Information Provision and Economic Approach for Promotion of Plastic Shopping Bag Reduction in Bangkok, Thailand.

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การศึกษานี้ได้ศึกษาสถานการณ์การจัดการถุงพลาสติกผ่านมุมมองผู้มีส่วนได้ส่วนเสีย และศึกษาแนวโน้มการใช้ถุงพลาสติกในปัจจุบัน, ประเมินประสิทธิภาพของการให้ข้อมูลต่อพฤติกรรมการใช้ถุงพลาสติก รวมถึงวิเคราะห์มูลค่าความเต็มใจที่จะจ่ายเพื่อส่งเสริมการจัดการขยะถุงพลาสติกในกรุงเทพมหานคร ซึ่งรวบรวมข้อมูลด้วยแบบสอบถามภาคสนามและระบบออนไลน์ พบว่าความถี่ในการใช้งานถุงพลาสติกในปัจจุบันนั้นมีแนวโน้มปานกลาง ในขณะที่มีแนวโน้มการใช้ถุงพลาสติกซ้ำอยู่สม่ำเสมอ และจากสถานการณ์การจัดการถุงพลาสติกแสดงให้เห็นว่าปัจจุบันยังมีการแจกถุงพลาสติกฟรีตามท้องตลาด ในขณะที่ร้านสะดวกซื้อรายใหญ่บางสาขาเริ่มมีมาตรการงดแจกจ่ายถุงพลาสติกฟรีแล้ว อย่างไรก็ตามกำลังการผลิตและยอดสั่งซื้อถุงพลาสติกนั้นเริ่มที่จะได้ลดลงอันเนื่องมาจากมาตรการการลดการใช้ที่เกิดขึ้น การศึกษานี้ยังพบอีกว่าทั้งข้อมูลเชิงเปรียบเทียบ และข้อมูลแนวคิดตลอดวัฏจักรสามารถลดความตั้งใจในการใช้ถุงพลาสติก, ความคาดหวังถุงพลาสติกฟรีจากร้านค้า และความตั้งใจในการซ้อนถุงพลาสติกได้ รวมถึงช่วยเพิ่มทัศนิคติและความตระหนักรู้ต่อสิ่งแวดล้อมได้เช่นเดียวกันในขณะที่ศึกษามูลค่าความเต็มใจที่จะจ่ายสำหรับการจัดการขยะถุงพลาสติก ด้วยวิธี Contingent Valuation Method (CVM) และนำไปวิเคราะห์ด้วย Interval regression พบว่ากลุ่มผู้ทำแบบสอบถามออนไลน์และภาคสนามแสดงมูลค่าความเต็มใจที่จะจ่ายเป็นเงินระหว่าง 0.98-1.43 บาทต่อถุงพลาสติก 1 ใบ โดยปัจจัยหลักที่ส่งผลต่อมูลค่าความเต็มใจที่จะจ่ายประกอบไปด้วย อายุ, ความตั้งใจในการใช้ถุงพลาสติก และการสนับสนุนภาษีถุงพลาสติก ซึ่งระดับที่ส่งผลจะขึ้นอยู่กับชนิดของการให้ข้อมูลในแต่ละกลุ่มและการศึกษานี้ได้สังเคราะห์ข้อเสนอแนะจากผลการศึกษาออกเป็น 3 หัวข้อหลักดังต่อไปนี้ I) การเพิ่มความตระหนักรู้ต่อสิ่งแวดล้อมในสังคม II) การบูรณาการการทำงานและการบริหารจัดการของผู้มีส่วนได้ส่วนเสีย และ III) การออกกฎหมายรองรับมาตรการการลดการใช้ถุงพลาสติก

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Nattapat Piromrat : Information Provision and Economic Approach for Promotion of Plastic Shopping Bag Reduction in Bangkok, Thailand.. Advisor: Assoc. Prof. Chanathip Pharino, Ph.D. Co-advisor: Asst. Prof. Jun Nakatani, Ph.D.

This research aims to study the situations of plastic bag management from stakeholders, current plastic bag use trends, evaluate the effect of information provision and estimate the willingness to pay for plastic bag waste management in Bangkok. Online and field questionnaires had been distributed to collect the data. This study found that the trend of plastic bag use is moderate while most of respondents always reuse their plastic bag. Situations of plastic bag management indicate plastic bags are still distributed for free in the market, but some retailers started not to provide them. The plastic bag production is gradually affected by reduction measures. Descriptive and life cycle thinking based information can reduce plastic bag use intention, expectation for plastic bag as well as an intention of double plastic bag use intention. They can enhance environmental attitude and perception. Willingness to pay for plastic bag waste management was analyzed by using contingent valuation method then estimated by interval regression. Online and filed respondents express WTP 0.030-0.044US$ per bag. Influencing factors are age, use intention and levy support. Recommendations had been generated into 3 topics I) increase environmental awareness, II) integration of managements at all stakeholder levels and III) legislation for plastic bag reduction measure.

Field of Study: Environmental Engineering Student's Signature .....

Academic Year: 2018 Advisor's Signature .....

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Nattapat Piromrat

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CHAPTER I
INTRODUCTION

The trend of global population is increasing and natural resources are consumed more and more. Consequently, the retailers then supply to those enormous demand by providing the service which be able to afford the convenience and also accessibility as known as the supermarket and convenience store. Nevertheless, the supermarket and convenience store have to generate various kind of solid waste especially packaging and plastic waste. Earth Policy Institute (2014) claimed that plastic shopping bags have been annually used approximately a trillion bags per year or two million bags within only one minute worldwide. Moreover, in the past 10 years, Thailand has generated plastic waste average 2 million ton per year or 12% of the total wastes. Besides, plastic waste has been recycled 0.5 million ton per year while the remained amount, which is 1.5 million ton, is contaminated plastic shopping bags from after utilizing such as plastic bags for shopping and food packaging (Pollution Control Department, 2016).

According to Department of Environment (2017), Bangkok roughly generate 11,000 tons as the total municipal solid waste per month or 132,000 tons per year as shown in **Figure 1**. Besides, it is reported that, in 2009-2013, the average plastic bags waste proportion was approximately 21% of the total solid waste in Bangkok, which means this metro have to handle the plastic bag waste around 27,720 tons in every year (Department of Environment, 2013).

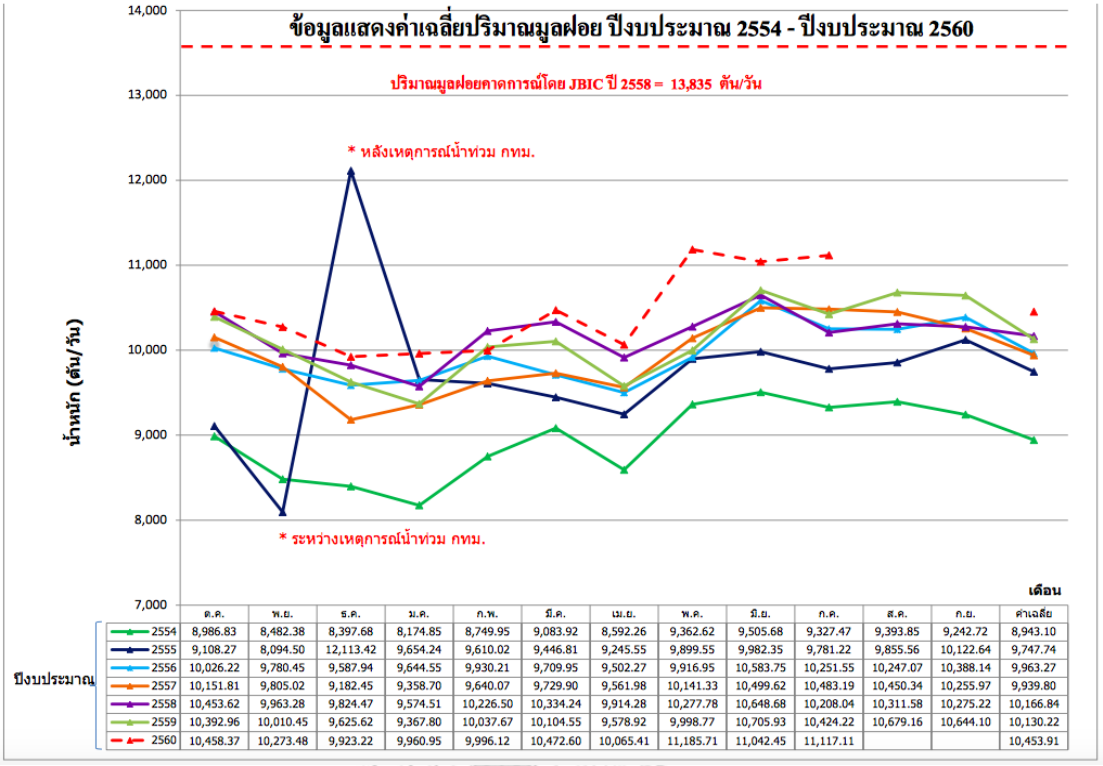


Figure 1 The average monthly municipal solid waste in Bangkok from 2011-2017

Source: Department of Environment (2017)

From the apparent numbers of plastic bags waste, however, it cannot indicate the whole actual amount. Some of them might not be collected for waste management and they eventually leaked to the environment then led to many problems such as remaining in ocean and land for a long time, harming to living organisms, clogging in drainage system to be flooding, breeding germs and a carrier of bringing diseases and also causing aesthetic impacts (Euronews, 2016).

Furthermore, the huge amount of plastic bag waste is mostly collected and transferred to the landfill. Besides, this waste management required less cost of energy, preparation and operation than incineration and recycle. The plastic bag waste has to be collected, categorized, cleaned and dry to prevent any contaminated plastic bag before recycling. Meanwhile, plastic bags come from petrochemical industry which use fossil fuel as plastic production energy so if they are collected to incineration process, it will not only emit the air pollutions but, without enough disposal efficiency, then this process also release some pollution

affected to living health. However, the characteristic of plastic bag is low density, which is high volume per weight, and it also resists to compression. Therefore, the disposal of this kind of waste by landfill need space more than food waste and also take a long time for degradation. Plastic bags may take around 20 and 1000 years to break down in the environment (Smith, 2004).

These problems encourage the globe to concern about the environment then they have tried to take some action to control the uses of plastic bags which is upstream solution for reducing the plastic bags waste. Many developed countries aim to improve the attitudes and perception of using free plastic bags from the supermarket and convenience store. For instance, in Ireland, they have achieved from setting the plastic bag levy for 0.15 Euro per one plastic bag in supermarket and convenience store in 2002. From this regulation, it affected to reduce the uses of plastic bags for more than 90% in the first year of implementation (Convery, McDonnell and Ferreira, 2007). However, in 2007, the price of levy had increased to 0.22 Euro after the plastic bags waste ratio slightly increased in 2006, as shown in **Figure 2** (Department of the Environment Community and Local Government, 2011).

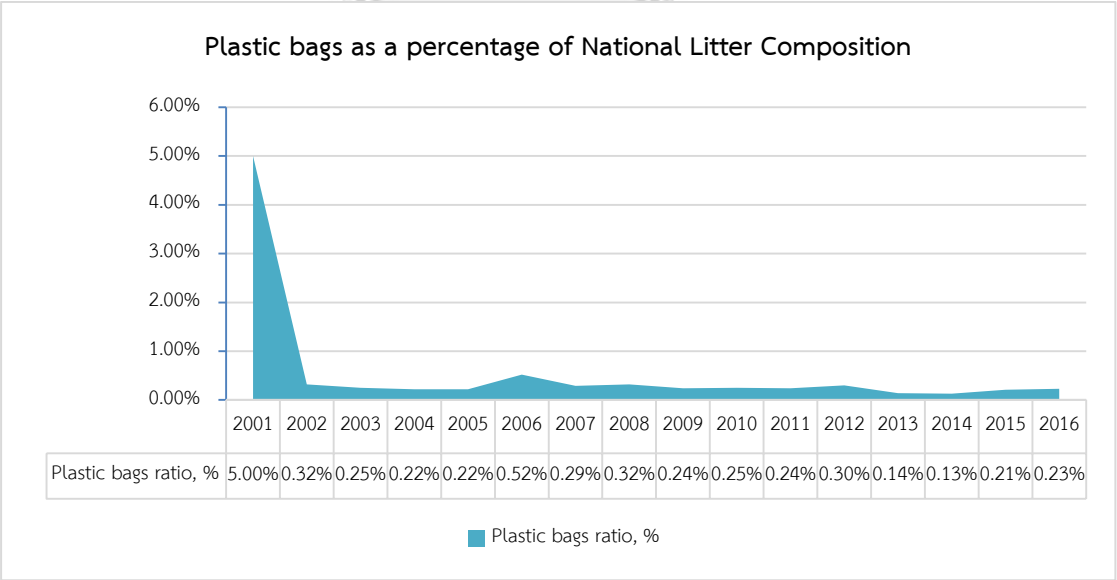


Figure 2 Plastic bags as a percentage of Ireland's national litter composition

Source: The Litter Monitoring Body (2017)

Information provision is currently not effective and comprehensive enough to make people realize to environmental problems. Difficulties and complication of the information need to be considered in order to create the efficiency of information provision so it need to be easy to understand and interesting in the same time. Life cycle thinking or LCT based information is the one of information provision which shows the whole picture of environmental impacts of goods or services as an example in **Figure 3**. Phuphisith (2017) found that life cycle thinking based information to encourage pro environmental behavior can made attitude score of waste separation and refill product significantly improve after received those kinds of information and intension score also improved by LCT based information but not significant.

