

**A STUDY OF KEY SUCCESS FACTORS AND BARRIERS TO
REDUCE SINGLE-USE PLASTICS IN THAILAND**

The image shows a large, faint watermark of the Mahidol University logo in the background. The logo is circular with a blue center containing a golden emblem of a traditional Thai stupa. The outer ring of the logo contains Thai text. Overlaid on this watermark is the author's name.

SUNISA JEANPAKDEESOMBAT

**A THEMATIC PAPER SUBMITTED IN PARTIAL
FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF MANAGEMENT
COLLEGE OF MANAGEMENT
MAHIDOL UNIVERSITY
2021**

COPYRIGHT OF MAHIDOL UNIVERSITY

Thematic paper
entitled
**A STUDY OF KEY SUCCESS FACTORS AND BARRIERS TO
REDUCE SINGLE-USE PLASTICS IN THAILAND**

was submitted to the College of Management, Mahidol University
for the degree of Master of Management

on
December 18, 2021



.....
Miss Sunisa Jeanpakdeesombat
Candidate

.....
Assoc. Prof. Prattana Punnakitikashem,
Ph.D.
Advisor

.....
Assoc. Prof. Sooksan Kantabutra,
Ph.D.
Chairperson

.....
Assoc. Prof. Vichita Ractham,
Ph.D.
Dean
College of Management
Mahidol University

.....
Asst. Prof. Pornkasem Kantamara,,
Ed.D.
Committee member

ACKNOWLEDGEMENTS

Numerous people deserve to be thanked for their assistance in supporting this study. My completion of this project could not have been accomplished without the support of interviewees. I would like to thank you to all interviewees who provide a valuable time and information as well as feedbacks this thematic paper.

I cannot express enough thanks to my advisor, Associate Professor Dr. Prattana Punnakitikashem, who continue providing me an advice and encouragement. Your insightful feedback pushed me to contribute my thought and brought my work to be higher level. My sincere thanks to all professors at College of Management, Mahidol University, who give me a valuable knowledge and guidance throughout my studies. You provided me the tools that I needed to select the right direction and successfully to complete my study.

A special thanks to my caring, loving and supportive family and classmate. Your encouragement pushes me to overcome difficulties during my studying and working.

Sunisa Jeanpakdeesombat

A STUDY OF KEY SUCCESS FACTORS AND BARRIERS TO REDUCE SINGLE-USE PLASTICS IN THAILAND

SUNISA JEANPAKDEESOMBAT 6349040

M.M. (GENERAL MANAGEMENT)

THEMATIC PAPER ADVISORY COMMITTEE: ASSOC. PROF. PRATTANA PUNNAKITIKASHEM, Ph.D., ASSOC. PROF. SOOKSAN KANTABUTRA, Ph.D., ASST. PROF. PORNKASEM KANTAMARA, Ed.D.

ABSTRACT

The single-use plastics are in the spotlight as a culprit for environment and waste management system in worldwide. A several campaigns and voluntary strategies have been in Thailand under Thailand's Roadmap on Plastic Waste Management 2018-2030 in order to reduce the number of single-use plastic consumption and waste. This study aims to explore key success factors and barriers in single-use plastic reduction in Thailand through qualitative method. The 25 selected stakeholders are interviewed including government agencies and consumers who are in different background and expertise in order to gather data. The results showed that the interviewed stakeholders point out various factors based on their views. The most predominant key success factors are (1) awareness and values and (2) collaboration. Further suggested measures are (3) financial incentive, (4) consumer behavior, (5) innovation and technology of virgin plastics and alternatives, (6) legislation and (7) single-use plastic price. Based on these results, the study provides four recommended actions for relevant stakeholders in upstream, midstream and downstream to be able to tackle single-use plastic in Thailand effectively.

KEY WORDS: Single use plastics / Plastic reduction / Sustainable consumption

39 pages

CONTENTS

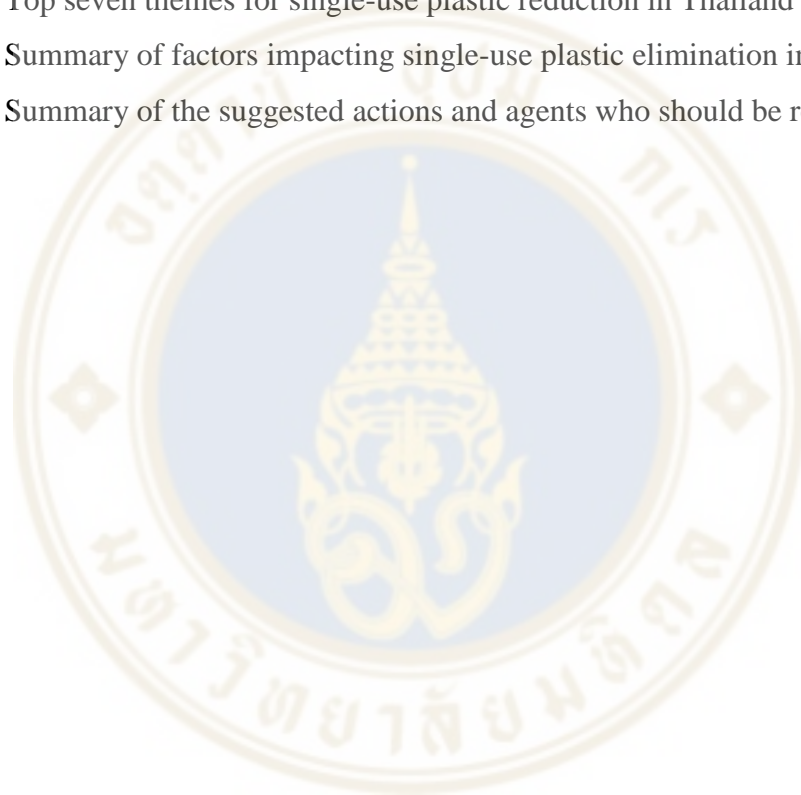
	Page
ACKNOWLEDGEMENTS	ii
ABSTRACT	iii
LIST OF TABLES	vi
LIST OF FIGURES	vii
CHAPTER I INTRODUCTION	1
1.1 Background	1
1.2 Problem statement	6
1.3 Research questions	7
1.4 Research objectives	7
1.5 Research scope	7
CHAPTER II LITERATURE REVIEW	8
2.1 Single-use plastics	8
2.2 Key success factors of single-use plastics reduction	9
2.3 Barriers to reduce single-use plastics	11
CHAPTER III METHODOLOGY	13
3.1 Research methodology	13
3.2 Sample selection	13
3.3 Interview questions	14
3.4 Data collection	14
3.5 Data analysis	15
CHAPTER IV FINDING AND DISCUSSION	16
4.1 Responsive profile	16
4.2 Stakeholder perceptions of single-use plastic pollution in Thailand	18
4.3 Key success factors and barriers	19
4.3.1 Public and individual awareness	20
4.3.2 Collaboration	21

CONTENTS (cont.)

	Page
4.3.3 Financial incentive	22
4.3.4 Consumer buying behavior	23
4.3.5 Innovation and technology development	24
4.3.6 Legislation	25
4.3.7 Price of single-use plastic	26
4.4 Finding discussion	27
CHAPTER V CONCLUSIONS AND RECOMMENDATIONS	30
5.1 Conclusion	30
5.2 Recommendations for action	32
5.3 Limitation	36
5.4 Future research	36
REFERENCES	37
BIOGRAPHY	39

LIST OF TABLES

Table	Page
Table 1 Interests and barriers to reduction as expressed by interviewees	13
Table 2 List of interviewed stakeholders	18
Table 3 Top seven themes for single-use plastic reduction in Thailand	21
Table 4 Summary of factors impacting single-use plastic elimination in Thailand	31
Table 5 Summary of the suggested actions and agents who should be responsible	36



LIST OF FIGURES

Figure	Page
Figure 1 The examples of single-use plastic life cycle	1
Figure 2 Number Plastic Bottle Cap Seal campaign	3
Figure 3 Plastic waste cycle in Thailand	5
Figure 4 Thailand's government on campaign 'Everyday Say No to Plastic Bags'	6
Figure 5 Group of proposed measures to tackle the plastic crisis	12
Figure 6: Plastic resin identification codes to attached products	33
Figure 7 Extended Producer Responsibility in Japan	34

CHAPTER I

INTRODUCTION

1.1 Background

Plastic pollution and its subsequent accumulation are a worldwide issue impacting our health, natural environment and a marine animal that have been observed suffering from indigestion of plastics. While plastic has many valuable uses in business and daily life, we have become addicted to single-use plastic for serving convenience. The United Nations Environment Programme (UNEP) mentioned in 2020 that there was more than 8.3 billion tons of plastic has been produced since the early 1950s and about 60% has ended up in either a landfill or natural environments. Today, the world continues producing about 300 million tons of plastic waste every year that equal to the weight of entire human population (UNEP final report for Thailand, 2020, P.4).

