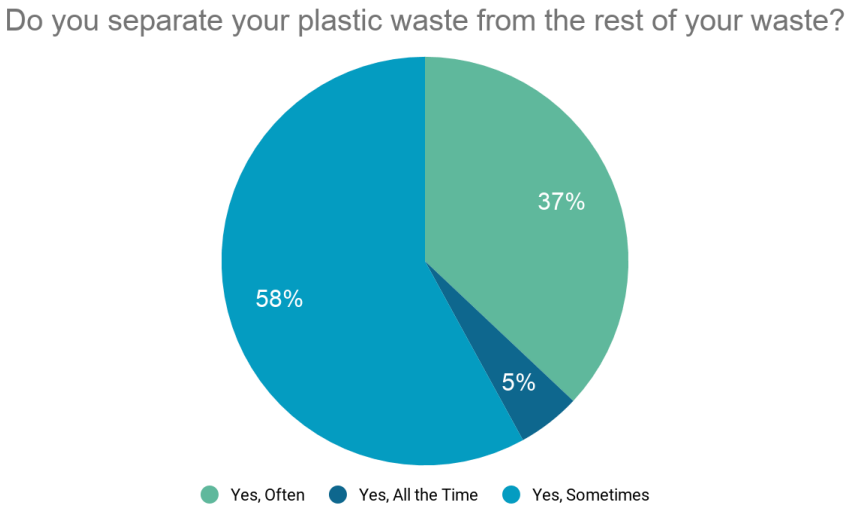
Question 2. Number of household members including yourself
[จำนวนสมาชิกในครอบครัวที่อาศัยอยู่ในคอนโด]



Question 3. How important do you think recycling is?
[คุณคิดว่าการรีไซเคิลสำคัญมากขนาดไหน?]

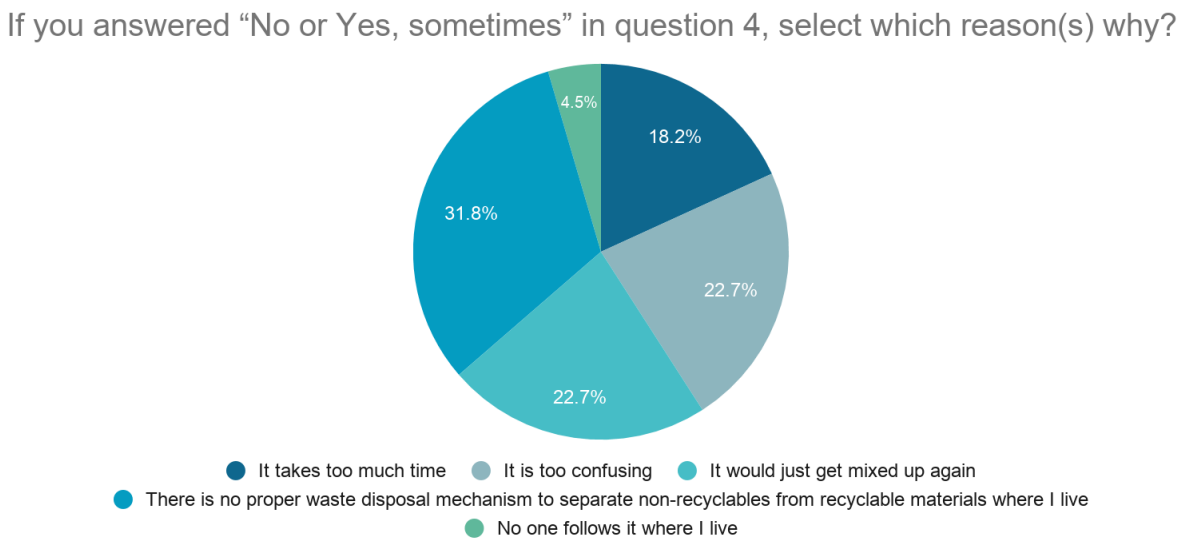


Question 4. Do you separate your plastic waste from the rest of your waste?
[คุณได้แยกขยะพลาสติกออกจากขยะทั่วไปหรือไม่?]