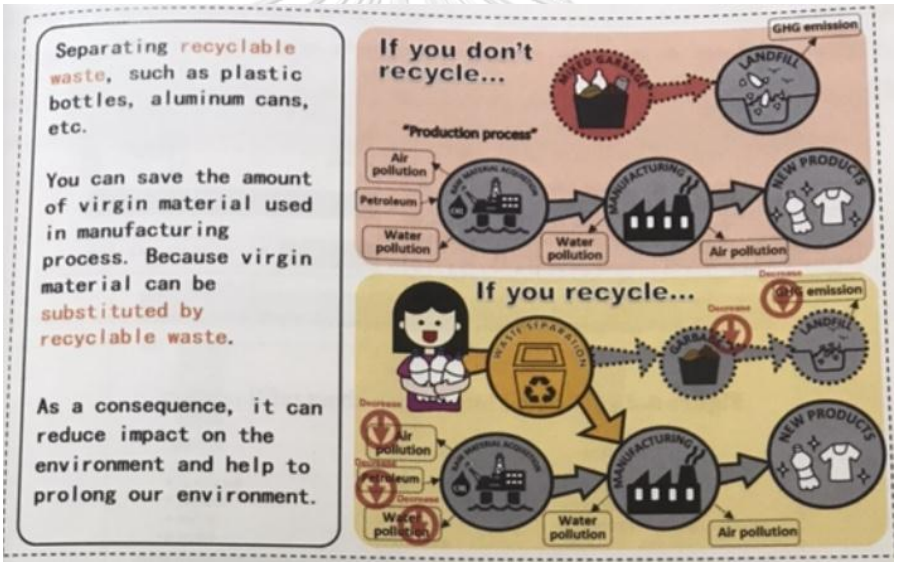


Figure 3 Life cycle thinking based information

Source: Phuphisith (2017)

Nowadays Thailand still lacks the research or study concerning the trend and behavior of free plastic shopping bag use. Therefore, the guideline of effective plastic bags use control is limited and not strong enough. In some private sectors, they emphasized and concerned about plastic bags use control for instance Chula zero waste, by Chulalongkorn University, can reduce the plastic bag use by setting the plastic bag fee for 2 Baht at the stores in the campus. However, there was just the

reducing plastic bag campaign for short terms by the government. Information provision cannot effectively convince people to participate and also lack of monitoring after implementation.

Information provision for encouraging pro environmental behavior and setting policies by using economic approach for plastic bags levy are very interesting for research especially in developing countries like Thailand. Moreover, this research will indicate the feasibility of policy and enhance the efficiency of upstream waste management. Besides, it will be a sustainable solution to mitigate plastic bags waste problems in the society and people will be provoked for changing their attitude. Furthermore, Thai government is now emphasizing about the solid waste problem as the national agenda of the nation waste master plan (2016-2021). Therefore, this study will be important and necessary to setting the law or regulation for control and limit the use of free plastic shopping bags.

1.1 Objectives

1. To study the situations of plastic bag management in terms of production, policy and distribution as well as the trends of customer behaviors.
2. To evaluate the effect of information provision based on life cycle thinking and descriptive on the people's attitude and perception as well as the changes of customer behaviors for the plastic bag use and reuse.
3. To analyze the influencing factors and estimate the price of willingness to pay for plastic bag levy.

1.2 Scope

1. The situations of plastic bag management are investigated through plastic bag manufacturer, policy makers for plastic bag reduction, retailers and customers and the trend of customer behaviors are plastic bags use, expectation for plastic bags and double plastic bag behavior.

2. Manufacturer is Plastic Industry Club of the Federation of Thai Industries. Policy makers are Department of Environmental Quality Promotion and Chulalongkorn University. Retailers are 7-Eleven and traditional markets.
3. The study covers only T-shirt plastic bags which are normally distributed for free at department store, convenience store, supermarket, grocery store and traditional market.
4. The information provision in this study includes descriptive information and life cycle thinking based thinking information.
5. Contingent valuation method with payment card is used for economic approach to estimate the willingness to pay for plastic bag levy.
6. Respondents for online survey (555 samples) and respondents for face to face interview (409 samples) are in Bangkok, Thailand.

1.3 Expected benefits

In Thailand, the researches about the use of plastic bags at supermarket and convenience store are still limited so this study will provoke the society to realize the trend of huge use of plastic bags. Furthermore, information provision will positively affect to change customer's attitude and perception for environment either direct or indirect impacts from using them. The government cannot only consider about the effective information for publish but they also can determine about economic approach for setting the plastic bags levy at supermarket and convenience store for reducing plastic bags use as well. Besides, these kinds of regulation and policy will set the new improvement for the environment and provoke the public to realize more about the solid waste management which is the national agenda of the national waste master plan (2017-2021).

1.4 Definitions in the research

Plastic shopping bag or plastic bag which is mentioned in this study referred to all sizes of disposable or single-use plastic bag provided for free to the customers at the point of sale. It is made of polyethylene and intended to be used once before discarded or recycled. However, plastic bag in this study is not focused for food packaging (United Nations Environment Programme, 2018).

Willingness to pay (WTP) is the value or price that people place on a particular good or service to obtain one. It can be estimated for goods which are not in regular market by establishing the hypothetical situation as known as contingent valuation method (Ahmed and Gotoh, 2006).

Descriptive information in this study is the information concerning the numbers of plastic bag use per person per year in each country.

Life cycle thinking (LCT) based information, in this study, is the information described how much carbon dioxide (CO2) was emitted throughout the life cycle of plastic bag.

Online questionnaire survey or online survey which is mentioned in this study is the questionnaire distribution via website. The respondents in this kind of survey come from online based collection of INTAGE survey company.

Field questionnaire survey or field survey is questionnaire distribution by using face to face interview. The respondents in this kind of survey is gathered in the areas where are near the supermarket, convenience store, market and department store.

CHAPTER II
LITERATURE REVIEW

2.1 Situation of plastic bag waste generation

According to the solid waste annual report of Pollution Control Department, in Thailand (Pollution Control Department, 2016), the trend of municipal solid waste generation is growing in every year. Moreover, in 2016, there is more than 27 million tons of generated solid waste or 1.14 kg per capital per day of generating ratio which has been a highest number in the past 8 years, see in **Table 1**.

Table 1 Thailand's municipal solid waste generation in 2008-2016

Year	Generating solid waste (million ton)	Generating ratio (kg/cap*day)
2008	23.93	1.03
2009	24.11	1.04
2010	24.22	1.04
2011	25.35	1.08
2012	24.73	1.05
2013	26.77	1.15
2014	26.19	1.11
2015	26.85	1.13
2016	27.06	1.14

Source: Pollution Control Department (2016)

Final disposals of the municipal solid waste are still under crisis, particularly a lack of landfill spaces and very low recovery rate. Some of the wastes can be properly disposed but large portions still remain improperly managed at generating sources and at transfer stations. Accumulating solid waste impacts raised serious concerns to both Thai government who is currently responsible for the waste management and the public who have been impacted by nearby the disposal sites.

The public who suffered from the waste mismanagement situation made a request to suspend the operation of the disposal station in some areas causing more accumulation of unmanaged wastes.

Pollution Control Department (2016) reports that Thailand generated more than 26 million tons of solid waste in 2014 because the increasing population and the changing behavior to extravagant use of packaging materials. Besides, the waste generating ratio monitored by PCD also indicates the growing trend from 1.03 kg per capital per day in 2008 to 1.11kg per capital per day in 2014. However, in the total generated wastes in each year included the number of proper disposed, remaining and recycling waste as shown in **Table 2**. The percentage of improper waste management is quite high, double the percentage of recycle rate. Interestingly, there is an opportunity in crisis if we can transform those improperly managed wastes into the recycling stream.

Table 2 Solid waste management in Thailand in 2008-2016

Year	Waste management					
	Disposal				Recycling	
	Proper		Not proper			
	(Million ton/year)	%	(Million ton/year)	%	(Million ton/year)	%
2008	5.69	23.8	14.79	61.8	3.45	14.4
2009	5.97	24.8	14.28	59.2	3.86	16.0
2010	5.77	23.8	14.55	60.1	3.90	16.1
2011	5.64	22.2	15.61	61.6	4.10	16.2
2012	5.83	23.6	13.62	55.1	5.28	21.4
2013	7.42	27.7	14.20	53.0	5.15	19.2
2014	7.88	30.1	13.49	51.4	4.82	18.4
2015	8.34	31.1	13.57	50.5	4.94	18.4
2016	9.57	35.4	11.7	43.2	5.81	21.5

Source: Pollution Control Department (2016)

The 2,450 waste disposal stations with landfill system, which are largely open dumps in practice, can handle 7.88 million tons annually or 30.1% of the total generated wastes. Moreover, only 480 solid waste disposal stations have proper and

effective disposal system. Nevertheless, there are 18 stations which are either already built but cannot operate or have budgets but cannot build the stations because nearby society disagree and they do not want the stations to locate around their properties. However, the percentage of proper disposal has been currently increasing because the government sets a waste management as national agenda to emphasize all stakeholders to coordinate full efforts to solve national waste crisis. In particular, the public sector can play a major role on waste separation and waste reduction at the source (Pollution Control Department, 2016).

Normally, plastic shopping bags are very popular and widely used around the world due to its dominant functions and properties. Durability, flexibility, low production and transportation cost are the main advantages that make plastic bags to be wanted for service in shopping. Plastic shopping bags then have been distributed for free to the customers who are going to shopping at supermarket and convenience stores. In Thailand, there has generated plastic waste average 2 million tons per year or 12% of the total wastes. Besides, plastic waste has been recycled 0.5 million ton per year while the remaining amount, which is 1.5 million tons, is contaminated plastic shopping bags before sending them to disposal process (Pollution Control Department, 2016).

According to Department of Environment (2017), it had reported that municipal solid waste in Bangkok has been increasingly generated in every month. From available data, it presents that there were more than 11,000 tons as the total municipal solid waste in June 2017 and the rough calculation is there might be around 132,000 tons per year which would be generated by this metro.

Besides, the latest nationwide solid waste monitoring report shows that, in 2009-2013, the average plastic bags waste proportion was approximately 21% of the total solid waste in Bangkok, see detail in **Table 3**. This means this metro have to handle the plastic bag waste around 27,720 tons in every year (Department of Environment, 2013). However, this report had not been conducted by Department of Environment since then.

Table 3 The municipal solid waste composition in Bangkok in 2009-2013

Waste composition	Years					
	2009	2010	2011	2012	2013	Average
Organic waste	50.01	54.87	50.07	48.7	49.78	50.69
Food waste	44.34	48.41	44.67	42.72	43.34	44.70
Leaves and wood	5.67	6.46	5.26	5.98	6.44	5.96
Etc.	0	0	0.14	0	0	0.03
Recyclable waste	10.29	10.65	10.98	11.85	11.29	11.01
Paper (Recycle)	1.19	1.42	1.80	2.76	1.88	1.81
Plastic (Recycle)	3.25	3.40	3.44	3.66	3.56	3.46
Foam	1.44	1.55	1.43	1.58	1.57	1.51
Glass	2.70	2.56	2.77	2.70	3.08	2.76
Metal	1.71	1.72	1.54	1.15	1.20	1.46
Landfill waste	39.70	34.48	38.95	39.45	38.93	38.30
Paper (Non-Recycle)	10.70	6.25	10.25	12.43	9.67	9.86
Plastic (Non-Recycle)	**19.18**	**21.43**	**20.56**	**21.35**	**21.54**	**20.81**
Leather and rubber	1.95	1.40	1.50	0.83	1.45	1.43
Fabric	5.52	3.99	4.17	2.83	3.92	4.09
Ceramic and rock	0.81	0.65	0.59	0.53	0.73	0.66
Bone and shell	1.54	0.76	1.88	1.48	1.63	1.46
Total	100	100	100	100	100	100

Source: Department of Environment (2013)

Although the characteristic of plastic bags is very useful for our daily life, those plastic bags waste lead to various problems at the same time. The accumulated amount of this waste can lead to major concerns. For instance, clogging and blocking the drainage system then lead to flooding when raining season, reducing the quality of water resources if this waste is discarded or on the surface of water bodies, as well as posed impacts to the aesthetic landscape. Moreover, when plastic bag itself and marine debris which come from degraded plastic bags are in marine or aquatic environment, those aquatic life can be threatened through entanglement, suffocation and ingestion (Bahri, 2005). Department of Marine and

Coastal Resources found that the estuary of Chao Phraya River released solid wastes more than 14,000 pieces per hours which was highest amount from 5 main estuaries. Moreover, plastic bags were found approximately 14,977 and 15,850 bags in 2014 and 2015, respectively (Thai PBS, 2017).