The single-use plastics are everywhere and become integral to our daily lives. Almost 99% of single-use plastics are produced from oil, natural gas and coal which are fossil resources or non-renewable natural resources. It is most commonly used for packaging and service ware such as bag, bottles, wrappers and straws. The lifecycle of plastics article of WWF-Australia in 2018 disclosed that these plastic products take hundreds of years to break down and some can be recycled a few times or cannot be recycled at all or none.



Figure 1 The examples of single-use plastic life cycle (WWF-Australia, 2018)

Thailand is the world's 11th biggest exporter of plastic market and 2nd biggest in ASEAN zone after Singapore. In 2019, 9.0 billion tons of plastic were produced, which were exported 56% of output and the remaining 46% were consumed within Thailand. The plastic industry contributed 6.1% to GDP of Thailand, playing a vital role in upstream, midstream and downstream of petroleum and petrochemical industries. The domestic market consumption can divide into two segments: 1) end-consumer market, which are bag, bottle, straw and food container; and 2) suppliers to end-user industrial, which are packaging, electrical appliance, auto-part, medical device and supplies. By product types in 2019, packaging was the largest volume of domestic consumption (e.g. plastic bags, sack, bottles etc.). Krungsri research revealed that the demand of plastic products continues increasing during 2021-2023 on average 2-3%, in accordance with global economy estimation of IMF (Krungsri research, 2021). On the other hand, the final report of UNEP in 2020 (with results for year 2018) provided National Guideline for Plastic Pollution Hotspotting and Shaping Action for Thailand. There was 70% of collection rate of plastic but only 12% was entered to recycling process and another 58% of collected plastic was mismanaged. The remaining 30% of the plastic waste in the country was uncollected that lead to 336 thousand tons of plastic leaks to the ocean every year or 4.8 kg per capita per year (Kaza et al., 2018). It is sad to know that the majority of plastic wastes come from human activities along a shoreline and inland. Some plastic wastes were shipped to Thailand more than 2.9 million kg in 2018 and doubled to 7.9 million kg in a month (Jan Dell, 2019). Total domestic waste together with imported plastic waste are exceed waste management's efficiency system in Thailand.

The government need to play a major role in order to solve the plastic crisis in Thailand. Thailand's Roadmap on Plastic Waste Management 2018-2030 has been developed based on plastic waste cycle information of Thailand in 2017. The Ministry of Natural Resources and Environment is in charge to set action plan of plastic waste managements to serve as a framework and direction for preventing and managing plastic waste in the country (The Government Public Relations, 2019). The campaign began with collaborating with drinking bottled producers to stop affixing plastic over water bottle caps, which would not only decrease plastic waste but also reduced unnecessary wastes and production costs. The Pollution Control Departmented stated 4.4 billion

bottles of water have been produced in Thailand every year and 60 per cent of them have cap seals that generated 2.6 billion pieces of small plastic waste a year. The agreement of government with 13 drinking bottle operators were reached and effective on April 1, 2018 with ultimate goal to reduce 2.6 billion pieces of small plastic waste annually, or 520 tones as shown in the figure 2. (Pollution Control Department, 2018).



Figure 2 Number Plastic Bottle Cap Seal campaign (2018)

Referring to news of Thailand's sweetheart dugong dies with plastic in stomach, her name is Marium, which is a baby dugong being found lost near a beach in southern Thailand and nurtured by marine experts for several months. Marium become a superstar and her moving was followed on social media. But the heartbreaking moment happened on 17th August 2019. She died after an infection linked to bits of plastic lining her stomach. “The death of Marium is a sad loss, but it is the beginning of a mission to protect animals. Indeed, there are many dugongs whose survival is threatened, and we have prepared a plan to protect them” the environment minister said in an interview with the Bangkok Post (Bangkok Post News, 2020). The Ministry of Natural Resources and Environment together with relevant sectors have accelerated the implementation of integrated plastic waste management from the production process, distribution, consumption and disposal. In action, the Action Plan on Plastic Waste Management Phase I (2020 – 2022) was developed with the following goals and measures.

1. Goal 1: Reducing and stop using single-use plastic targeted plastics by using environmentally friendly in 2022. There are 4 types of single-use plastic: (1) carrying plastic bags less than 36 microns thick, (2) foam boxes containing food, (3) plastic glasses (single-use thin) and (4) plastic straws.

2. Goal 2: Recycle 50% of plastic waste by 2022 with action plan's measures are;

1) to reduce the occurrence of plastic waste at source and focus on the prevention and control of waste from the production of products;

- Reducing single-use plastics
- Eco-Design of packaging
- Use alternatives to replace single-use plastics
- Set plastic product standard
- Green procurement
- Support for Eco-investment
- Creating a plastic database
- Tax incentives to promote biodegradable plastic packaging

2) Measures to reduce the use of plastics at the consumption stage by enhancing consciousness of the people in the proper consumption, promote green purchasing/consumption of products;

- Educate and outreach to promote green consumption
- Cooperate among stakeholders to reduce single-use plastics
- Set rules / regulations / procedures in preventing marine littering
- Establish policy on plastic waste management under international cooperation

3) Measures to post-consumer plastic waste management, focus on optimizing the recycling of plastic return to circular economy system by encourage people to reduce and sorting waste to be reused, establishing guidelines for promoting the recycling of plastic waste.

○ Issued rules and regulations for waste separation according to the 3Rs (Reduce, Reuse and Recycle) principle by the local government

- Develop and promote the Circular Economy
- Promote waste-to-energy
- Capacity building informal sector and waste buyer
- Develop a law to prevent / solve the problem of marine plastic litter
- Control the import of plastic scraps from abroad
- Awards those who have contributed good plastic management

(Pollution Control Department, 2021)