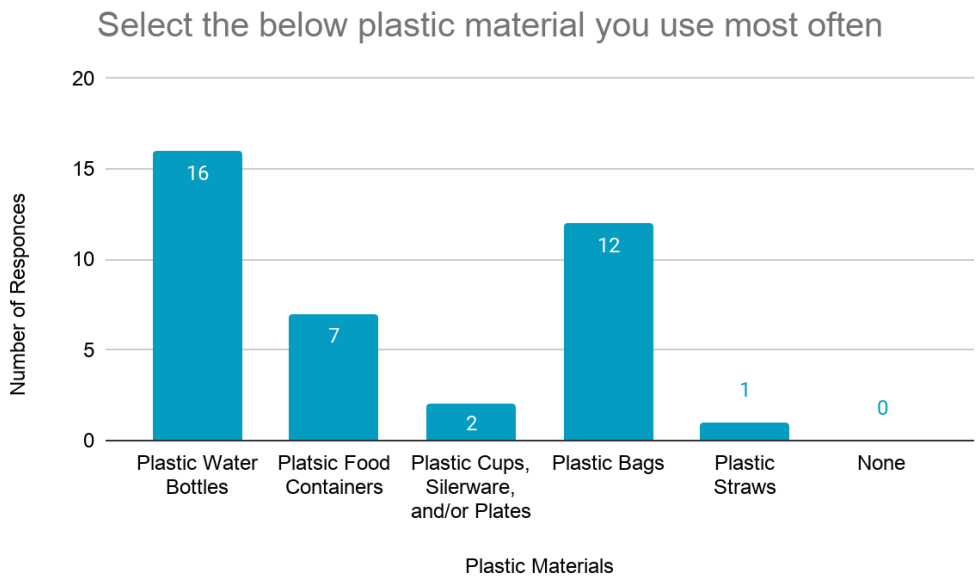


Question 5. If you answered “No or Yes, sometimes” in question 4, select which reason(s) why? (You can select more than one answer) [ถ้าคุณตอบ "ไม่แยก หรือ แยกบ้างครั้ง

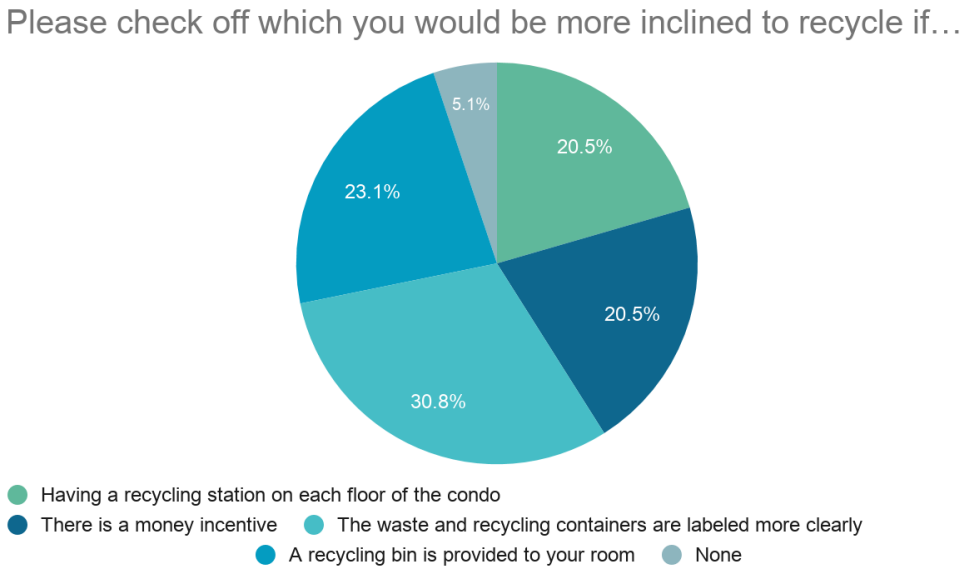
" , เพราะอะไร? (คุณสามารถตอบได้มากกว่า 1 ข้อ)]