2.2 Existing plastic bag management

Many countries have initiated many solutions to control and reduce the use of plastic bags. Policy instruments have been developed for adapting to environmental policy to rule and optimize for better environment (Miller, 2012). There are three main types of policy instrument which are 1) Regulation, 2) Economic/market based and 3) non-regulatory, shown in **Figure 4.**

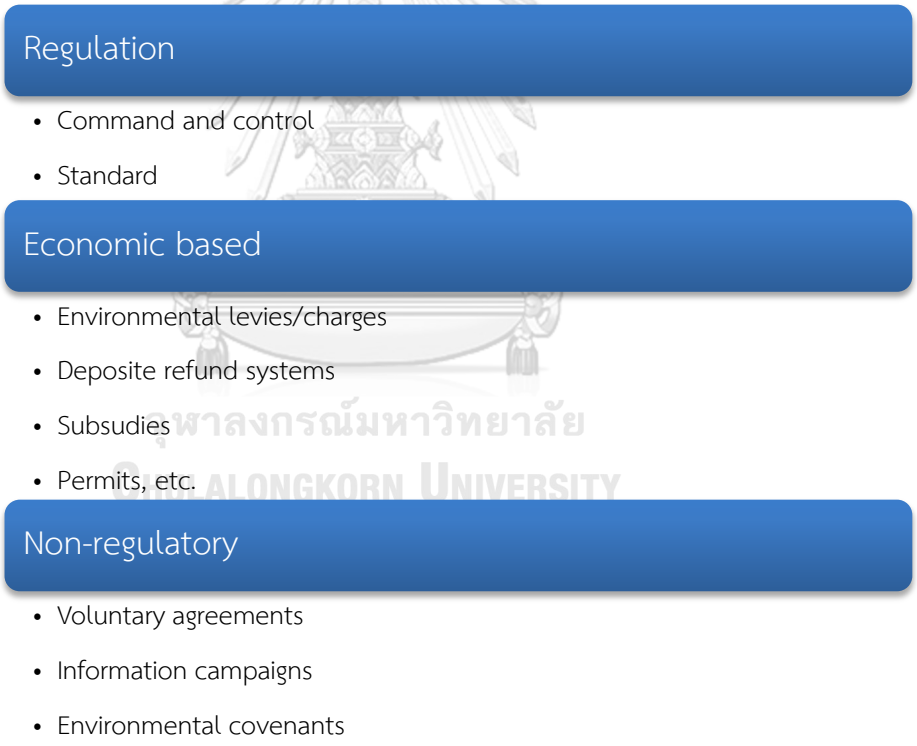


Figure 4 Environmental policy instruments

Source: Miller (2012)

Moreover, the examples of regulatory, economic and voluntary regulations are collected around the globe which represents the worldwide efforts to cope lightweight plastic bag consumption. Besides, the list of examples in Africa, Europe and Asia is shown in **Table 4**. The exchange used rate was 1US$ = 32.561 Baht.

Table 4 The examples of worldwide regulations for plastic bags reduction

	Country	Type (Year)	Features	Recent situation
Africa	Botswana	Levy (2007)	Levy on retailer. Retailers decide to charge 2 to 4 US$ cents or 0.65 to 1.30 Baht per bag. Cut the use 50% with 19 months by setting high prices of bags (Dikgang and Visser, 2010).	The government will regulates to ban the use and importation of plastic bags, effective in November 2018 (Tebele, 2018).
	Cameroon	Ban (2014)	Ban on non-biodegradable plastic bags in terms of importation, production or commercialization since April 2014. (Nyuylime, 2018).	Alternatives are expensive for national traders and many users fell back to the old practice. Plastic pollutants which had disappeared following the ban gradually reappeared (Nyuylime, 2018).
	Kenya	Ban and levy (2007)	In 2007, a ban to plastic bags < 30 μm, and imposed a levy for thicker bags. Then, in 2011, they banned plastic bags < 60 μm, and continue with a levy for thicker bags (Goitom, 2017).	In February 2017, the Government of Kenya announced a ban on the production, sale, importation and use of plastic carrier bags. Plus, encourages retailers to offer consumers alternatives to plastic bags (Goitom, 2017).

Table 4 The examples of worldwide regulations for plastic bags reduction

	Country	Type (Year)	Features	Recent situation
Europe	Bulgaria	Levy (2012)	Retailers were imposed an Ecotax per a bag around 10US$ cents (3.26 Baht) on any bags made of polyethylene with a thickness of up to 25 μm (Surfrider Foundation Europe, 2017).	The revenue of fee dropped around 60% which represents the downward trend of the bag uses (Sofia News Agency, 2015).
	England	Voluntary levy (2015)	Large shops have to charge around 7US$ cents (2.28 Baht) for each plastic bags they provide (Department for Environment Food and Rural Affairs, 2015).	After six months of implementation, the use of single-use plastic bags dropped up to 85% (Smithers, 2016).
	France	Ban (2016)	The ban of lightweight single-use plastic carrier bags in 2006 (Eastaugh, 2016).	The ban expanded on all other plastic bags except compostable bags. in 2017 (Surfrider Foundation Europe, 2017).
	Germany	Voluntary ban or levy (2016)	The stores may phase out from plastic bags use or collect the fee between 6-60US$ cents per bag, (around 1.95-19.53 Baht) depending on the bag size (Deutsche Welle News, 2016).	Many more companies participate without having signed the agreement (Surfrider Foundation Europe, 2017).

Table 4 The examples of worldwide regulations for plastic bags reduction

	Country	Type (Year)	Features	Recent situation
Europe	Greece	Levy (2018)	Customers are imposed around 4US$ cents (1.30 Baht) of Ecotax in each lightweight plastic bag since January 2018 (Surfrider Foundation Europe, 2017).	A plastic bag consumption is cut up to 80% and sales of reusable shopping bags increased within first month of implementation (Smith, 2018).
	Italy	Ban (2011)	Nationwide stores were not allowed to give out non-biodegradable lightweight plastic bags (Messia, 2010).	Consumers have to pay for lightweight plastic bags in supermarkets and grocery stores around 3US$ cents – 12US$ cents (0.98-3.90 Baht) (European Supermarket Magazine, 2017).
	Switzerland	Voluntary levy (2016)	Big supermarkets, Migros and Coop, charged 5US$ cents (1.63 Baht) to customers for single-use plastic bags, after parliament rejected the outright ban (The Local, 2016).	The demand dropped around 85% since they started charging (Swissinfo, 2017).
Asia	Cambodia	Levy (2017)	Cambodia passed the legislation to impose a plastic bag tax in October 2017 (Chakrya and Chen, 2018).	Customers at shopping centers and supermarkets are charged 400 Riel (10 US$ cents or 3.26 Baht) per plastic bag. It is planned to expand the levy for other stores and markets (Chakrya and Chen, 2018).

Table 4 The examples of worldwide regulations for plastic bags reduction

	Country	Type (Year)	Features	Recent situation
Asia	Indonesia	Levy (2016)	Customers were imposed for 200 rupiahs of plastic bag levy around 2US$ cents (0.65 Baht) at selected retailers in 23 cities (Black, 2016).	They can reduce 40% on average, in the uses of plastic bags only in the selected cities. Indonesia is planning to impose a nationwide tax in 2018 (Loh, 2018).
	Japan	Voluntary levy (2016)	Many stores stopped to give plastic bags for free but charge a small fee (2 to 5 Yen or 0.59-1.47 Baht) for the bag instead (Real Estate Tokyo, 2016).	AEON Charges 3 Yen (2.7US$ cents or 0.88 Baht) for a small bag and a large bag for 5 Yen (4.5US$ cents or 1.47 Baht), Natural House Charging a plastic bag for 5 Yen (4.5US$ cents or 1.47 Baht) and SEIJO ISHII Charging a plastic bag for 2 Yen (1.8US$ cents or 0.59 Baht) (Real Estate Tokyo, 2016).
	Malaysia	Ban and levy (2011)	In Penang, customers were encouraged to bring their own bags unless they had to pay for 3.7 US$ cents (1.2 Baht) for a new plastic bag under "No Free Plastic Bag" initiative (Mok, 2018).	The federal government wants all states to begin imposing a pollution charge on plastic bags used within 2021 (The Nation, 2018).
	Myanmar	Ban (2011)	Yangon banned the production of high-density polyethene plastic bags in 2011 (Christian, 2018).	There is still a problem, clogged in waterways, from discarded plastic bags. They are normally distributed for free by small stores selling fruits, vegetables, meat for daily meals in Yangon (Saosopheakneath and Kanha, 2018).

Table 4 The examples of worldwide regulations for plastic bags reduction

	Country	Type (Year)	Features	Recent situation
Asia	Singapore	Voluntary levy (2017)	Miniso shop imposed around 7US$ cents (2.28 Baht) per plastic bag to their customers (Boh, 2017).	25 outlets dropped the bag uses by 75% In 5 months (Boh, 2017).
	Taiwan	Ban and Levy (2002)	Banning on plastic shopping bags with thickness less than 60 μm. Retailers usually set the levy in the range of 3 - 10US$ cents (0.98-3.26 Baht) per plastic bag (Environmental Protection Department, 2007).	To expand restriction on the use of free plastic bags in about 80,000 additional shops started in 2018 (Xinhua, 2017).
	Viet Nam	Levy (2012)	Imposing VN$40,000 (1.76 US$ or 57.30 Baht) per kg tax in January 2012 on retailers (Tuoi Tre News, 2017).	The plastic bags are still widely used even at high tax was impose. Then, the government is considering an amendment to increase the tax fivefold (Tuoi Tre News, 2017).

2.2.1 Regulation measures

Regulation is “a measure taken by government authorities so as to influence people by formulating rules and directives which mandate the latter to act according to these orders; the determining feature of regulations is, therefore, that the relationship is authoritative” (Bemelmans-Videc, Rist and Vedung, 1998).

It often referred to as command and control regulation which is “a directive to individual decision-makers requiring them to set one or more output or input quantities at some specified levels or prohibiting them from exceed (or falling short of) some specified levels” (Lindeneg, 1992). This typically involves the government

issuing a ‘command’ to some target group in order to ‘control’ their behavior. Control also sometimes refers to the need for governments to monitor and enforce target group activity in order for a ‘command’ to be effective (Policy Design Lab, n/a). It also has legal sanctions or penalties for non-compliance. It sets the certain standard by considering on “what, how, when, where, and how much to produce, consume, emit, and clean up” (United Nations Environment Programme, 2005).

Although the main benefit of regulation is that regulator has reasonable knowledge of expected outcomes and apply the same rules to everyone as equality (Lindeneg, 1992). There might be time-consuming and costly for monitoring and enforcement. Besides, those rules or regulations will make no incentive for the compliers to develop goals beyond the requirements and other oversea businesses, which are not compliers of the regulations, will get more advantages than competitive compliers (Miller, 2012).

Selected International experiences

Bangladesh

After they experienced serious flooding resulting in major loss of life due to improperly disposed plastic bags clogged drains during the monsoon season, Bangladesh started to ban all of manufactures and distributions of plastic bags. The government had realized to the externalities of plastic bags before using command and control policy as banning. In addition, plastic bags litter are also very high or 85% of waste stream and the two third of major flooding happened in 1988 and 1998 caused by them (Akullian et al. (2006) and Smith (2004)).

In 1999, Ministry of Environment and Forest (MOEF) started Sustainable Environment Management Program (SEMP) for framing a strategy for phasing out of polythene shopping bags by studying about the production, marketing and use of polythene shopping bags including on its socio-economic impacts before making the final decision. Consequently, in 1993, MOEF declared the initiative to ban the production and trade of plastic bags but the legislation was not passed by the

parliament. Nevertheless, the cabinet approved the proposal from MOEF to ban the production and use of polyethylene shopping bag before Bangladesh became the first country to ban plastic bags since March 2002.

The law of section 1 under the Bangladesh Environment Conservation Act was revised and stated that there is restriction on the production and sale of environmentally harmful products. If it is proven that any kind of plastic bags or products made of polyethylene or poly-propylene is detrimental for environment then government can ban the use of those products to any selected area or entire country (Green Page, 2013). The penalties and punishments for non-compliance are;

- For production, import and marketing, 10 years sentence of vigorous prison or 1 million Taka (11,883US$ or up to 400,000 Baht) fine, or both punishment together.
- For sale, exhibition for sale, store, distribution, transportation or use for commercial purpose, 6 months sentence of vigorous prison or 10,000 Taka (118.83US$ or 4,000 Baht) fine, or both punishments together.