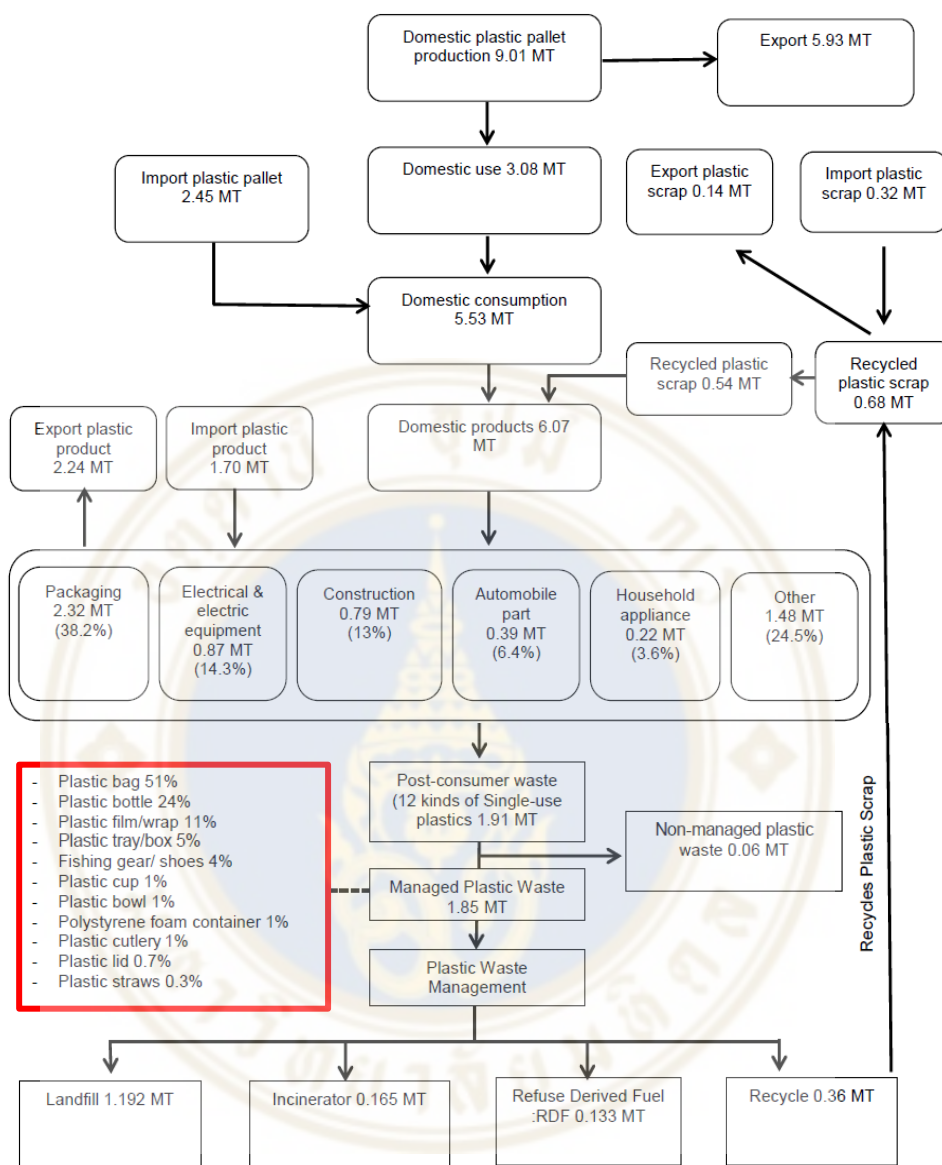


Figure 3 Plastic waste cycle in Thailand (2017)

Regarding the figure 3 of Plastic waste cycle in Thailand in 2017, It illustrated that the majority of plastic waste is single-use plastic so that it aligned with goals of Action plan on Plastic Waste Management Phase I (2020 – 2022) aim to reduce number of them within 2022. In the past year, the government has involved private sectors to be partnership (33 state agencies and 43 private companies) and ban on the use of plastic. Because most proportion plastic waste is the single-use plastics such as

hot bag, cool bag, plastic carrier bag and straw in amount of 1.93 million tons, in particularly plastic shopping bag, people use it to carry food that are bought from shops. The government has launched campaign with supermarket, shopping mall and convenience store to stopped handing out plastic bag to consumers while plastic bags less than 36 microns in thickness, Styrofoam food boxes, plastic straws and single-use plastic cups will be prohibited by 2022. Big department stores, giant retailers and grocery reached agreement with Ministry of Natural Resources and Environment in September 2019 and started campaign in January 2020 to reduce single-use plastic bag at level of manufacturing, consumption and disposal management (Ministry of Natural Resources and Environment, 2020).



Figure 4 Thailand's government on campaign 'Everyday Say No to Plastic Bags'

In This study, the research focused on enablers and barrier in eliminating single-use plastic products under cooperation between government agencies, private sector and public in Thailand. Using quantitative method to capture consumer's perspectives of the plastic problems and government approaches on reducing number of single-use plastic and raising awareness on plastic impact in public. The analyzed data demonstrated customer's willingness and barrier to involve the campaign that could provide policy maker on promoting sustainable consumption of plastic in Thailand.

1.2 problem statement

Referring to current approaches of reducing single-use plastics in Thailand, it is the ultimate goal in Action Plan on Plastic Waste Management 2018-2024 in order

to eliminate single-use plastic usage, increase sustainable consumption and promote alternative products for consumers. By implementing this campaign, it requires collaboration from consumers, society and public to strive the goals within 2024. The study would like to examine and understand the key success factors and barriers which impact on single-use plastics reduction in Thailand in order that the research could provide the strategies to related government agencies.

1.3 Research questions

Question 1: What are key success factors to reduce single-use plastic in Thailand?

Question 2: What are barriers that should be improved to achieve sustainable consumption of single-use plastic in Thailand?

Question 3: What are desired activities to effectively reduce single-use plastic in Thailand?

1.4 Research Objectives

To explore key success factors to reduce single-use plastic in Thailand

To identify barriers of impeding single-use plastic in Thailand.

To develop an understanding of single-use plastic elimination that help recommend strategies to generate sustainable consumption in Thailand.

1.5 Research scope

The study focuses on enablers to support and barrier to impede consumer for single-use plastic reduction based on approaches of Action Plan on Plastic Waste Management through interview. This method provided 6 questions to asked 30 stakeholders from government agencies and consumer in Bangkok, Thailand in order to explore various perspectives from both sides.

CHAPTER II

LITERATURE REVIEW

2.1 Single-use plastics

Single-use plastics are a highlight example of the problems with throwaway behavior. It prioritizes convenience over durability and consideration of long-term impacts to environment. A half of producing 300 million tons each year worldwide is single-use items such as bag and straw. Nowadays, the world is impact from plastic wastes from over consumption, poor quality product and mismanaged process that reflect on environment. The world organization, United Nations Environment Programme (UNEP) launched a campaign to raise awareness of plastic pollution because if we continue using plastic at rate we are, our ocean become a big plastic soup and have more plastic than marine animal by 2050 (UNEP report, 2020).

Currently, the world is facing the most challenging in plastic crisis. No one can tackle this problem by themselves. The European Commission 2020 stated that plastic industry has consistently grown in our economy and the plastic production has increased every year. In contrast, there is only 6% of recycled plastic demand in Europe with uncertainty market and low profitability. The key challenges linked to the production, consumption and plastics life cycle to be turned into opportunities for EU industry by concrete actions such as circular plastic, innovation and technology for long-term production and consumption. It is essential to calls on national, regional authorities, plastic manufacturing and all relevant stakeholders to involve (European Commission, 2018).

Reduce, reuse and recycle, 3Rs theme is sound familiar for waste management in public for many years. Many policies of plastic were launched in Germany to tackle the plastic crisis and they are the champion of the recycling in the world. But some studies revealed that Germany and other developed countries are main exporters of plastic waste to countries with poor waste management (Hutner et al., 2017).

The single-use plastic bag is banned and applied in the policy in developing countries such as Nepal. In 2021, the policy has been implemented in both national and local level. Each municipality has specific regulations that are vary in range and scope to fit with specific area so that it can provide effective ban of plastic bag. The number of plastic bags after the ban still have not significant but alter on a year the plastic reduction was improved from consumer's reuse plastic bag. It demonstrated the policy makers and municipalities need more approaches to attract consumers and retailers to continue reducing plastic bag. It has not only regulations to force people but also communication and social benefit through the overall reduction of plastic bag should be executed in long-term. The limitation in developing countries was waste collection and disposal management that should be addressed by series of intervention from regulation levying fine to avoid bring plastic wastes to environment and mismanagement (Bishal B., 2021).

2.2 Key success factors of single-use plastics reduction

Northeast Ohio's Lake Erie basin of United State is a vast majority of shoreline trash in which made up of plastic wastes from consumer products, plastic manufacturing, shipping and fishing. By considering the influencing benefits and obstacles to positive behavior for plastic bags and plastic bottles. The online survey from 1,489 respondents in five states illustrated usage and disposal of two plastic debris items that could be reduced effectively through government policies with a financial incentive. It was the first trigger point to influence change in plastic producers and consumer behaviors but it was effective in the short-term and middle-term for encouraging pro-environmental behaviors. Health benefit also was stated as a way to change consumer behavior by negative effects like cigarette. The health argument could point out in term of the harm plastic could cause human, animals and environmental when chemicals leak into food cycle, entangle organisms and pollute the environment. The financial incentive could apply to health benefit as tax of cigarette. The ultimate goal of government or policy maker prefers sustainable behaviors in the campaigns rather than a positive number of plastic reductions in short run. The solutions were to create social norm that

beyond the impact society as a whole and also emphasized indirect benefit such as health benefits. The interesting actions from northeast Ohio was cleanliness of tap water because the survey revealed that the stakeholders didn't use reusable bottle because there were not enough refill stations. It indicated that people have currently using reusable water bottles but they concerned about safe, clean and available filtration system (Jill & Scott, 2018).