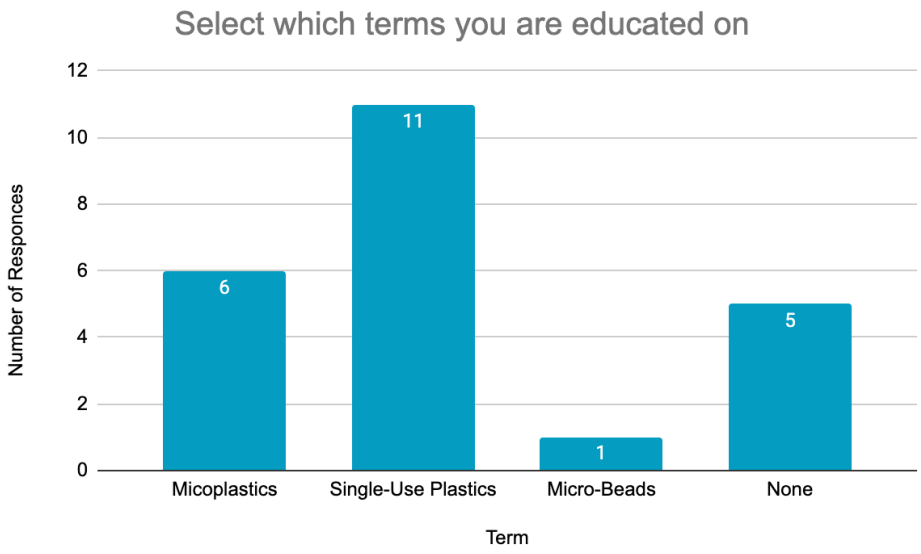
Question 6. Select the below plastic material you use most often. (You can select more than one answer) [กรุณาเลือกอุปกรณ์พลาสติกที่คุณใช้บ่อยในชีวิตประจำวัน (คุณสามารถตอบได้มากกว่า 1 ข้อ)]



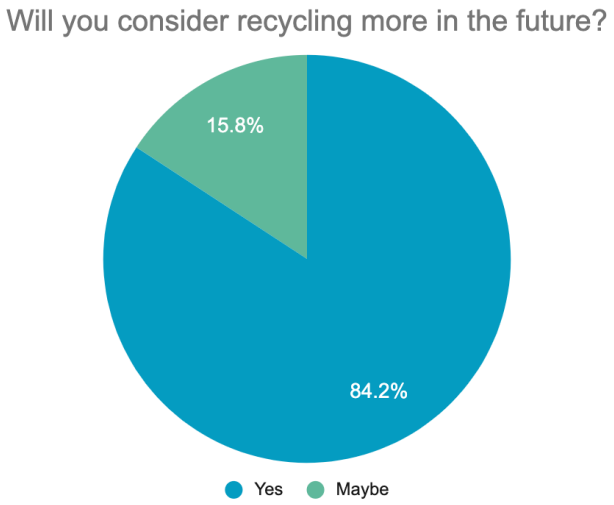
Question 7. Please check off which you would be more inclined to recycle if… (You can select more than one answer)
[กรุณาเลือกว่าสิ่งใดจะทำให้คุณมีแนวโน้มที่ทำให้คุณสนใจในการรีไซเคิลมากขึ้น? (คุณสามารถตอบได้มากกว่า 1 ข้อ)]



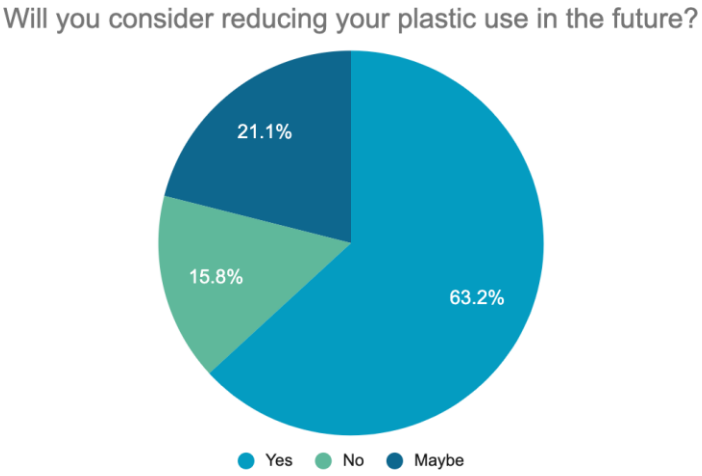
Question 8. Select which of the terms you are educated on. (You can select more than one answer) [โปรดเลือกหัวข้อที่คุณคิดว่ามีความรู้และความเข้าใจในหัวข้อดังกล่าวต่อไปนี้ (คุณสามารถตอบได้มากกว่า 1 ข้อ)]