Despite the prohibition of the use in Bangladesh, scattered plastic shopping bags have been seen everywhere on the roads and in canals because there is an absence of monitoring by the law enforcers so people have continued use of the harmful item freely (The Daily Star, 2011). Especially, the cheap and thin plastic bags, which are used to carry any vegetables, groceries and other household goods usually found more than the thicker bags. In addition, the durability of thicker plastic bags makes them to be reused more often. Plus, they are also more expensive, so most shopkeepers do not use them to give away to their customers (Molla, 2018).

India

There was the anti-plastic bag initiative in 1990s before the laws were passed and enacted in various states and cities in India. During in the late 1990s to early 2000s, the states of Sikkim, Maharashtra, Himachal Pradesh and the Himalayan

regions of Ladakh, Haryana, Jammu and Kashmir as well as Delhi and Mumbai all started to ban on plastic bag distribution, use and discard (Down to Earth, 2000).

In August 2000, the city of Mumbai, India, had restricted the manufacture and the use of plastic shopping bags due to clogging storm water drains and causing flooding (Smith, 2004) . In addition, scattered plastic bags adversely affected to the tourist industry, particularly in the Himalayas. Some mammals were suffered by accidently eating discarded bags along with other garbage, then eventually starve to death because plastic bags blocked their digestive systems which were found in many districts (Krulwich, 2008).

Besides, the waste and recycling infrastructure were not sufficient and effective. Therefore, the special authorized police squads were set for monitoring the shops where violated the regulation. Huge fines and the suspension of trading for one month will be applied to retailers if they are caught for using plastic bags (Freinkel, 2011). Nevertheless, some jurisdictions believed that thicker plastic bags would be reused and not discarded. Then, they focused only on banning the thin plastic bags which is less than 20 or 25 microns but other jurisdictions banned all kind of plastic bags outright (Clapp and Swanston, 2009). Despite lack of implementation, there are currently 25 Indian states and union territories started to ban plastic shopping bags. Besides, Jammu & Kashmir and Maharashtra just became the latest states, where ban the use of plastic bags since January and March 2018, respectively (Parvaiz, 2018).

United States

The history of plastic bags concerns in US began since San Francisco became the first city where ban plastic grocery bags in 2007 and it was the first major law regulating carry out bags in the US. The city had expected the ban will achieve the goal of the city which was reaching zero waste by 2020. The reasons supported this legislation were not only plastic litter and aquatic life risks but also greenhouse gas emission from petroleum-based products (Clapp and Swanston, 2009). Moreover, the

law cited that plastic grocery bags cause falling of 14 million trees, use of 12 million barrels of oil, and annual deaths of 100,000 aquatic lifes (1 Bag at a Time, n/a).

The law has been amended during that time for effectiveness improvement and setting the objective which was, for instance, reducing 70% to 90% of plastic bags use. Furthermore, this law focused to prohibit the very thin plastic bags or T-Shirt bags in many places such as supermarkets and large pharmacies. This kind of bags has thickness less than 1 mil and prone to breakage in the first use. The amendment was applied afterward in 2012 and the main point was consideration fee for those bags, even though there was not in original law, and in that year the act of prohibition on bag fees in California was expiring. Meanwhile, the ordinance was expanded to reduce waste and impacts from plastic bags. Ten cents was the fee that charge the customers on carry out bags and the law expanded to include all retail establishments in the city as well as food establishments, fast food stores. However, there were the exemptions for bags for specifically produce, bulk food, prescription drugs dry cleaning and other specific uses. The efforts by San Francisco in 2012 was the model to adapt for real practice in many cities in US (1 Bag at a Time, n/a).

In 2014, the city of Los Angeles just started this kind of ordinance and became the largest U.S. city to ban plastic bags. Either large or small retailers started to ban plastic bags in order to reduce waste and pollution and also require ten cents on each paper carryout bag requested by the customers. However, there was not all kinds of plastic bags are not allowed (LA Sanitation, n/a).

The following types of bag are only allowed to use in LA.;

- Produce bags used for bagging vegetables, fruits and meats, and pharmacy bags
- Restaurant bags
- Hardware stores bags (e.g. Home Depot, Lowes and others)
- Select retail stores bags (e.g. Macy's, JC Penny, Ross, TJ Maxx, and others)

Nonetheless, if the customers that is on the California Special Supplemental Food Program for Women, Infants, and Children or Supplemental Food Program, those stores under the ordinance will provide either a recyclable paper bag or a reusable bag at no cost to them (LA Sanitation, n/a).

In that year, Proposition 67 was a referendum approved by the votes before the ban on single-use plastic bags was applied to large food retailers, pharmacies, corner markets and liquor stores but not restaurants in all cities of California. Therefore, California is the nation's first statewide ban on single-use plastic bags. However, the retailers can offer alternative carrier bags or thicker plastic bags as long as they charge at least ten cents for each of them (Smith, 2016).

Meanwhile, In Austin, Texas, the Council passed the resolution and then became the Single Use Bag Ordinance (SUBO) in March 2013 and officially went into effect one year later. This ordinance, 20120301-078 Chapter 15-6, stated to the type of allowed reusable bags, made of cloth and machine washable fabrics of all kinds. The use of plastic bags will be outright ban. However, the ordinance permitted plastic bags which must be at least 4 mils thick to be reusable. Moreover, the city also intended to encourage businesses and consumers to reduce bag waste. For instance, reusable bags have to be displayed language describing their re-usability and those stores must post signs in English and Spanish describing the city's ban on single use bags to promoting the customer to be more aware for bags using (1 Bag at a Time, n/a). However, the study from Austin Resource Recovery had assessed the achievement of this ordinance and found that the number of bags used in Austin was reduced by more than 197,000 bags in 2015. Besides, litter of bags was also markedly lower (Waters, 2015).

China

In June 2008, the State Council, on the behalf of China's parliament, started to enact for banning nationwide shops, supermarkets, and sales outlets from providing free plastic bags that are less than 0.025 millimeters thick but exempted the use of plastic packaging for raw meat and noodles, for hygiene and safety

reasons. Moreover, this had been one of the city preparation before Beijing hosted the Olympic Games (The Wall Street Journal, 2008).

"White Pollution" is another name to refer to plastic bags pollution in China, where is the world's most populous nation for using plastic bag, because they normally are found in various environment such as waterways, on beaches, and in unofficial dumping sites across the country. Normally, prior the ban, approximately 3 billion plastic bags are used in each day, creating more than 3 million tons of garbage each year. The plastic bags production required annually up to 37 million tons of petroleum. According to the National Development and Reform Commission (NDRC), the banning review reported that "supermarkets can reduce plastic bag usage by 66 percent since the policy became effective whereas the declined usage of plastic bags has no negative effect on the sales of supermarkets." (Worldwatch Institute, n/a).

After the first anniversary of the implementation, the China Chain Store and Franchise Association estimated it had saved around 40 billion plastic bags or the equivalent of 1.6 million tons of oil. However, The State Administration of Industry and Commerce took responsibilities to monitor and had has the rights to fine any shopkeepers and vendors who violated the regulation by caught distributing free plastic bags up to as 10,000 Yuan (1,465US$ or 47,701.85 Baht) (Waters, 2015).

Although Chinese consumers were getting use to bring their own reusable bags to shopping and their awareness of environment trended to be more improved, the bans were some inconsistent across the country. A Beijing-based environmental group or Global Village had found that more than 80% of rural store violated the ban by providing customers free plastic bags (Worldwatch Institute, n/a). Moreover, Feng (2017) claimed that there are many stores as well as street vendors providing plastic bags without any punishment even though they are violating the ban. While some supermarkets and shopping malls nowadays sold plastic bags with 0.30 Yuan (4US$ cents or 1.30 Baht) of fee so it seems to be gradually profitable business instead.

2.2.2 Economic based measure

The one of successful instruments that can effectively control the use and the littering of plastic bags is economic instruments or market-based instruments. Plastic bags levy or charge had been widely known in last decade around the world.

Panayotou (1994) also gave an explanation of this instrument which is "Economic instruments for environmental management such as the removal of distortionary subsidies, secure property rights, pollution taxes, user charges, tradable emission permits, and refundable deposits aim to correct these failures, reinstate full-cost pricing, and bring about a realignment of resource allocation with society's objectives and interests - a necessary condition for sustainable development.''. Furthermore, economic instruments are often used to cover the costs of environmental services and expenditures or incentivize a change in behavior (Killian, 2007).

Economic instruments for environmental protection and natural resource management can be distinguished into seven categories as shown in **Figure 5**, see more details in Panayotou (1994).

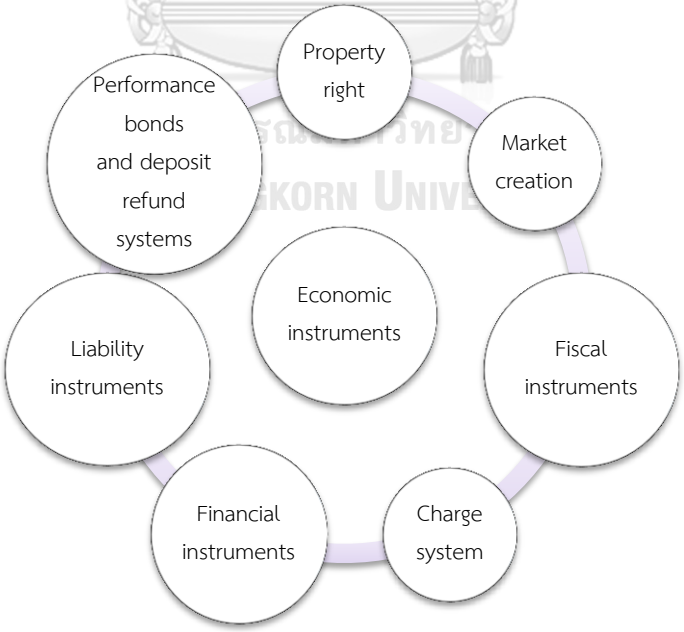


Figure 5 Economic instruments for environmental protection and natural resource management

Source: Panayotou (1994)

The government should seriously concern collecting levy and keep them transparent for the public investigation especially in some developing countries where might be some doubt about the corruptions. Although this approach requires less straight control compared to regulation, revenue record and management must be monitoring by administration of the levy (Miller, 2012).

Moreover, this instrument allows the authorities to communicate about the price signal directly to the customers and producers of polluting goods. Besides, Patel Tonra Limited (2004) claimed that the decent environmental taxation which is more direct to the customers, can make their behavior might be influenced for the greater the opportunity for success.

This instrument is flexible and it indicates "willingness to pay" for goods or services. The consumers have to pay for priced goods or services whereas they can avoid the payments by not consuming them (Miller, 2012). However, taxation can lead to negative impact in some perspectives which are placing heavier burdens on the poor and distorting market's goods prices (Taylor et al., 2012).

Selected international experiences

Denmark

Danish government particularly emphasized on environment by introducing green taxes in 1994. Then, they started to enact a tax on plastic bags at that time which is based on polluter pays principle to reduce the waste from entire life cycle of plastic bags. The type of bags that covered by this taxation is the bags which are at least 5 liters capacity and they can be reasonably replaced by alternative clothing bags but the very strong plastic bags directly comparable with cloth bags and carrier nets are not covered by the tax. During implementation period, the manufacturers and importers of plastic bags were first required to pay a tax based on the weight of plastic bags which was 3US$ (97.68 Baht) per kg before it later slightly increased to 3.3US$ (107.45 Baht) per kg in 1998. Furthermore, the level of taxation has been

unchanged since then and has therefore not followed the price development (The Danish Ecological Council, 2015).

During the taxation period, the plastic bags in the market had been reduced up to 66%. Moreover, the plastic bags consumption was cut to a half from 800 million bags to 400 million bags and approximately 80 bags per person annually. However, the importers and the retailers were charged for the tax and the plastic bags were provided for free to the customers in many stores but this tax was already latent to the customers by increased prices on goods instead. These latent prices can compromise the dramatic confliction between the retailers and customers while some retailers selected to encourage the customers for using alternative bags instead. Moreover, some supermarket charged customers for using plastic bags and then made remarkable effect on reducing the plastic bags uses (Environmental Protection Department, 2007).

The revenues from the tax also indicate to the plastic bags use effect in Denmark. In addition, the revenues share from the plastic bags sale for importers and retailers level was divided for the tax approximately 7US$ cents (2.28 Baht) per bag and retailers around 15US$ cents (4.88 Baht) per bag (The Danish Ecological Council, 2015), shows in **Table 5**.

Table 5 Revenues from the tax in Denmark

Years	1995	2000	2005	2010	2014
Annual revenues (€)	21,564	23,799	25,723	26,818	24,547

Source: The Danish Ecological Council (2015)

However, the challenges have been left to the country after European Parliament agreed on the plastic bag directive in April 2015, which are divided in two alternatives. First, it targeted to plastic bags with wall thickness below 50 microns by charging before the end of 2018 or, secondly, reduce the average use of those bags to 40 bags per person by the end of 2025 (The Danish Ecological Council, 2015).