Regarding a European strategy for plastic in circular economy of European Commission Report 2018 (P.6), packaging is 39.9 % of plastic waste in 2015 and fast-moving-consumer goods (FMCG) sector is in spotlight because plastic offer unique benefit to products. For instance, lightweight, variable shape, electrical and thermal resistance and durable with many colors. But reducing in environmental impact will improve the sustainability of business in cost of climate change and resources. FMCG in United Kingdom mentioned the factor for eliminating plastic in packaging from 7 European FMCGs. The results showed that influencing factors of FMCG companies toward elimination were summarized in 7 areas of consumer buying behavior, collaboration with external stakeholders, packaging functionality, cost, sustainability goals, infrastructure and legislation. The companies have realized what they have been facing and also willing to change if the public demand or consumer demand required. The challenge of change into alternative packaging was higher cost with lower functionality and inconsistent technology and infrastructure and supporting policies. The solution needed collaboration between governments, companies and consumers to tackle plastic problems (Xuezi et al, 2021).

While another research in Germany interviewed experts, the analysis demonstrated six groups of recommended measures as the figure 5. The most essential factors are (1) Creation of alternatives for consumers, which could prevent plastic waste at the consumer level, expanding reusable system to engage consumers in more sustainable shopping behavior. (2) Political measures were legal or political regulations to extend producer responsibility and prioritize plastic waste prevention. (3) Change in consumer behavior in political views mentioned littering and treating waste management correctly. (4) Communication and raising awareness were highlighted from all stakeholders and requested range of responsible agents such as environmental organizations, consumer protection agencies, media, educational and public institutions,

the society at large, politics, producers and retailers. (5) Technological innovation and development for alternative products and disposal management (6) Networking with other stakeholders to exchange knowledge and know-how among responsible agents. In conclusion, all measures should be implemented by all relevant agents via the rethinking of patterns of production and consumption and consumers were crucial agents for solving the plastic pollutions through sustainable lifestyles (Julai & Katharina, 2021)

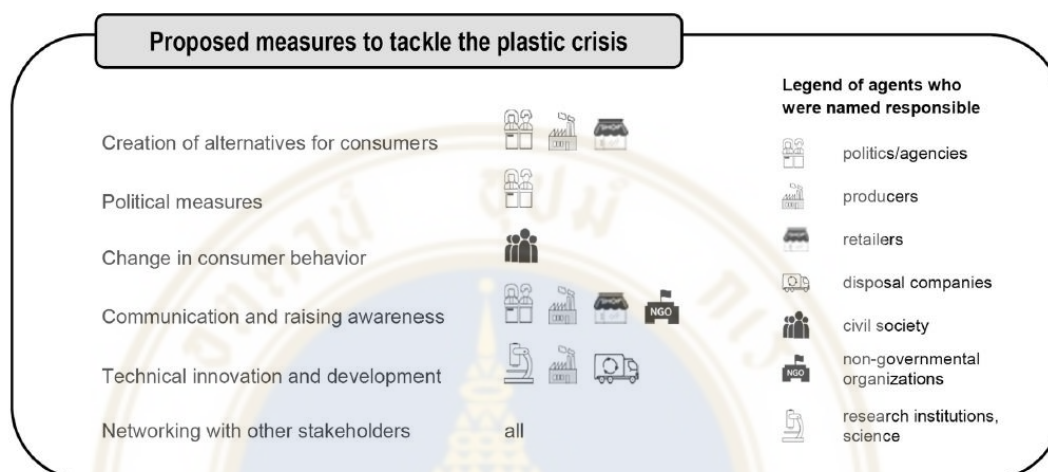


Figure 5 Group of proposed measures to tackle the plastic crisis (Julai & Katharina, 2021, p.5)

2.3 Barriers to reduce single-use plastics

The Indian's government initiated the several regulatory policies regarding the reducing single-use plastic, there still had some barriers that could be categorized in 5 dimensions, namely, (1) policy making related barriers to control plastic production, penalty, education and other restriction in plastic advertising. (2) Lack of government initiatives to promote an alternative products and high cost for technology development for biodegradable plastic that impacted to high price of products. (3) Lack of financial incentives to encourage change behavior and support for developing alternatives and (4) Technology and infrastructure related barriers for producing sufficient alternatives to meet end-user expectations. (5) Fear of losing consumers of producer, retail and other businesses. The analyzed data in India suggested the solutions based on infrastructures in developing economy context that the government agencies should offer financial support to manufacturing and financial incentive for customers as well as conduct

strategically regulation committee to verify the campaigns (Vimal K. et al, 2020). It illustrated some different recommendations from experts and focus groups between developed country and developing country. The financial incentives from government are significant factors to change consumer behavior and plastic industry in developing country while the social norm and sustainable consumption based on education and knowledge are key answers to reduce number of plastic and pollution in environment.

The other segments of using plastic to serve convenience and hygiene to customer is food business. In Candana, the food-based business representatives realized environmental impact from single-use plastic in their business but they had concerns on cost and source of alternative plastic as well as client feedback that required convenience. It requested additional support and guidance from government agencies. The community played in the vital role to adopt the single-use plastics reduction initiative. Both business and community illustrated policy maker and municipality were essential in providing product alternatives to be more accessible with affordable price. The plastic industries and other large distributors in economic context had to be accountable for negative impact on environment and manageable in proper way. The reducing in use of SUP was only initial stage to mitigate the plastic pollution but awareness and behavior also shifted in long-term was required for sustainable consumption at individual, community, country and global level (Prinyankaet al., 2021)

Table 1 Interests and barriers to Single-use plastic reduction as expressed by interviewees

Interests		Barriers	
<i>Sample size (n=7)</i>		<i>Sample size (n=7)</i>	
Drivers	5 Awareness/Values	Sourcing alternatives	7
	3 Customer interest	Costs	6
	1 Growing take-out market	Client pushback	3
Steps taken	7 Switching to alternatives	Knowledge gaps	4
	3 Discounts	Time	2
	3 Buying in bulk	Food safety regulations	1
	2 Reusing SUP containers		
		Challenges	
		Concerns	

CHAPTER III

METHODOLOGY

3.1 Research methodology

The study integrated qualitative data from semi-structured interviews. Through this methodology the research could comprehensively explore opinions on variety of potential key success factors and barriers to tackle the single-use plastic in Thailand. The interview provided in-depth knowledge by asking open-end questions. The stakeholder's opinions demonstrated the variety of current plastic problems, actual success cases and main barriers for single-use reduction in Thailand. The study conducted interviews with 25 stakeholders from government agencies and consumers who experienced in reducing single-use plastic or using alternative plastics. Themes in qualitative data were classified to address research questions in order to provide recommendations based on key success factors and barriers to reduce single-use plastic which enable policy maker to tackle plastic crisis in Thailand.

3.2 Sample selection

The study selected sample of stakeholders from government agencies in Thailand and customers. The 25 interviewees consist of 8 representatives of government agencies who are responsible in Thailand's Roadmap on Plastic Waste Management 2018-2030 and Action Plan on Plastic Waste Management. The other 17 consumers answered questions to cover different perspectives of product user. The interviewed stakeholders were contacted by telephone and email to make an interview appointment with receiving data protection declaration package. The personal information of interviewees was treated anonymously so that the stakeholders could answer the questions honestly without concerns. The stakeholders were asked to answer all questions with a specific focus on key success factors and barriers to reduce single-use plastic in Thailand.

3.3 Interview questions

The preceding text introduced the questions as an open-ended question for an expert interview regarding the topic of success factors and barriers to reduce single-use plastic in Thailand.

Question 1: According to the single use plastic consumption in Thailand, what are your concerns on this situation?

Question 2: Do you think the government campaigns can help reduce plastic consumption in Thailand? If yes, please and specify campaign.

Question 3: What are key success factors to reduce single-use plastic in Thailand?

Question 4: What are barriers that should be improved to achieve sustainable plastic consumption in Thailand?

Question 5: What are your recommended activities to reduce single-use plastic in long-term? (Julia & Katharina, 2021)

Question 6: Do you have any concerns or suggestion regarding the recent campaign of the plastic ban in Thailand? If yes. Please explain?