Question 9. Will you consider recycling more in the future?
[คุณจะคำนึงถึงการรีไซเคิลพลาสติกมากขึ้นในอนาคตของคุณหรือไหม]



Question 10. Will you consider reducing your plastic use in the future? [คุณจะคำนึงถึงการใช้พลาสติกลดลงในอนาคตหรือไหม?]



Question 11. How much plastic waste that you produce in one day? (you can estimated it in pieces) [ปริมาณขยะพลาสติกที่คุณสร้างในแต่ละวันมีกี่ชิ้น ?(สามารถประมาณเป็นจำนวนชิ้นได้)]

Appendix C: List of Questions for the Administrative Committees of Thai Condominiums

The answers listed below are from the administrative committee of the Regent on the Park 2, but the same questions were asked to the three other condominiums' administrative committees: The Regent on the Park 1 Condominium, The Regent on the Park 3 Condominium, and the H Condominium.

1. Are you directly involved in enforcing any rules within the (insert name) condominium?

Ans : Yes

2. How do you feel about your plastic consumption in your condominium?

Ans : I feel that most of the residents in the condominium have used plastic very much in daily life.

3. Would you be willing to help increase plastic recycling and reducing efforts in your condominium?

Ans : Yes, of course I want to help increase the plastic recycling and reduction in this condominium.

4. What are your problems with the waste management in your condominium?

Ans : The problem is about people who live in the condominium. They don't care about the plastic waste and they don't sort their waste before putting it in the garbage room.

5. From feedback of the survey, what are you going to do to respond back to the residents?

Ans : From the feedback, the administrative committees plan to create some campaigns for the residents to raise their awareness, make them care and attend to sort the plastic and other wastes more.

6. Where do you see potential for improvement in your condominium?

Ans : Honestly, I don't know right now.

7. What are some of the most notable achievements in waste management in your condominium?

Ans : For the most notable achievement in waste management, it is when they changed the color of the trash bins and labeled them for the first time.

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Appendix D: Additional Information on Less Plastic Thailand

All this work would not have been done without the help of our sponsor Less Plastic Thailand. Being located right at the center of this ongoing issue, Less Plastic Thailand has worked over several years to lessen the impact of unmanaged waste directly in its capital Bangkok, Thailand. This organization is a non-profit aid that focuses on creating practical solutions to reducing plastic pollution. According to their influence on social media and websites, Less Plastic Thailand has risen in recent years. Even though their lifespan has been short, their effect has been meaningful, yet not fulfilling enough to make a drastic change in Thailand.

As the Less plastic Thailand motto states, “Together, we can create a healthier world for ourselves and generations to come”, Less Plastic Thailand has made its life mission to create a safer and healthier environment for their current and future citizens. Around the world, the amount of waste produced keeps increasing drastically. Specifically, waste such as plastic that has been proved to be in most cases non-biodegradable and harmful to any life on Earth. This organization has the mission of spreading information and promoting education on how to reduce, reuse and recycle their materials. Utilizing their methods and all their efforts, Less

Plastic Thailand works in hopes of decreasing the pollution and environmental hazards in its countries to make the livelihoods better.