Ireland

The history of plastic bags levies in Ireland actually began in 1994 since there was discussing about the feasibility of Irish plastic bags levy. Then, in 1999, Noel Dempsey, who was the minister for Environment and Local Government in that time, commissioned a report to explore the different options to make a better environment. Besides, the report suggested that there should be imposition of an upstream levy which are producers and importers with the rate around €0.035 (0.037US$ or 1.20 Baht) per bag, similar to Denmark case. Moreover, it also gave the reasons for rejecting the downstream point of sale levy that it could be administratively complex and difficult. Nonetheless, the minister insisted his intention that he wanted a strong signal to be sent directly to consumers, including having the choice of paying the levy and getting a bag (Convery, McDonnell and Ferreira, 2007).

In March 2000, Dempsey's proposal of a downstream €0.15 (0.17US$ or 5.53 Baht) tax per bag was subsequently agreed by the Irish Government after that a new Environment Fund and the provision of charges for the landfill levy and the plastic bag levy were established under the Waste Management (Amendment) Act. In March 2002, Irish government imposed "PlasTax" to the shoppers at €0.15 per plastic bag and subsequently increased it to €0.22 per bag (0.25US$ or 8.14 Baht) in July 2007. The revenue from levy collection is into an environment fund operated by the Department of the Environment, Heritage and Local Government, and it would be used to support waste management and other environmental initiatives (Smith, 2004).

There was an exception for levy-free bags, which are smaller plastic bags that met specific conditions and used to store non-packaged goods such as dairy products, fruit and vegetables, nuts, confectionary, hot or cold cooked food and ice, while reusable bags were allowed to distribute as long as the customers are charged exceeds €0.70 per bag (Department of the Environment Community and Local Government, 2007).

Prior the tax introduction, there was the plastic bag litter accounted for 5% of total national litter composition whereas, in 2002, this proportion fell to 0.32%, 0.25% in 2003 and 0.22% in 2004. In 2006, the plastic bags composition jumped more than two times from 0.22% in 2005 to 0.52% in 2006 see in **Figure 6**. This number indicated to the reverse of public plastic bags consumption then the plastic bags levy had been increased to €0.22 per bags in July 2007 (The Litter Monitoring Body, 2017).

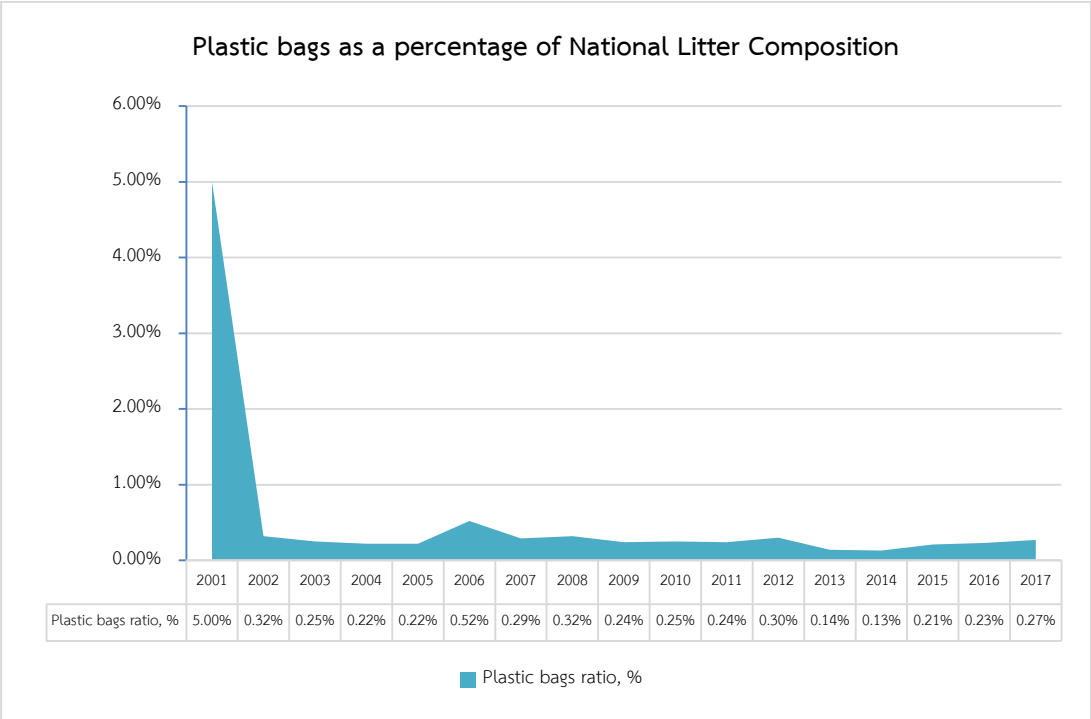


Figure 6 Plastic bags as a percentage of Ireland's national litter composition

Source: The Litter Monitoring Body (2017).

The results of the measure reflected a positive impact on littering plastic bags as a percentage of National Litter Composition by reaching an all-time low portion in 2014 (0.13%). However, the recent results in 2017 show that the plastic bag litter composition has increased continuously since 2014.

Although there was a little composition of plastic bags waste before the levy introduction, the Department of the Environment, Heritage and Local Government realized to the major problems that come from them. For instance, this kind of

waste was visible and persistent so it easily causes to an aesthetic impact throughout the countryside and along the coastline (Department of the Environment Heritage and Local Government Press, 2001).

Moreover, Ireland is a country of frequent high winds so this factor leads any tiny waste scatter and travel long distance plus the hedgerows, with relatively small fields enclosed by shrubs, hedges, clumps of trees and ditches are found along every roadside in this country. Consequently, they make discard plastic bags remain and accumulate then the masking effect of deciduous vegetation is absented in winter by those plastic bags waste accumulation. However, the taxation also covered to the biodegradable bags because they also cause to littering problem and it would be not possible for monitoring by local authorities whether the stores use biodegradable bags or not (Convery, McDonnell and Ferreira, 2007).

This levy initiative showed that it can reduce the use of the plastic bags up to 94% in the first year of implementation. Besides, the annual revenues were around €12–14 million from collecting the levy and administration costs are just about 3% of revenues. Moreover, the public participation reflected the success of this policy through plastic bags consumption in Ireland. The decreasing consumption in the individual use of plastic bags in the short term, a trend which reversed slightly over the years, but which was countered by the increase in the plastic bag levy in 2007 as shown in **Table 6** (Convery, McDonnell and Ferreira, 2007).

Table 6 Plastic bags consumption in Ireland throughout the levy implementation

Periods of implementation	Plastic bags consumption
Immediate	More than 90% reduction in plastic bag consumption
Pre-levy in 2002 consumption	328 bags/inhabitant/year
Post-levy in 2002 consumption	21 bags/inhabitant/year
Pre-levy increase in 2007	33 bags/inhabitant/year
Post-levy increase in 2007	26 bags/inhabitant/year
Usage in 2010	18 bags/inhabitant/year

Source: Bruxelles Environment (2011)

Hong Kong

The unpleasant effects by using plastic bags in Hong Kong have made this country faces major and visible environmental problems. In 2005, landfill survey reports that approximately 8 billion plastic shopping bags were disposed in that year. This number also means that more than 3 plastic shopping bags were consumed per person per day. From the excess uses of plastic bags, the Secretary for the Environment, associated with the Advisory Council on the Environment, established the regulation of prohibiting registered retailers in Hong Kong to provide free plastic shopping bags for customers under section 29 of the Product Eco-Responsibility Ordinance (No. 32 of 2008) then subject to the approval of the Legislative Council on April 23th, 2009 (Environmental Protection Department, 2015).

In July 2009, after the regulation was effective, prohibition to provide any free plastic shopping bags and charging their customers an environmental levy of HK$0.50 (about 6.5US$ cents or 2.11 Baht) per bag are must for retailers in Hong Kong. Besides, the retailers under the ordinance include large and chain supermarkets, convenience stores, personal health and beauty stores, and supermarkets inside department stores. The levy scheme was considered to encourage people to improve their habit of 'Bring Your Own Bag' (BYOB) and aimed to create a direct economic disincentive to encourage consumers to reduce the indiscriminate use of PSBs (Environmental Protection Department, 2011).

However, this period was called the first phase of implementation (July 7th, 2009 to March 31th, 2015) targeting some 3,000 retail outlets mostly being supermarkets, convenience stores and medicare and cosmetics stores after that the full phase implementation for the plastic shopping bags levy scheme, has taken effect since April 1st, 2015, covered more than 100,000 points of retail sales. On the other hand, Retailers who violate the regulation would be fined for 2,000US$ (65,122 Baht) or even prosecutions. The brief implementation details are below and the information provision about the regulation are shown in **Figure 7** (Environmental Protection Department, 2015).

- Ban on free plastic shopping bags distribution at all points of retail sales.
- With exemptions, retailers would charge to customers at least 0.50HK$ (about 6.5US$ cents or 2.11 Baht) for each plastic bag.
- Exemptions on PSB use for food hygiene reasons.
- All plastic bags including flat-top bags will be subject to regulation Retention of the PSB charges by sellers.

This economic based initiative aimed to encourage the public for showing their efforts to reduce use of plastic shopping bags. Moreover, according to a public opinion survey and voluntary campaigns, this levy is a sufficient incentive to reduce the use of plastic shopping bags, but not exceed the level generally accepted by the public (Zhang, 2009).

Figure 7 Implementation of the plastic shopping bags levy scheme details

Source: Environmental Protection Department (2015)

South Africa

"National Flower" has been called for plastic bag in South Africa because they were usually found in the environment (BBC News, 2003), which came from around 8 billion of thin-filmed plastic bags consumption annually. The extensive use of them has not only made more proposition of plastic bags waste but its characteristics, light weight and tendency to 'balloon' with the wind, is also hard to handle. Moreover, in most developing countries, they have had inadequate solid waste management and this kind of waste tends to be blown by wind at open waste disposal sites plus the impact from their persistence of material would be major cause of environmental deterioration.

In September 2002, Minister for Environmental Affairs and various labor and business organizations signed on a memorandum of agreement concerning use of disposable polythene shopping bags and established a non-government body with revenue collection responsibilities then, in May 2003, the agreement was eventually effective (Smith, 2004). The other main elements of the agreement were;

- Regulation of the minimum thickness of plastic bags.
- Disclosure and transparency regarding the costs of plastic shopping bags.
- Regulation of the type and amount of ink to be used on the printing on bags.
- Promoting a market for recycled materials.
- Imposing a levy.
- Preventing the importation of plastic bags.

The minimum thickness of the plastic bags was intended to change from 17 μm to 30 μm whereas, 24 μm thick plastic bags were allowed in the early periods (BBC News, 2003). Although there was the recommendation to set the minimum thickness to 80 μm, that proposal was rejected by commerce and industry (The

Environmental Conservation Act, 2002). Furthermore, the restriction about printing surface area was stated which depending on ink amount and types, allowed printing for 25% of the surface area of plastic bags and can increase to 50% if the ink was environmentally friendly (Dikgang, Leiman and Visser, 2012).

In the first state, the government study shown that there was more than a half of entire survey who was non-compliance though with using 24 μm thick plastic bags at that time. Consequently, South African government, the Plastic Federation of South Africa, had made the decision that after 1st June 2010 the minimum thickness in market had to be to 30 μm instead. Initially, 46 Rand cents (3US$ cents or 1.30 Baht) was collected for each plastic shopping bag across all retailers since May 2003. Besides, some study found that the overall fall in the consumption of plastic bags per real R$1,000 (81.58US$ or 2,656 Baht) of shopping is about 44%, including the high-income retailer and the low-income retailer which are 57% and 50% reductions, respectively. However, three month later, this rate was pressured from the plastic-bag manufacturers then the charge eventually fell plus some firms began charging at different prices. However, this regulation had only succeeded only in reducing consumption in the short term because there was an increasing plastic bags demand over time in this country, despite the price increases (Dikgang, Leiman and Visser, 2012). Currently, there is approximately 1.6 billion Rand raised on the levy since 2004. Nonetheless, the levy is ultimately passed on to consumers who buy the bags at the prices around 60 Rand cents (4US$ cents or 1.30 Baht) per bag (Rogers, 2018).

2.2.3 Voluntary measure

This kind of measure is sometime called “Non-Regulatory” it is usually constructed and applied for reducing plastic bags campaign in national code of practice or agenda. Either voluntary levies or bans can be seen on retailers and manufacturers where started to apply it to their own customers. For instance, they committed to reduce plastic bags distribution, setting a minimum charge for each of them, switching to alternative bags, voluntary labeling and promoting reusable bags etc. Moreover, voluntary measure can also be collaborated concurrently with other

kind of policies, such as regulations or economic instruments for improving entire outcome (Miller, 2012).

Selected international Experiences

Australia

Australia has concerned and emphasized on litter situation, such as discarded plastic bags, especially along coastlines which can directly and indirectly harm to the marine animals. However, although plastic bags consume not much of resources and appeared in minor proposition of overall litter steam, there are many reasons for Australia to necessarily take action on them such as it is distributed for free in large number and can impact to aesthetic, ecological issues, plus public concern is currently on this adverse situation (Environment Australia, 2002).