3.4 Data collection

Due to Covid-19 situation, almost interview conducted through online channels such as Zoom, Microsoft Team and Google meet. There were only 6 face-to-face interviews with government agencies who provided historical information of Action Plan on Plastic Waste Management Phase. The interviewed stakeholders were received the questions and briefed details of the study via e-mail or line in advance so that they could prepare the answers. Prior to interview, all participant were informed a data protection declaration to ensure that their data would be treated as a confidential so that they could answer honestly during interview. The selected method was written semi-structured interview with open questions about perception of single-use plastics concerns and problems, in-depth questions of Thailand's single-use plastic campaigns, key success factor and barriers toward plastic reduction as well as the recommended activities or solutions respectively. The interview took about 15-30 minutes to ask all questions with specific to single-sue plastic in Thailand.

3.5 Data analysis

At the end of data collection, 25 of the 30 stakeholders provided confirmation to interview. The data was analyzed based on qualitative method linked to an inductive and deductive approaches by combining data with coding and theoretical concept. The classified categories focus on what are the key success factors and barriers to single-use plastic reduction in Thailand. The coding scheme of key success factors and barriers were categorized according to number of participant frequency mentioned with arranged from most to least score. As the results of coding process, the stakeholder's responses were sorted into 7 categories of key success factors and barriers. The analysis can provide recommendations for improved sustainable single-use plastic reduction in Thailand.



CHAPTER IV

FINDING AND DISCUSSION

All interviews were recorded and transcribed. The interviewer also took notes to complement the recordings. The collected data from interview was analyzed and coded in different approaches as qualitative method in order to explore key success factors and barriers in single-use plastic reduction in Thailand according to the research objectives;

1. To explore key success factors to reduce single-use plastic in Thailand.
2. To identify barriers of impeding single-use plastic campaigns in Thailand.
3. To develop an understanding of single-use plastic reduction that help recommend strategies to generate sustainable consumption in Thailand.

All interviewed stakeholders live in Bangkok and have experience about single-use plastic. 8 government representatives contributed the reason behind campaigns and policies which implemented in the past and recently periods. While consumers with different backgrounds provided perspectives based on real experiences and reflected desirable actions from their views.

4.1 Responsive profile

The study includes 25 representatives are in Bangkok and have an experienced with single-use plastics reduction and alternative plastics. The interviewed stakeholders were selected with different background in order to receive various response and perspectives. There are 8 government representatives who contributed single-use plastic data under political views and 17 consumers provided opinions from lens of followers and actors. The profile of each participant is given as the table 2.

Table 2 List of interviewed stakeholders

Code	Organization	Background/Specification
G1	Government	Marine and coastal resources
G2	Government	Marine and coastal resources
G3	Government	Marine and coastal resources
G4	Government	Environment and pollution
G5	Government	Public relations
G6	Government	Public relations
G7	Government	Environmental economics
G8	Government	Plastic industry
C1	Consumer	Marine science
C2	Consumer	Bioscience
C3	Consumer	Science
C4	Consumer	Chemistry
C5	Consumer	Environment
C6	Consumer	Petroleum chemical
C7	Consumer	Social science
C8	Consumer	Medical
C9	Consumer	Medical
C11	Consumer	Human Resources
C12	Consumer	Social investment
C13	Consumer	Marketing
C14	Consumer	Marketing
C15	Consumer	Marketing
C16	Consumer	legal
C17	Consumer	Political science

4.2 Stakeholder perceptions of single-use plastic pollution in Thailand

The stakeholders were asked to name at least one significant problem that came to mind regarding the single-use plastic pollutions in Thailand. The variety of problems illustrated the common and complexity issues. Most of the interviewed stakeholder mentioned **environment impact** and **overuse of single-use plastics** as a major problem, which also emphasized single-use plastic as a root cause of many consequences. The stakeholders specified sub-aspect of environmental impact, such as microplastic in food cycle, pollution of soil and ocean, marine animal, public space and health risks of human, as well as death of endangered marine species. Moreover, the stakeholders from government agencies highlighted **environmental concerns** from a huge virgin plastic waste that has been continually increasing every year with new functions to response consumer demand. The environmentalist also concerned single-use plastic consumption that over capacity of waste management system.

“It’s obvious that quantity of single-use plastic waste exceeds waste management system in Thailand, we can see an impractical waste recycling system and rampant overuse of plastic grocery bags, straw, glass and other type of virgin plastic in everywhere. If we haven’t done something to reduce amount of it, the negative impact will be back to us at the end”. (G4)

Another government officer mentioned about marine animal and ecosystem that directly affected from unwell management of litter waste. Then, it leaked to environment and became a food of marine animal, in particular protected species and ecosystem.

“Many endangered marine species died from consuming single-use plastics, which cannot be digested. They have died from bits of plastic lining their stomach, like Marium dugong”. (G2)

Most of consumer representatives named microplastic problems leaking into food cycle. Then, it impacted directly to health and environment in large volume of plastic waste could not decompose within a month or year. From this problem, it reflected the failure of litter management system in household and public. The microplastic might be in soil, water, fish and other food we consumed every day.

The vast majority of Thai was not concerned at all in throwing everything in the same garbage, regardless of the harm to the environment.

“It’s very hard for me to manage plastic waste because I don’t know exactly which one can be recycled and reused and how to dispose in proper way. Honestly, everything is in the same bin in my house.”

(C11)

Furthermore, several stakeholders from all sector criticized that Thai people have not well educated on what recycling was and how an individual’s actions could make a consequence in positive and negative impact. Normally, people did not realize how much single-use plastic products we use every day, such as a seasoning sauce and powder sachets, flock & cutlery from food delivery. It was huge waste to serve our convenience. Currently, it have become the serious problem of waste management that the interviewed stakeholder from all sectors agreed on too much single-use products in the market and it became the vital part in business and our daily life. It was extremely challenging to change inadequate behavior and involve plastic operators with power of government authorities in order to collaborate for solving over consumptions of single-use plastic in Thailand.

4.3 Key success factors and barriers

The analysis of the interviews was coded and grouped into top seven themes of key success factors and barriers characteristics according to the perceived level of information and experiences each stakeholder has. The most predominant one being (1) public and individual awareness and (2) collaboration. Further suggested measures were (3) financial incentive. (4) consumer behavior, (5) innovation and technology development, (6) legislation and (7) single-use plastic price. Other factors were mentioned less prominently. The table 3 indicates number of respondents toward each key success factor and barrier that were named more than ten times from interviewed stakeholders.

Table 3 Top seven themes for single-use plastic reduction in Thailand

Code	No. of participant viewed as a key success factor	No. of participant viewed as a barrier
1. Public and individual awareness	20	15
2. Collaboration	13	16
3. Financial incentive	18	6
4. Consumer behavior	0	19
5. Innovation and technology development	12	3
6. Legislation	11	4
7. SUP price	0	13

4.3.1 Public and individual awareness

The 20 stakeholders or 80% from all sectors emphasized the public and individual awareness as a key success factor to reduce single-use plastic. This included basic knowledge regarding plastic, impact of virgin plastic, its associated toxicity on human and environment as well as waste management could be the essential information to increase public knowledge and change behavior in long-term. Some respondents mentioned that waste management and label symbols on plastic products should be basic understanding for everyone. The first target should be the children and new generation who might change their family member and surrounded people mindset. The results of finding aligned with the past research mentioned public and individual awareness as enabler to solve plastic crisis. When public awareness and knowledge exist in everyone and everywhere, it could shift consumer behavior in term of sustainability and willingness to take action. Furthermore, the educational programs could generate awareness for creating a progressive and transformative process of change. (Fernqvist et al. 2015).