Less Plastic Thailand uses several platforms such as Instagram, Facebook, and their own website, to accomplish collaborative work across the globe. Their main media source to spread information to Thai people has been the use of cartoons in order to be relatable and easy to understand to both adults and young kids. Despite the fact that their intentions are pure and their strategies are innovating, the progress has been rather flat. For starters, this organization is rather small in comparison to the multitude of people in Bangkok alone. As of right now, Less Plastic Thailand has only accomplished uniting approximately 30 households and four condos to participate in their recycling guidelines, which is definitely not enough to make a drastic change before it's too late. We find this to be an important step back in the progress of changing people's routines and therefore their futures. Given its size and the lack of motivation from Thai communities, only nine percent of the 6,500 metric tons of plastic waste was recycled in 2015 (Bangkok Post). This demonstrates the amount of work that has to be done in order to gather more people to work towards this common goal.

Given the information available, we have come to the conclusion that this sponsor's goal appears to be heavily focused on educating the public on recycling. Therefore our project and efforts are important to Less Plastic Thailand to aid them in their search of the method to spread out the information necessary to make a change. After reading about their attempts and cross-referencing with Thailand's current situation, we assume that focusing on plastic alone is not enough to make a difference in the carbon footprint of Thai communities. Even though Less Plastic Thailand has proposed recycling guidelines, the program is still not well known by the general public and believe it is too complex to get more people to follow. The objective of our project will help the sponsored organization overcome the main obstacle of getting more citizens to follow a recycling regime that will better the future of its community. Utilizing our advertisement skills and topical knowledge on recycling and waste, we will help promote their solution in a manner that is friendly and easy for the Thai people.

Appendix E: Additional Social Media Information

Based on Digital 2021 Thailand by Hootsuite (2021), social media ads are targeted to 7 different age groups. Those categories are the following,

- 13 to 17 years old
- 18 to 24 years old

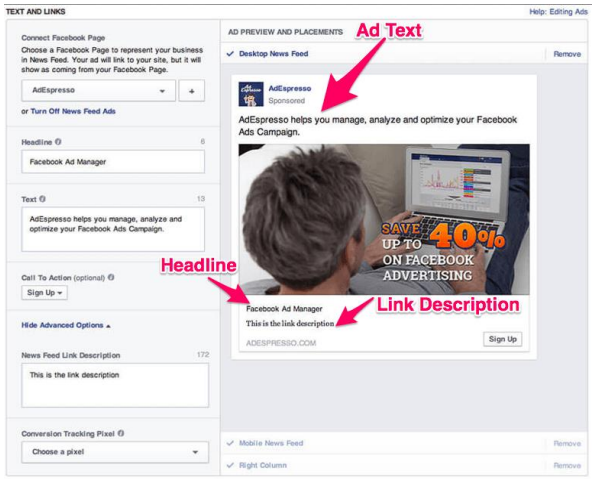
- 25 to 34 years old
- 35 to 44 years old
- 45 to 54 years old
- 55 to 64 years old
- 65+ years old

These are the age group that marketers target with adverts on social media. The percentage of groups typically targeted are the following in the order listed, 5%, 22.7%, 33.9%, 17.6%, 11.1%, 5.7% and 4%, respectively. As the largest percentage of ads are directed towards those between the ages of 18-44 it would be most effective to target posts towards this same age range. For advertisements, there is an ideal length for the three sections of ads, which includes the headline, the main text, and the description. AdEspresso (2018) analyzed 752,626 Facebook ads in 2018, and it was found that the most interacted with (measured by likes and shares) posts had sections with the following lengths.