In 2002, Code of Practice for the Management of Plastic Bags had been adapted for reducing plastic shopping bags consumption by signed agreement between the Australian Retailers Association and the Environment Protection and Heritage Council (EPHC) in Australia. This code also aimed to cut half or 50% of the total plastic bags consumption and a 50% recycling rate by 2005 and required 90% and 25% participation rates for supermarkets and no-supermarkets respectively. Besides, it attempted to introduce changes that will achieve environmental goals in a manner that is supported by the community and is economically efficient and practical (Environment Australia, 2002).

However, Environment Protection and Heritage Council (EPHC) reported that the reduction on plastic bags did not achieve those goals which are 45% of reduction, 14% of recycle rate and 19% of no-supermarkets compliance. Consequently, in January 2007, this failure on the policy brought EPFC to publish the consultation document providing the options of plastic shopping bag reduction which included extension of the Code of Practice, a levy on plastic shopping bags and a complete ban (Environmental Protection Department, 2007).

The voluntary levies have been implemented in many retailers for example; (Smith, 2004)

- Lord Howe Island – retailers introduced 55AU$ cents (42US$ cents or 13.68 Baht) charge for plastic bags to their customers. However, some grocery shops charged while some never applied the levy at all.
- IKEA – the retailer introduced its own 10AU$ cents (8US$ cents or 2.6 Baht) plastic bag levy in October 2002. Then, plastic bag consumption was cut from 8,000 bags per week to 250 bags per week or up to 97% reduction;
- Aldi supermarkets – They charges for plastic bags by provided options for the carrier bags. 15AU$ cents (11US$ cents or 3.58 Baht) per plastic bag, 69AU$ cents (52US$ cents or 16.93 Baht) per cotton bag, 1.49AU$ (1.13US$ or 36.79 Baht) per cooler bag, free reused boxes, no bag or own bag. The most famous option is the reused boxes, or for small purchases no bags.
- In October 2003, Bunnings Hardware stores introduced 10AU$ cents (8US$ cents or 2.60 Baht) levy on plastic bags resulted 91% of reduction in plastic bags uses.

England

Modbury is a market town and civil parish in the South Hams district of the English county of Devon. The big revolution of this small West Country town led here is the first town in England, where has been without any plastic bags use since April 2007. Voluntary action for stop providing any plastic bags was applied by all 43 local traders and eventually 6 months later this town was completely out of plastic bags distribution. In addition, the genesis of the idea came from a young Modbury-born-and-raised wildlife camerawoman, Rebecca Hosking, who had visited the Pacific to film marine life for shooting the documentary film about an episode of Natural World “Hawaii - Message in the Waves”. This film had shocked her with the ugly

truth of plastic bags to see those marine animals suffer and die from plastic waste. Rebecca revealed “The sea is now like a trash can and the plastic is there forever. It doesn’t go away for hundreds of years. What I witnessed was just so unnecessary. All this damage is simply caused by our throwaway living.” (Vidal, 2007).

Her sorrow for those suffering marine animals made her return to Modbury again and found that the seas there also full of plastic. Therefore, she came up with the idea that will change this town forever. The invitation had been sent to all traders in the town to Modbury art gallery for watching her documentary film. At the end of the day, all of traders surprisingly agree to give up on plastic bags (Vidal, 2007). Moreover, the traders also sent their unused plastic bags for making plastic bags chairs and set up plastic bag amnesty points, where people can bring in their own (Hosking and Carleton-Smith, 2008).

The success of voluntary measure in Modbury reflected the effort of sacrifice from the pioneer and then the reputation of results inspired many towns in the country to do so such as Bringhton, Helston, Hebden Bridge, Hay-on-Wye, North Berwick and East Dulwich. Furthermore, big national and international retailers started to charge for plastic bags to their customers by themselves without a national legislation (Sornil, 2012).

Selected national experiences

In Thailand, the initiatives for plastic bags use reduction are not quite comprehensive and still ongoing. The federal measures associated with the private sectors especially retailers but they have been usually voluntary campaigns for a short period and very weak. There have been several voluntary campaigns for plastic bags reduction in the past 10 years in this country where the huge use of them still be neglected by society. Some examples of the previous initiatives are such as;

45 days of plastic bags reduction campaign

In 2009, Ministry of Natural Resources and Environment (MNRE), The National Municipal League of Thailand, retailers, shopping malls and Bangkok collaborated for

the 45 days of plastic bags reduction campaign in order to encourage people to cut their plastic bags use and prevent the global warming. This campaign started from April 22th to June 5th which are Earthday and World Environmental Day, respectively (Ministry of Natural Resources and Environment, 2009).

During the campaign period, people who go to shopping were promoted to deny for asking any plastic bags in their shopping trips. There were 17 brands of retailers and traders, who participated and agreed to support this campaign.

1. Seven Eleven
2. Big C Superstore
3. Tops Supermarket
4. Robinson
5. The Malls
6. Central
7. Siam Discovery
8. Siam Center
9. Siam Paragon
10. Foodland Supermarket
11. Fashion Island
12. Jasco
13. B2S
14. Office Dipo
15. Homework
16. Powerbuy
17. Villa Market

Furthermore, the campaign aimed to cut 8 million uses of plastic bags in the first year. Although there did not reach to the target which was 4,430,236 of reducing plastic bags, they can reduce approximately up to 14 million plastic shopping bags in the next year because private and federal organization had joined more to this campaign. Nonetheless, this initiative is lack of continuous process and it seems to be eventually forgotten by the public (Sornil, 2012).

"No Bag No Baht" Campaign

There also was "No Bag No Baht" Campaign in Bangkok which was the cooperation by Department of Environmental Quality Promotion (DEQP), Ministry of Natural Resources and Environment (MNRE), malls, supermarkets and the convenience stores. It was promoted via radio, TV, newspaper and billboard and the campaign event launched at Chatuchak Market in May 2010. In addition, the customers, who only refuse a plastic bag by purchasing any goods more than 100 Baht, would get 1 Baht discount. While 5,000 free reusable cloth bags were given

away for people. Besides, flyers and stickers of campaign information also provided to around 8,800 traders in that area to apply this kind of initiative and negotiated with other private stores for the campaign feasibility. Moreover, Bangkok also encourage other market, such as Prachachuen Market, Sanam Luang Market, Thewet Market and Minburi Market (Wanich, 2010).

Plastic bags reduction in 15th of every month campaign

In August 2015, there was the campaign about plastic bags reduction by encourage people to refuse to ask for plastic bags in their shopping trips in the 15th of every month. The objectives were that to establish responsibility for environment to be a trash-free society. 15 malls and big retailers in Thailand agreed to be the compliance while they also convinced their customers to use reusable bags at the same time. After the first campaign, the results were positive and they can reduce around 1.8 million plastic bags in only August 15th. Accordingly, MNRE then announced that the 30th in every month would be additional date of this campaign and started in September 30th 2015 (Thairat., 2015). Eventually, the campaign added every Wednesday to be the additional date of campaign and the nationwide result, June 2017, shows that they can reduce approximately 166 million plastic bags since the implementation began (Thairat, 2017).

Reduce plastic bag uses on Monday, Wednesday and Friday campaign

To enhance previous campaign, the recent nation-wide plastic bags reduction campaign was generated and aims to encourage people not to use plastic bags and bring their own reusable bags to their shopping trips especially on Monday, Wednesday and Friday. Besides, this government also plans to strengthen the campaign by stop providing plastic bags on those specific days as well whereas it has not been practical so far (Thairat, 2017).

Chula Zero Waste campaign

Furthermore, there have been many dominant campaigns concerning to this issue by other private sector. Chula Zero Waste, is the environmental scheme

generated by Chulalongkorn University in Thailand, it has started since November 2016 and achieved from plastic bags and other waste reduction initiative focusing on both campus stores and 7-Eleven in the university. The scheme objectives are 1) to provoke the student and everyone in the campus stop asking for plastic bags when they buy a few goods, 2) to establish the new habit on carry the reusable bags and reuse the plastic bags (Chula News, 2017).

However, in the first 3 months of implementation, the result indicated just only 30% of plastic bags reduction comparing with the use in October, when the campaign did not launch. Obviously, in that state, this number represented that campaign cannot change those behaviors to be more care for taking their own reusable bags or reuse plastic bags. Consequently, the campus then addressed that from February 2017 the campus stores have had to stop providing free plastic bags unless as long as each one of them is charged for 2 Baht except plastic bags for hot foods. In transition period, there were several alternatives for the customers if they are not willing to pay for plastic bags for instance, distributing free plastic bags which came from a donation, using deposit refund system on reusable bag, is a nonwoven fabric (spunbond) bag, for 10 Baht per each (Chula News, 2017).

During the implementation period, the results from campus stores indicated that the declining number of the plastic bags use especially in June 2017 that 5 of campus stores can cut from 56,000 of plastic bags use per month in before campaign period to 200 plastic bags per month or approximately 99.6% of the reduction rate, see in **Figure 8** (Chula News, 2017).

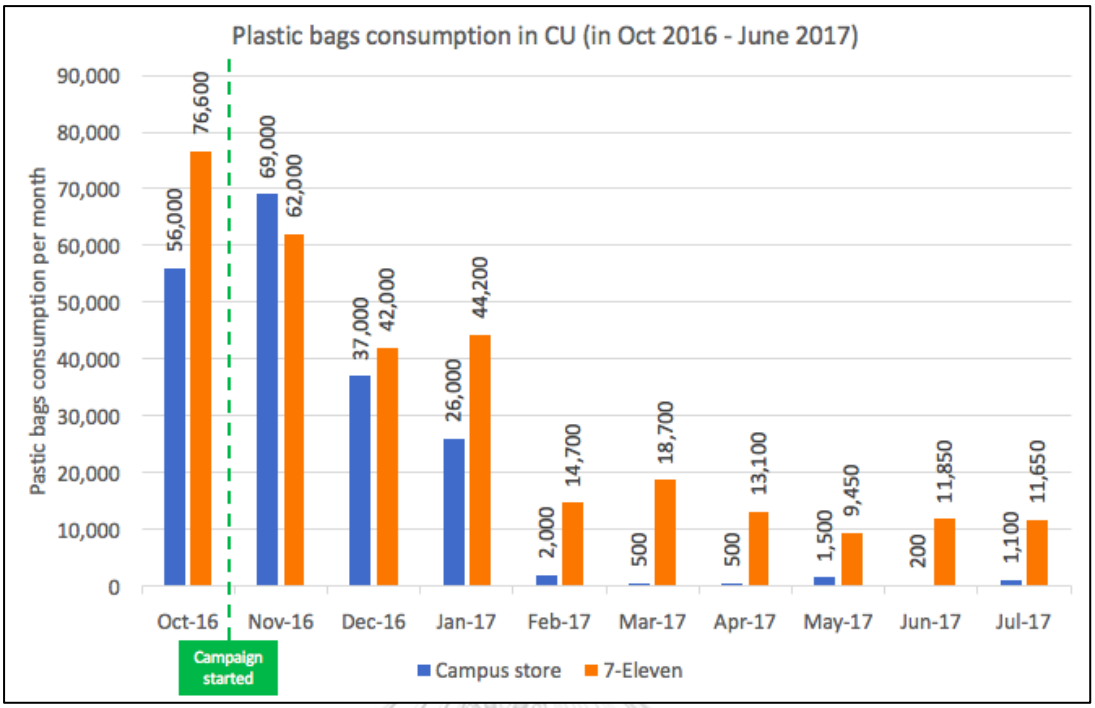


Figure 8 Plastic bags consumption in Chulalongkorn University in October 2016- June 2017

Source: Chula News (2017).

Moreover, the sales from all stores have not been affected by this campaign. Mostly, the sales depend on the day, weekday or weekend, and time periods when customers stay at the university.

Furthermore, the campaign has set the donations of reusable bags from the student and the public to be distribute as alternative bags in both campus store and 7-Eleven. Then people who donate the bags will get the notebook as the gift if their number of donation reaches the campaign requirement.

7 Go Green

There have been many other campaigns established by private retailers to encourage and convince their customer to reduce the plastic bag in Thailand. For instance, 7-Eleven has established the campaign, associated with Department of Environmental Quality Promotion, Green World Foundation and Thai Webmaster Association, about changing customer's behavior to reduce and avoid of using plastic

bags under 7 Go Green initiatives since 2012. 7 Go Green initiative is an idea divided into 4 aspects which are 1) reduce plastic bags, 2) energy saving store, 3) Green logistic and 4) Green product (CP E-News, 2016).

This campaign mainly focuses on teenage group and school roadshow has set and encourage them to refuse the plastic bags and put many goods in one plastic bags as well as provide the information about global warming from plastic bags waste to the students (CP E-News, 2016).

In the end year of 2018, 7-Eleven also conducted the new plastic bag reduction campaign by encouraging customers to voluntarily cut their plastic bag use. In addition, each plastic bag which is refused by them would be 0.6 US$ cents (0.2 Baht) for the donation of medical equipment (Matichon Online, 2018).