“The relevant government agencies have continually promoted and implemented the campaigns of single-use plastics. We aim to raise awareness on plastic reduction in public and to communicates the

current plastic problems from our action today that should be improved seriously.” (G1)

In contrast, 60% of respondents classified public and individual awareness as a barrier. when society fail in public sensitization and sufficient education, it become a big barrier to change. Currently, there was a small group of Thai who realized single-use plastic problems and tried to reduce consumption seriously. The finding demonstrated that causes of impeding people from consciousness were ineffective communication. For example, inapplicable issues to consumer, unreliable policies and campaign and other related to actual results from action taken. The key lessons learned from success countries in UNEP report mentioned that understanding what stakeholders were doing at local, regional and international levels was important to create the policies and campaign to increase their interest and advocate to aware on plastic crisis (Addressing Single-Use Plastic Products Pollution Using a Life Cycle Approach, 2021)

“I think we use plastic bag more one per day, plastic bottom at least one and many plastic containers. I know that there is campaign to encourage us to reduce usage of plastic but I don’t know the results of my action can actually help solve this problem seriously”. (C15)

4.3.2 Collaboration

On the consumer side, the stakeholders viewed enabler to eliminate single-use plastic in Thailand should start from government and private sectors. While the government representatives mentioned that the consumers were key important stakeholder to help undertake this crisis. The 13 of interviewees or 52% mentioned collaboration among stakeholders was the supporting factor to drive single-use plastic reduction successfully. The summarized opinion stated that policies and procedures of government agencies had to be consistent to each other firstly. Then, all business operators could follow accordingly. By reducing the number of plastic wastes, it needed entire od supply chain - the upstream, midstream and downstream operators as well as consumers to make a change worthwhile. The collaboration with large corporation could shift and attract intention other stakeholders to aware but small local movements of bottom-up initiatives could cause a significant shift to help reduce land-based sources

of plastic pollution so that the effectiveness of collaboration in across groups was important factor.

“The plastic bag waste came from 3 main source; (1) about 30% from shopping mall and convenience store, (2) local food and restaurant generate SUP about 30% and the large sources about 40% from fresh food market. To be success in action plan of plastic waste management, all of them are the key driver to achieve the goals.”

(C6)

Oppositely, the difficult task for various localities with the persistent use of single-use plastic by local merchants and restaurant was barrier due to low cost and usualness. The currently campaigns have focused on collaborating with only by corporations but the local businesses still have not change behavior.

4.3.3 Financial incentive

The third of most important factors in eliminating single-use plastic was financial incentive for plastic manufacturing and consumers. It was voted as success factor about 72% from the interviewed stakeholders requesting policy maker to initiate discount programs. In order to transform traditional plastic production to eco-plastic, it required cost of resources that needed investment in such R&D, material, testing and machine in long-term production from government. For example, R&D institution support, tax reduction for using natural material, subsidy of alternatives. The consumers mentioned financial benefits i.e. gift voucher or discount that was attractive people willingness to change. Therefore, the variety of incentives for the plastic industry to develop environment-friendly products and durable benefits to consumer were suggested to be key success factor.

“In collaboration with private sector, we have identified carefully what their benefits for attending our campaigns and we found that cost saving and financial interest are the essential to the business owner. There is tax reduction for PLA manufacturing. It calls Green Tax regarding the reduction of tax rate to encourage this business but It still have a few players in the green market” (C4 & C8)

On the other hand, 24% of interviewed stakeholders considered financial support as the obstacle. Although plastic operators were willing to change but they always had financial pressure to protect their business firstly. Some respondents discussed about low-income that impact to consumer decision. So, the financial agenda was the most important barrier for developing countries as Thailand because people prefer the cheapest option to the alternatives.

“Financial benefit is attractive plastic owners, alternative plastic producer and other relating sectors. Without any supporting, the relevant operators may reluctant to change or collaborate in changing” (C19)

4.3.4 Consumer buying behavior

The consumer buying behavior included convenience, hygiene and usualness were stated as the barrier absolutely. It was 19 interviewees from 25 or 76% of all stakeholders viewed that it would be difficult to dissuade people from choosing thing they were get accustomed to and that were convenient. The convenience was highlighted to be the obstacle factor while hygiene was mentioned based on the key concern from using recycled plastic and alternatives. The business owners also provided many plastics packaging to serve consumer convenience due to fear of losing consumers or getting compliances. The solution to enable consumers to prevent, recycle and dispose of plastic waste need to have supporting infrastructure and communication. For instance, alternatives with the same functionality, proper disposal system and education. Some customer mentioned it was not only customer behavior but also include business operator usualness behavior. The restaurant always handed in plastic bag, plastic cutlery and seasoning sachets even customer did not request.

“Hygiene and convenience are key functions that I think plastic can serve for everyone with the low cost. Personally, I am not comfortable to use recycled cup, straw or food container. Sometimes, I don’t want plastic cutlery and other seasoning sachets but seller provide to me automatically.” (C3)

We could deny that plastic can offer convenience and hygiene that is essential for food and beverage business, medical treatment and other activities, especially during covid-19 pandemic.

“We found that consumer rely on convenience in daily life which is key barrier. It’s hard to change immediately but it needs constantly efforts to encourage people to reduce single-use plastic in long-term.” (C4)

Currently, the results of score showed that consumer buying behavior was solely barrier in SUPP reducing because we could deny that plastic can offer convenience and hygiene that is essential for food and beverage business, medical treatment and other activities, especially during covid-19 pandemic. The consumer behavior could be change right away. It is generally assumed that maintaining pro-environmental behavior long-term is much more difficult than influencing short-term gains.

4.3.5 Innovation and technology development

Based on the interview results, 12 of respondents considered innovation and technology development of alternatives and traditional plastic were the accomplishment factor. Technical innovation of plastic production and alternative were mentioned based on consumers experiences and government perspectives. The majority of respondents stated that alternatives or eco-plastic should have the same functions or better quality rather than virgin plastic. It needs the government to support sustainable infrastructure to operators in order to find new technology and innovative material. The substitutes development should be produced in mass production in order to correspond to requirements of the market. Furthermore, all stakeholders mentioned that alternative products in the market must be accessible and affordable price in order that local business and consumer were willing to change from virgin plastic to eco-plastic.

The interesting point was misunderstanding of cotton bag and plastic bag in term of providing impact to environment. When we analyzed deeply from upstream to downstream, cotton bag generates more greenhouse gas rather than plastic bag in production. The environmental impact assessment and virgin plastic journey should be addressed carefully prior implementing the policies.

“Alternatives must be produced and designed in mass production and distribution to every business, especially food and beverage. The consumers should easily access to eco-plastic products and able to manage unusable plastic based on Circular Economy.” (G1 & G6)

On the other hand, 6 stakeholders viewed that they were barrier because there were a few alternative products in the market while virgin plastic are earlier to access with lower price. The results demonstrated that current alternative products could not meet customer expectation in term of functionality and trust.

“I support alternative product and try to reduce single-use plastic in my daily life. But I can’t use paper straw because its smell, quality and stability over time when in contact with beverages is not good as well.” (C9)

4.3.6 Legislation

As the results, 44% of interviewees viewed legislation was as a driver to urge companies and consumers to make moves. The concrete rules and penalties would be effective rather than campaigns that have not implemented continually and consistently. The government and consumer agreed in the same view of regulation for control entire of plastic cycle which should start from single-use plastic waste prevention. Moreover, the written laws and regulations could enforce restriction and embargo in production and use of plastic, e.g., law to prohibit virgin plastic or replace plastic material that can easily end up in the environment or tax collection. Some stakeholders proposed to regulate percentage of polylactic Acid (PLA), which was a viable alternative to petrochemical-based plastics in production. It could be decomposed to be black material in soil that consumer could manage by themselves. If someone don’t follow the campaign and still not change their behavior, there is nothing happen. Those of people will transfer this behavior to next generation continually.”

The government mentioned interesting issue that regulations had to be effective without impact to daily life of people. If government ordered or regulation cause some difficulties or inconveniences, people always resist. In other word, the regulations, campaigns and actions of government agencies should not impact to basic right of people and also not impact to quality of product and against business as a whole.

“There is no concrete penalty or laws for supporting single-use plastic reduction or ban. Now, it is only a campaign to encourage people to help avoid using plastic only.” (C15 & C21)

“If someone don’t follow the campaign and still not change their behavior, those of people may transfer this behavior to next generation continually.” (C21)

On the other hand, 4 respondents or only 16% stated the legislation was a barrier to change for products in some businesses. This factor was considered as a double-edged sword, which might be a stopper for business development or a risk of human rights violation.