- Headline: 5 words
- Main Text (Ad Text): 18 words
- Description: 13 words

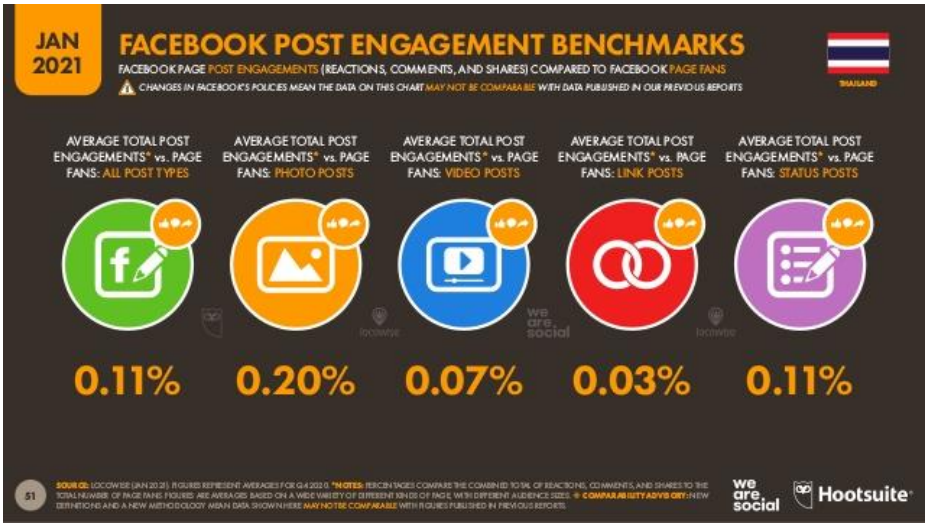
Figures 28 and 29 provide information about how to format advertisements on Facebook in the way to best promote engagement as well as the different types of posts that are made on Facebook and the amount of interaction that each type gets.

Figure 28. An Example of How a Facebook Ad Works.



(AdEspresso, 2018)

Figure 29. Facebook Post Engagement Categories.



(Digital 2021 Thailand, 2021)

Appendix F: Guidelines to Becoming a Plastic Free Community

Guidelines to Becoming a Plastic Free Community

Steps and Recommendations for Less Plastic Thailand

Experience Based Recommendations

Administration Recommendations

Approach with the intent that **Less Plastic Thailand is going to do most of the work** to encourage the condo to want to act.

Dispel myths about Plastic Recycling
Common myths:
1) *"Separating your waste does not matter."*
How to Combat: **Providing information** about how separated **waste is handled** is helpful.
2) *"It is not worth it to separate waste."*
How to Combat: **Providing information** about the **money that can be obtained from selling the waste** in addition to informing the administration that keeping waste separated helps to create a cleaner condominium which will **increase the value of the condo** as it will be a more attractive place to live.

Assisting the condominium administration in **increasing its communication** with its residents is important to inform and enforce recycling methods within the condominium.

Implemented Methods Recommendations

Ensure that the **bins in the waste room are properly labeled,** with the labels including **pictures or descriptions** of the waste associated with that bin.

Provide extra bins for certain kinds of waste, **including high-value plastics**, which can be resold. This provides a financial incentive to recycle.

Be **willing to alter or adapt existing strategies** to fit the condominium. Condominiums are unique and there is rarely one perfect solution, but many strategies can be reworked to fit any condominium.

Research Based Recommendations

Research Based Recommendations

Social Media Guidelines

Posts should be short, less than 80 words. These posts should also have **catchy headlines** to grab users attention.

When linking videos, **add the link to the end of the post** to view the video separately. This increases engagement with the post.

For video based posts, **the video should have captions** and be able to be **understood without sound off**. The video should also be equally effective on a smartphone when compared to a computer.

Systemic Change Guidelines

Systemic changes are the most effective way to reduce plastic waste and increase recycling. It is also the most difficult.

Start trying to convince packing producers and stores to **divest from plastics**. This will force consumers into using more **ecologically friendly methods.**

This is applicable in condominiums as the system of **waste management** can be altered **more easily** than on a grander scale.

Physical Media Guidelines

Variety of posts including informational posts, flyers, cartoons keeps **audiences engaged** and more willing to interact with posts.

Branding can be helpful recognition for recycling programs such as **including your logo and contact information on products** to help increase engagement (examples include reusable water bottles, reusable bags, or even recycling bins)

Talking to people physically is one of the most effective strategies to create engagement. Creates an **emotional bond** between program and person.

Events with people where they help to collect waste helps to form a lasting impact as it **creates a deeper understanding** of the effects of improperly recycling on a more personal level.

Thank you Less Plastic Thailand for partnering with us! We wanted to especially thank Samornmitr Lamsam, the head of Less Plastic Thailand, and Metha Senthong, coordinator of Less Plastic Thailand, for providing us with a goal and giving us the tools to reach it.

- Team Six