No Bag Day Sale

Meanwhile, Central shopping mall in Thailand announced about "No Bag Day Sale" campaign which was originally for corporate social responsibility in 2012. This campaign also encourages people to avoid asking for plastic bags plus the reusable cloth bags are prepared for sale. The customers who refuse to take the free plastic shopping bags or who bring their own reusable bags for shopping trip will be get the 5-10% of discounts coupon in only 15th 16th 17th of every month. Besides, in June 2012, the mall can reduce up to 50% plastic shopping bags use. Currently, the 1 Card points will be provided to the customers who refuse to use plastic shopping bags instead and the revenue from selling reusable bags will partly support to the Seub Nakhasathien Foundation and Foundation for Environment (Manager online, 2014).

Other private measures in Thailand

Moreover, there are many voluntary campaigns to incentivize people to reduce the plastic bag use in many big retailers, see the examples in **Table 7**.

Table 7 The examples of non-regulatory or voluntary measures for plastic bag reduction in Thailand

Stores	Features
Big C	No Plastic Bags campaign is the short-term campaign by providing 200 points of Big Card to the customers who refuse plastic bag and purchase more than 200 Baht (around 6US$) (Big C Supercenter, 2018).
Foodland	If the customers refuse to take any plastic bag will get 1% discount when shopping more than 500 Baht (around 15US$) but not exceed than 2,000 Baht (around 60US$) in every Wednesday (Foodland Supermarket, 2018).
IKEA	IKEA does not have the policy to give a plastic bag for any purchasing. The customers who want the bags for the goods can buy a 71-L polypropylene bags, 29 Baht (87US$ cents) for each (IKEA, 2018).
Tesco Lotus	The customers, who are members and refuse a plastic bag, will get 20 Green Points. In addition, they will get up to 100 Green Points only in 3th July as known as International Plastic Bag Free Day. Plus, Tesco Lotus will donate 1 Baht (3US$ cents), supports to medical equipment for marine life, in each plastic bag rejection (Tesco Lotus, 2018).
The Mall	10 points of M Card will give to the customers who refuse to take plastic bag since 2007. Plus, in International Plastic Bag Free Day, plastic bag is prohibited to give away to the customers and the reusable bags are prepared for 19 Baht (around 50US$ cents) per each (Matichon, 2018).
Tops Markets	Normally, the customers who bring their own bags or refuse plastic bag will get 8 points of The 1 Card. Besides, 193 branches in the country stop to provide any plastic bag in International Plastic Bag Free Day but reward their customer with 8 points of The 1 Card instead (Tops Markets, 2018).
Makro	This famous wholesale retailer does not give away any plastic bag to their customers but the reusable bags are prepared for sale at cashier counter (Siam Makro, 2016).

2.3 Information provision

Information provision as called as education can be able to make people realize and understand about the impacts of their actions and also the details of

how to engage in the specific behavior (Schultz, 2002). Information provision has been also widely used as the intervention to foster the behavior change. Besides, the dimension of knowledge is necessarily to be known concerning what, when, where and how to perform a pro-environmental behavior. In addition, information provision policies normally have the objectives to overcome the knowledge deficit (Bortoleto, 2015). Furthermore, there are many forms of knowledge to be applied for instance procedural, declarative and effectiveness knowledge.

Procedural knowledge is needed to point out people of how to perform or achieve any specific behaviors or a particular environmental goal and the details depend on that specific behavior (Kaiser and Fuhrer, 2003). This form of knowledge, by provided information about where, when and how to do recycling plus which materials as recyclable, used to be applied to foster the recycling behavior. It also shows that it does not provided enough motive to make people change or to do the particular behavior (Schultz, 2002). Some studies point that the small level of knowledge had improved by this kind of information while the recycling rate also increase, however, it is insignificant difference from control condition (Schultz, 1999). However, this knowledge ought to be clear enough and understandable to further become action strategies that convert the intention to the real practice (Bortoleto, 2015).

Meanwhile, declarative information educates people about the information of the fact of something or how environmental system works e.g. knowledge of the side effects of chlorofluorocarbons (CFCs) in the atmosphere or what climate change is (Kaiser and Fuhrer (2003) and (Bortoleto, 2015)). Declarative knowledge can ideally reduce uncertainty which allows people to take actions (Kaiser and Fuhrer, 2003). Moreover, Lee, Kurisu and Hanaki (2015) found that providing this kind of knowledge of the existing campaign could improve people's intention to perform the behavior.

Effectiveness Knowledge refers to a kind of knowledge about the differential ecological consequences or the relative conservation effectiveness of different behaviors. It is also relevant when behavior is instrumental in optimizing a person's cost-benefit ratio (Kaiser and Fuhrer, 2003). For example, Fuel or CO_2 emission can be

cut by switching from a gasoline-fueled car to a hybrid car, see Lee, Kurisu and Hanaki (2015) for example. Buying a fuel-efficient automobile has a greater impact on energy conservation than does curtailing driving behavior, see an example in (Stern and Gardner, 1981).

Moreover, social knowledge is the one of factors that can influence to the pro-environmental behavior as well and social knowledge considers normative influences and social norms (Bortoleto, 2015). In addition, those social norms can be divided into two types such as descriptive social norm, which refers to what most others do, and injunctive social norm, which refers to what others ought to do (Cialdini, Kallgren and Reno, 1991). However, social norm is totally different from personal norm. Social norm is defined as "external perceptions about appropriateness of behavior" whereas personal norm is "internalized self-expectations" (Schultz, 2002). Some study found that personal norm affected to recycling behavior just for short term only but descriptive social norms is competence to effect in a long term (Schultz et al., 2007). Besides, this type of knowledge seems to be more effective motive when the behavior of interested can be seen by others such as curbside recycling (Schultz, 2002).

However, information provision cannot guarantee that individuals will understand or acknowledge for the particular information. This limitation leads to the reduction of the effect from information campaigns if changes deviate too far from existing beliefs leading to opposing beliefs (Cook and Berrenberg, 1981). Schultz (2014) also suggested that the information provision is effectively used to support an existing behavior with an already-motivated person while there is no evidence to indicate what type of information is the best one. However, among some limitation, information provision is widely used as campaign to encourage people to do in specific behavior over other interventions because it is inexpensive to create and disseminate.

2.3.1 Information provision based on Life Cycle Thinking (LCT)

Life cycle thinking (LCT) has recently been the topic that the world talks about and many countries applied it to be a part of environment improvement. This

initiative aims to see every angle beyond the traditional focus on production site and manufacturing processes to incorporate various aspects associated with a product over its entire life cycle (United Nations Environment Programme, 2006). In addition, the entire life cycle is considered includes extraction of raw materials from natural resources, materials and energy that are used in the part of production, packaging, distribution, use, maintenance and recycling, reuse, recovery and then disposal process as shown as in **Figure 9** (UN Environment, n/a).

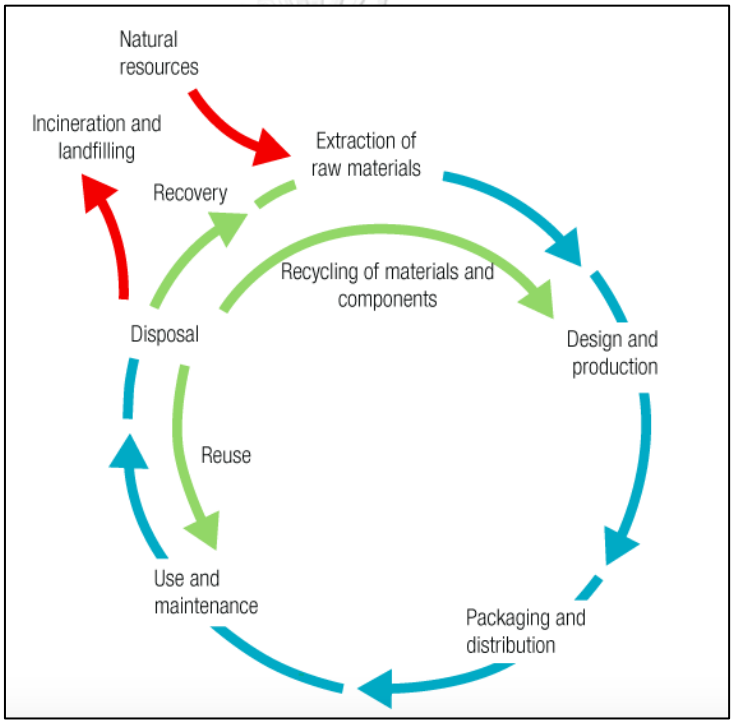


Figure 9 A typical product lifecycle diagram

Source: UN Environment (n/a)

The main purpose of life cycle thinking initiative is to reduce the use of resources and emissions to the environment as well as enhance the socio-economic performance through the life cycle of a product (UN Environment, n/a). Besides, the LCT concept can be applied to the environmentally-friendly Product to show the impact on environment which is helpful for the customers for making their decisions

for instance environmental labels, ecolabel, carbon footprint label, carbon reduction label, and water footprint label, etc. (Phuphisith, 2017)

Nevertheless, Upham, Dendler and Bleda (2011) argued that the labeled emissions values, carbon equivalent mass, seems to be too difficult to make sense for the UK public if there does not provide any additional information to them. The information provision based on LCT was also conducted concerning reusable shopping bags by Kikuchi-Uehara, Nakatani and Hirao (2016) and found that LCT-based information is capable to raise the environmental awareness and its efficacy changed along with the level of LCT skills of the respondents. However, it was effective in improving environmental awareness only in low LCT skills respondents.

2.4 Economic approach

Environmental value has been emphasized to conduct a cost-benefit analysis. It is based on the total economic value which consists of use value, non-use value and option value while use value consists of direct use value, indirect use value. On the other hand, non-use value consists of bequest value and existence value, see in **Figure 10.**

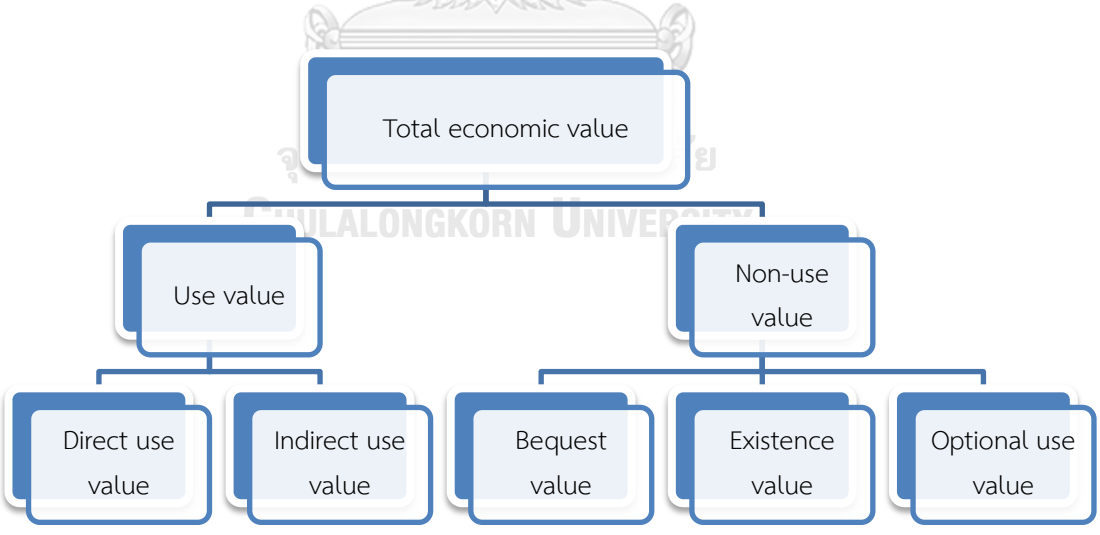


Figure 10 Type of environmental value

Source: Lesser, Dodds and Zerbe (1997)

Use value is the value of environmental goods and services that individuals actually consume in both direct and indirect ways. For instance, bird watching, hunting and fishing. Conversely, non-use value is not relevant to the actual consumption of them. For instance, a value that is not relevant to the actual consumption neither direct use nor indirect use, for example the value from wetland protection. Non-use value use which can be divided into bequest value, values from preserving of the good environment for the future generation, and existence value, value that people receive from preserving the existing environment such as preserving endangered habitats species.

Environmental valuation techniques are divided into two major types, monetary and non-monetary techniques. Monetary techniques are also known as direct valuation techniques. They are used to evaluate the value of environmental goods and services on the basis of the monetary values that individuals place on receiving or avoiding them and even they are not available in the market. Besides, for example contingent valuation method (CVM), it aims to estimate only how much purchasing power that people would be willing to give up for getting it, when they have to make the decision on hypothetical situation. On the other hand, the opposite techniques, non-monetary valuation techniques, are used to indirectly value environmental resources which is surrogate markets such as Travel Cost Method (TCM), Hedonic Pricing Method (HPM) (Ahmed and Gotoh, 2006).