4.3.7 Price of single-use plastic

The last factor from the interview results was price of single-use plastic and alternatives, which were absolute classified as the barrier. It was 13 interviewees or 52% of stakeholders viewed that alternatives price was higher compared to virgin plastic products so that plastic-free consumption could not happen. Currently, reusable processes were more expensive than one-way systems because the systems required additional cost of material and production. Therefore, green products still had a small number of producers for niche markets so that the price of alternatives was high with the same functionalities or below customer expectations.

“The alternatives or substitutes are always more expensive than single-use plastic. For example, the canvas shoes that made from reused plastic bottle. I saw it in the cashier counter, it cost 600+ baht. Not everyone could afford this price.” (C11)

In term of price, the government mentioned economic angle that petroleum and petrochemical businesses were original sources of plastic products which contributed revenue and influences to Thailand’s GDP. Therefore, the cost of raw material such as plastic pellets price was low because it was domestic resources. The number of plastic SME in Thailand was easily to start the business with high production capacity. Therefore, the quantity of plastic products in market was over demand and consumption that result in low price.

The interesting enabling factor that 6 interviewees mentioned was circular economy solution to plastic pollutions. It considers every stage of a product’s journey;

before and after it reaches the customer. This approach is not only vital to stop plastic pollution, it also offers strong economic, social and climate benefits.

4.4 Finding discussion

The study intends to understand how government and consumer can reduce the single-use plastic by exploring enablers and barriers that are influential in Thailand. From analysis of the 25 interviews, the top seven themes are classified according to the number of participants mentioned. The results contribute the consistent literature in plastic reduction practice and recommendations. The top themes are identified in line with the past researches.

The public awareness and individual values are the most important that stakeholder highlighted with recommendation to focusing on communicating the negative impacts of single-use plastic and how individual behavior changes can make a difference from the present (European Commission, 2020). The interviewees also believe in new generation that they main driver to solve plastic crisis in the future so that education and knowledge are vital element success in single-use plastic elimination. But it has not been effective without other measures and needs consistency. By the way, the effective collaboration between the government, public and private sectors is to provide clear and consistent information to consumers. It should formally communicate through regulations and engage in consumer and public to make sustainable choices and harmonization. This theme aligns with the first priority action of information exchange and awareness, which has been advised by Canadian Council of Ministers of the Environment (CCME, 2020).

The innovative technology is also critically in financing and policy to improve virgin plastic to be better and also develop the alternatives. It greatly increases the ambition levels above the maximum foreseeable levels and widen innovation opportunities for the use of more sustainable materials, such as bio-based (Camila et al, 2021). The findings mentioned that functionality and quality are key success factor to influence people change from traditional plastic to bio-plastic. It supports the study in FMCG business (Xuezi et al, 2021), who still have not change to use alternative in packaging and single-use plastic container due to functionality of alternative. Without

financial support or incentive from government, the private operators may not willing to change or develop the new plastic product according to circular economy concept and sustainable business. The synthesis stated financial incentive in term of tax exemption or reduction, discount and other benefits for both factory and consumers are seen as an effective way to influence behavior change and shift consumer buying behavior toward green products. Taxes of single-use plastic, such as environmental cost, plastic waste collection must be responsible by producers. It aligns with the study in northeast Ohio's Lake Erie basin in United States that financial incentives were the most preferred option for successful solution for individual and community (Jill & Scott, 2018).

The financial tools also link to price of single-use plastics and alternatives. The environmental cost that includes the damage of the economic inefficiencies created by the difficulty of plastic reutilization from reusing and recycling. Majority of interviewee stated that low price of alternative and high price of single-use plastic are essential factors to nudge consumers move from virgin plastic to eco-plastic. From economic aspect, the virgin plastics are too cheap that generate over consumption while green products are more expensive together with low environmental awareness of people, it demonstrates underuse in the market. The opposite prices impact to market failure of plastic which demand price of single-use plastic does not reflect the complete value of the production or the substance price does not complete value of finished products. It supports the research in United States that the variance in price of recycled plastics and alternatives are higher than single-use plastics. It was a constraint for the financial and production decisions of recycling companies (Mario C. F, 2008).

The highest dots from the respondents are consumer behavior stating convenience and hygiene. The result is consistent with the trade-offs section being mentioned to Thailand that the policy of single-use plastics must be balanced against the desirable factor like consumer convenience. The report also urges to think about alternative or substitute products having same price and functionality in order to replace the virgin plastic. It should be acceptable and sustainable in Thai context. (Addressing Single-use Plastic Products Pollution Using a Life Cycle Approach, 2021).

Some countries are success in applying regulations to be the driver such as South and Central America. But this study found that Thailand has prohibited plastic bags less than 36 microns but it has been still in the market (Bangkok Post, 2021). It

aligns with India to forbid the usage of plastic bags less than 50 mm in thickness. Nevertheless, it has been found that the execution of these rules has been somewhat gloomy and partial bans on single-use bags. Moreover, the legislation lacked of the absence of penalties to force people to follow and trigger to change buying behavior (Xanthos and Walker, 2017). For the other actions in reduction of single-use plastic in Thailand, almost have been a voluntary strategy to raise public awareness and request people to involve without certain benefits and visible results. The interesting enabling factor that 6 interviewees mentioned was circular economy solution to plastic pollutions. It considers every stage of a product's journey; before and after it reaches the customer. This approach is not only vital to stop plastic pollution, it also offers strong economic, social and climate benefits.



CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusion

Referring to Asian perspectives on a global plastic pollution treaty in 2020, Thailand is one of the 16 countries with the highest mismanaged plastic waste and contributes considerably to marine plastic pollution (WWF, a new treaty on plastic pollution, 2021). Moreover, we are the sixth biggest sources of plastic pollution in 2017 and 1.91 million tons were from the SUPP in daily life. For tackling this critical issue at the sources, the study aims to identify the key success factors and barriers of single-use plastic reduction in Thailand. The semi-structured interviews with the 8 representatives from government agencies who have responded in Action Plan of Plastic Management in 2020-2022 and the 17 consumers. Using the coding method to analyze data collection. As the results, the 7 specific factors were emphasized and developed understanding as summarized in the Table 4.

Table 4 Summary of factors impacting single-use plastic elimination in Thailand

Themes	enablers	barriers
1. Public and individual awareness	<ul style="list-style-type: none"> • To create momentum in sustainability through education in school and new generation - knowledge of waste separation and post-consumption process etc. • To increase awareness through communication in consequences of consumption behavior. 	<ul style="list-style-type: none"> • Lack of private value in plastic pollution • Distant problems from stakeholder's daily life
2. Collaboration	<ul style="list-style-type: none"> • To collaborate entire supply chain of sing-use plastic - upstream, midstream and downstream • To start from government agencies and all levels business operators 	<ul style="list-style-type: none"> • non-harmonization among stakeholders • Involved only big operators

Table 4: summary of factors impacting single-use plastic elimination in Thailand (cont.)

Themes	enabler	barrier
3. Financial incentive	<ul style="list-style-type: none"> To provide official benefits for factories in long-term i.e., tax collection, tax reduction and eco-plastic subsidy. To attract consumers by discount or free to reduce financial pressure. 	<ul style="list-style-type: none"> Lacks of financial incentive to encourage business operators to transform continually
3. Consumer behavior	N/A	<ul style="list-style-type: none"> Convenience, hygiene and usualness. Fear of losing consumers or getting compliances
4. Innovation and technology development	<ul style="list-style-type: none"> To develop functionality of eco-plastic or virgin plastic to have better quality. To provide sustainable infrastructure and technology of material and production to correspond requirements of the market. 	<ul style="list-style-type: none"> Limited alternative products in the market Lower performance of alternatives comparing to virgin plastic
5. Legislation	<ul style="list-style-type: none"> To initiate written laws and regulations as well penalty to expedite the movement. To apply legislation in all levels – national, municipality and individual 	<ul style="list-style-type: none"> Double-edged sword to violate consumer right and stop business development Risk of human rights violation
6. Price of single-use plastics	N/A	<ul style="list-style-type: none"> Cheapest option for people in developing country High price of alternative with low performance discourage consumer to continue using and changing.

5.2 Recommendations for action

Based on the finding that the interview participants proposed to tackle single-use of plastic pollution, the study deducted 4 recommended actions with sub-action requirements based on respondent's opinions and proposals. The actions require responsible stakeholders including politics/agencies, producers, retailer, disposal companies, civil society and research institutions.

(a) Improving label symbol on products

The labelling requirements to inform about plastic materials used in products will help consumers understand at the beginning on how to manage each product when it is unusable. First of all, government must educate people to understand what these symbols mean and how to manage through social media, school, community and organization. Then, consumer can aware at the beginning how to manage plastic product when it is unused. All single-use plastic and alternatives should be symbol with explanation or QR code to scan information. It will help increase knowledge in long-term and create good behavior among consumer to think from start to end of product life cycle. It's actions of **government agencies and bottling manufacturing and plastic producers** to provide explanation of disposal. The **school** will enhance education material to promote reduction and reuse activities that can learn about products. It will motivate children in kindergarten through high school on the benefit of reducing and reusing, and will have curriculum materials available for use.



Figure 6 Plastic resin identification codes to attached products

(b) Product design to return the sources

The material was mentioned in the study that requested manufacturers to reduce use of toxic substances, design for durability, reuse and recyclability. The first step should start from raw material, one feasible solution is to regulate on the types of plastics and different polymers used in production. This would scale up more pure material stream volumes and make it financially more viable to invest in new recycling technologies. For instance, **government and research institution** collaborate with **plastic producers** list out recycled raw material that allow to use in production in Thailand. It may help utilize a greater percentage of recycled materials in its construction and better economy in planning circularity, a longer lifetime, more options for repair in single-use plastic at the beginning.

(c) Source segregation and collection

The collaboration as the key success factor from analysis to support reduction in single-use plastic in long-term. The solution should be waste collection and manage system that urge producers to take responsible for the collection and recycling of specified volumes of plastic that they produce or place into the market. It requires

policy makers, municipalities, companies, retailer and consumers are stipulates role sharing together drive the system. The actions are in line with Extended Producer Responsibility (EPR), which is the suggestion from Ellen MacArthur Foundation (Breaking the Plastic Wave, 2016). The concept applies to upstream in production, midstream in retail and usage and downstream in post-consumptions as shown in the figure 7, which has implemented successfully in Japan.



Figure 7 Extended Producer Responsibility in Japan (The Japan Containers and Packaging Recycling Association, 2020)

All stakeholders are involved to separate and collect the post-consumer material in order to return to manufacturers. The local government with factory and retail should be set the location or system for mail-in retrieval, in-store collections and buy-back programs. It would help increase effectiveness of litter management so that the virgin plastic and also other garbage will not leak to environment. In order to implement smoothly and sustainably, this action need penalty policy to prevent unwell management.

(d) Fiscal action for manufacturers and market

The challenges of establishing are to enforce legal formulation for manufacturers to pay a tax, levy or monetary investment into programs that offset the environmental impact their products have on the environment. The single-use plastic leak in Thailand because they are the most consumed plastic item and they are not likely to be collected for recycling by the informal sector due to low per item value.





1) To increase tax and vat of single-use plastic in order to shift the price in the market. Tax liability calculation is design based on (1) tonnage of manufactured or converted single-use plastic in calendar year and (2) how much contains recycled material.

2) To subsidize alternative products, recycled factory/products and other innovative technology by supporting cost of tax reduction, R&D investment for eco-products and other green producing and purchasing. It can help cost of production and result in price of alternatives to be lower.

3) For downstream, the regulations on pay-as-you -throw garbage system (PAYT) must be applied to both business operator and household. For example, weight-based payment that collection track or garbage can calculate and charge based on actual weight.

The table 5 summarizes the suggested actions and agents who should be responsible and actionable to response the finding of key success factor and barrier in reducing single-use plastic in Thailand.

Table 5 Summary of the suggested actions and agents who should be responsible

Recommendations	Key enablers	Agents who should be responsible
(a) Improving label symbol on products	<ul style="list-style-type: none"> Public and individual awareness Consumer behavior 	
(b) Product design to return the sources	<ul style="list-style-type: none"> Innovation and technology development Price of single-use plastic 	
(c) Source segregation and collection	<ul style="list-style-type: none"> Legislation Collaboration Consumer behavior 	All 
(d) Legislative and fiscal policies	All	

Legend of agents who are responsible

	Politics/agencies		Producers
	Research institution		Retails
	Consumers		Disposal companies

5.3 Limitation

The experimental data collection was based on focus group organized with some government agencies and consumers in Bangkok, Thailand. Due to the group composition and the explorative qualitative nature of our research approach, the results of the focus group discussions cannot be considered representative for the Thai population. Instead, the qualitative study design intended to discover the depth and qualities of the research field. The result of the study is the presented compilation of key success factors and barriers influencing the single-use plastic reduction in Thailand.

5.4 Future research

Moving forward, the more analyses are needed to investigate perspectives and experiences from international companies and local operators. Research of the same topic to explore enabling factors and barriers in tackling single-se plastic in Thailand in the producer lens. It will provide an interesting approach to the government and consumers so as to understand more about impact and actions of upstream and midstream companies.

REFERENCES

- Aphinya Khanunthong. (2021, January). Thailand Industry Outlook 2021-23. Krungsri research. <https://www.krungsri.com/en/research/industry/industry-outlook/Petrochemicals/Plastics/IO/io-plastics-21>
- Bangkok Post. (2020). Marium death spurs 'dugong masterplan' talks. <https://www.bangkokpost.com/thailand/general/1732191/marium-death-spurs-dugong-masterplan-talks>
- European Commission. (2018). A European strategy for plastic in a circular economy. <https://www.europarc.org/wp-content/uploads/2018/01/Eu-plastics-strategy-brochure.pdf>
- Jan Dell. (2019). Plastic Pollution Coalition. 157,000 Shipping Containers of U.S. Plastic Waste Exported to Countries with Poor Waste Management in 2018. <https://www.plasticpollutioncoalition.org/blog/2019/3/6/157000-shipping-containers-of-us-plastic-waste-exported-to-countries-with-poor-waste-management-in-2018>
- Jambeck, J. et al.. (2015). Plastic waste inputs from land into the ocean. *Science*, 347(6223), 768-771.
- Jill F. Bartolotta & Scott D. Hardy (2018). Barriers and benefits to desired behaviors for single use plastic items in northeast Ohio's Lake Erie basin, 127 (2018), 576-585
- Julia S. & Katharina B. (2021). First reduce and reuse, then recycle! Enabling consumers to tackle the plastic crisis – Qualitative expert interviews in Germany, 313 (2021) 127782
- Kaza, S. et al (2018). What a Waste 2.0 : A Global Snapshot of Solid Waste Management to 2050. Urban Development;. Washington, DC: World Bank. © World Bank. <https://openknowledge.worldbank.org/handle/10986/30317> License: CC BY 3.0 IGO.

REFERENCES (cont.)

- K.E.K., V (2020). Analysis of barriers that impede the elimination of single-use plastic in developing economy context, 272 (2020) 122629
- Xuezi M., Curie P.& James M. (2021). Factors for eliminating plastic in packaging: The European FMCG experts' view, 256 (2020) 120492
- Ministry of Natural Resources and Environment. (2020). Draft of Thailand Roadmap on Plastic Waste Management Priyanka S.V., Tony R.W. & Sarah J. S. (2021). Identifying barriers to reducing single-use plastic use in a coastal metropolitan city in Canada.
- Pollution Control Department. (2021). National Action Plan on Plastic Waste Management in Thailand. https://www.iges.or.jp/sites/default/files/inline-files/S15_PPT_Thailand%20Plastic%20Action%20Plan.pdf
- Pollution Control Department. (2020). No Plastic Bottle Cap Seal. <https://www.pcd.go.th/garbage>
- The Government Public Relations. (2019). Roadmap on Plastic Waste Management. https://thailand.prd.go.th/1700/ewt/thailand/ewt_news.php?nid=7831&filename=index
- The United Nations Environment Programme (2018). UN Environment report. Banning single- use plastic: lessons and experiences from countries.
- UN Environment (2020). Final report for Thailand. National Guideline for Plastic Pollution Hotspotting and Shaping Action for Thailand
- WWF-Australia. (2018). The lifecycle of plastics article. <https://www.wwf.org.au/news/blogs/the-lifecycle-of-plastics#gs.hpz55>