2.4.1 Contingent Valuation Method (CVM)

CVM is flexible tool because it can be analyzed the environmental valuation of direct use value, non-use value and option value. Therefore, it is focused in this study to estimate the willingness to pay through hypothetical situation. Furthermore, the respondents have to be provided with adequate information for an accurate answer while the respondents also need to know how to do the payment and what type it is, such as annual tax or donation. There are many types of questions in contingent valuation method.

Open-ended question

This type of question asks the respondents straightforward to make them reveal how much they would be willing to pay in maximum without provided any choices such as how much would you be willing to pay to support the air quality improvement? However, the respondents can hardly make their decision and provide an unrealistic answer, so this bias leads to be variant for determination the mean of willingness to pay.

Closed-ended question or dichotomous choice method

The respondents will be asked about their willingness to pay by the way of making them to accept or reject the proposed value and making the respondents to easily answer is one of advantages to potentially grain the willingness to pay even though it requires larger sample size to receive the accurate results. In addition, dichotomous choice method can be distinguished into several kinds.

Single-ended dichotomous choice

The stated number will be shown to the respondents and then they are asked whether they accept it or not. However, some studies indicate that this method is inefficient and variant and then the double bounded dichotomous choice had been suggested.

Double ended dichotomous choice

In addition to the single-ended question, there is an additional one as the second question after that. The respondents will be asked with higher number when they previously accepted the first proposed number. Conversely, they will face with lower number if they reject the first proposed number. Asking the respondents twice to find the accurate number is improve the potential for elicit the willingness to pay.

Bidding game

The respondents will be explained about the hypothetical situation and the details of that product then proposed number will be shown to them and ask whether they would be willing to pay. The respondents have the right to bargain only one time as single bidding while multiple times as iterative bidding by reduce or increase the number until matching their preferences.

Payment card

The respondents will choose the number which match to their preferences from a series of cards with different numbers. Despite the ease for choosing answer, it shows the difficulty when it is applied in the different income groups.

Double-ended dichotomous choice and payment card seem to be the most popular kinds of question that are currently used to elicit the willingness to pay (or willingness to accept) (Challchareonwattana, 2015). Some study compared the results between double ended question and payment card and found that they yield indifferent results (Blaine et al. (2005) and Cameron and Huppert (1989)).

2.5 Studies related to willingness to pay and information provision

There are many researches about estimating the willingness to pay in Thailand. Improving municipal solid waste management and wastewater management seem to be the most dominant topics either in Thailand or developing countries. Challchareonwattana (2015) found that people have been willing to pay to improve the municipal solid waste management. The study was conducted with 1,064 samples by focusing on three scale settlements as case studies which includes Greater Phang Khon Area (peri-urban settlement), Muang Hua Hin Municipality (a moderately urbanized settlement) and Bangkok. The WTP analysis from payment card method also indicated that the people's willingness to pay were 0.73US$/month, 1.96US$/month and 1.65US$/month in each area, respectively. Accordingly, people were willing to pay more than the municipal solid waste fee,

which is partially subsidized, that currently charged by each municipality though it is lower than the full cost of the fee.

In developed country, Dunn (2012) found that people in Logan, Utah who use reusable bags for some trips would switch to using reusable bags for all trips if they were received 12US$ cents per reusable bag if they brought them from home. The tax level is hypothesized to be much less. The results show that people, who are younger and have lower income, are more willing to pay for continue use of plastic bag. The findings indicate a small tax can decrease usage of plastic bags considerably which is consistence with the study of Convery, McDonnell and Ferreira (2007).

Phuphisith (2017) studied about the information provision based on life cycle thinking (LCT) to promote pro-environmental behavior which are waste separation and refill product use behaviors. The research found that LCT based information was recognized more useful than the alternative information in both target behaviors. Moreover, the attitude of respondents increased after the information provision. Besides, the differences between a baseline practice and intention had been investigated. The results show that the respondents in LCT group about refill product was higher than the difference from respondents in without information or alternative information groups. Meanwhile, the differences between a baseline practice and intention about waste separation was higher than the differences of without information group.

Besides, Kikuchi-Uehara, Nakatani and Hirao (2016) also found that the efficacy of providing LCT-based information in raising consumers' environmental awareness changed according to the level of LCT skills of the respondents. LCT-based information was effective in improving environmental awareness in respondents with relatively low LCT skills.

2.6 Research gaps

In Thailand, plastic bags are always free and convenience for people in their shopping trip. This might be the one of reasons that the particular study related to plastic shopping bags uses or control is not much established and emphasized by either researchers or the government. Therefore, the national level information about plastic waste management, such as the plastic bags uses trend and plastic bags waste ratio, is barely unknown to be developed in this country. Moreover, in Thailand, there has been only the nationwide trend of municipal solid waste generation. The official composition of plastic bags waste had been available only in Bangkok but unfortunately the monitoring reports were made only in some fiscal years. So, this kind information is still lacking to reflect the trend of the entire country. Moreover, the trend of plastic bags uses, which is much more significant for upstream control, has not been studied yet in Thailand.

Meanwhile, many developed and developing countries already conduct their initiatives to take control on plastic bags uses such as set the plastic bags levy or plastic bags banning. The present habit on free plastic bags might be conquered by reasonable plastic bags levy. If they realize about the situation of excessive plastic bags waste and uses as well as the effects on environment. Actually, there was an unpublished study about plastic bag's willing ness to pay in Thailand, However, this study might be useful for people who study about plastic bags levy in developing country, Thailand.

Double bag behavior had been called in this study. It refers to the behavior of the customers when they decide to take the second plastic bag offered by the store if they buy the heavy goods. Currently, this behavior might be typical for both buyer and seller in Thailand. Sometimes, many sellers think that giving double bags is a good service for the customer, so customers might have positive feeling when getting plastic bags rather than realizing to their environmental impacts. This study then focuses on double bags behavior which is very interesting, while the global trend is trying to reduce plastic bags but some of them still ask for more.

Although there were many campaigns about plastic bags use reduction in Thailand, it seems the supermarket and convenience store still distribute huge amount of them. The previous campaigns are obviously lack of result monitoring and potential of continuity leading to unsustainable campaign. This study believes that an education with potential information would establish sustainable solution. Many people might not know or cannot imagine how many process of entire plastic bag's life cycle which emits Greenhouse Gas or how many plastic bags that we use per day. This information might fulfill their knowledge deficit and eventually change their use behavior.

Many campaign and initiative about plastic bag management has been set but it seems to be effective only a short period. Then, the perspectives on plastic bag management and reduction, in term of production, policy maker, retailer and customer, are important to be understood which are current gaps of plastic bag reduction. They can eventually generate the suitable and compromising management approach to harness the plastic bag use and reduction by understanding the actual problem in every angle.

Many aspects are still not widely studied now and being a knowledge gap in Thailand. However, these aspects would support the feasibility of policy adaptation based on public support in Thailand. The national policy makers can use them to set the rule to harness the use of plastic bags for better environment.

2.7 Contribution of research

The limitations and obstacles about plastic bag management and reduction from each angle such as production, policy maker, retailers and customers, are revealed in this study. So, the understanding of those limitations can lead to the suitable and compromising plastic bag management approach. Plus, both potential information provision and suitable willingness to pay for plastic bag levy can enhance the potential of plastic bag management in Bangkok.

CHAPTER III
METHODOLOGY

This study had been conducted and based on five major components see the outline details as shown as **Table 8**. In addition, the research's methodology consists of three main parts which are 1) questionnaire survey, 2) information provision design and 3) willingness to pay analysis.

Table 8 Outline of research

Components	Tasks	Processes
1. Literature review	1.1 Review about worldwide plastic bag management 1.2 Identify the study technique	Review research
2. Scope and design study parameter and area	2.1 Selecting study parameter 2.2 Selecting study area 2.3 Selecting study information provision	Select potentially study parameter, area and types of information provision
3. Data collection	3.1 Questionnaire and Information provision design and distribution 3.2 Gather primary data of plastic bag situation	Distribute online questionnaire and interview Plastic Industry Club of the Federation of Thai Industries, Department of Environmental Quality Promotion, Chulalongkorn university, 7-Eleven, traditional market and their customers.
4. Analysis	4.1 Identify the factor affecting on changing behavior 4.2 Determining WTP price that people are willing to pay for plastic bag levy	Conduct statistically analysis by SPSS
5. Recommendations	5.1 Formulating recommendations from existing regulations and new ideas	Provide recommendations from the results

3.1 Literature review plan

There were 6 main topics which were planned to investigate and review in this study such as situation of plastic bag waste generation, existing plastic bag management, information provision, economic approach, studies related to willingness to pay and information provision and research gaps.

Initially, the growing trend of solid waste generation in the past had been studied. While the nationwide trend of waste generation and proportion of the proper and improper waste management was also investigated. These two aspects based on the waste management online reports by Pollution Control Department (PCD) of Thailand. Besides, this study had also reviewed the information about the worldwide existing measures against plastic bags reduction as well as the nation measures in Thailand. The reviewed measures are regulation, economic/market based and non-regulatory or voluntary measure.

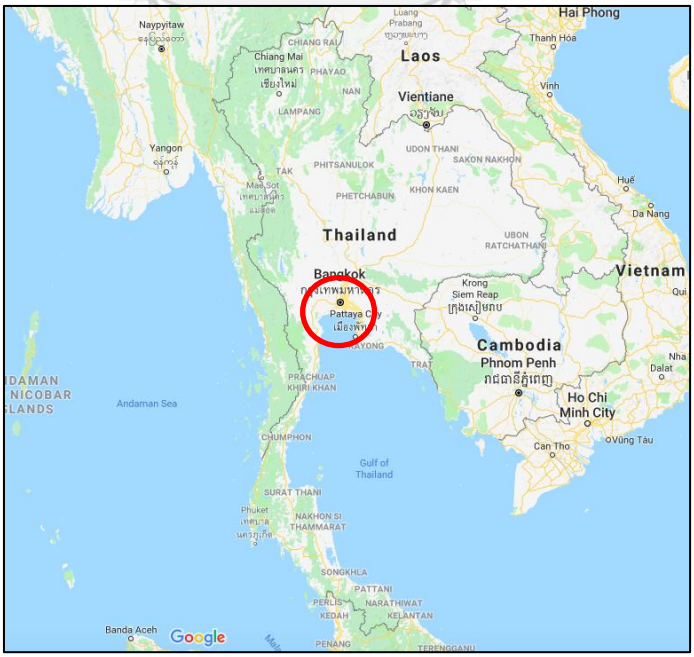
Information provision aspect was also investigated to be guideline to create the information, descriptive and life cycle thinking (LCT) based information, which are used in this study. The models of information creation came from the related researches, reports and news. Economic approach was focused to be one of the main aspects for plastic bag's willingness to pay in this study. Many worldwide experiences about policy adaption based on economic approach were investigated. Besides, the types of contingent valuation method were also reviewed in mentioned part.

Because there is not widely studied in Thailand, many foreign studies concerning information provision and willingness to pay were reviewed about, for example, the type and form of information provided to the respondents and what kind of tool is used to elicit the willingness to pay. Lastly, the research gaps derived from the limitation of previous researched and the new point of view after reviewing such as double plastic bags behavior.

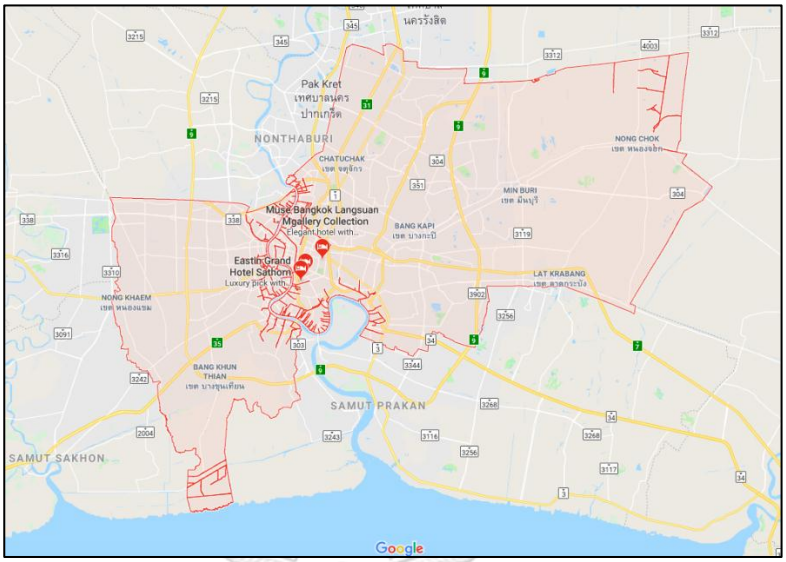
All of those mentioned topics were reviewed from many kinds of either international or national publications such as researches, journals, books, official reports, announcements and news etc.

3.2 Study area and parameters

The study area for data collection is Bangkok, where is the capital of Thailand lies in Southeast Asia as shown in **Figure 11**. Besides, Bangkok occupies approximately 1,568.7 square kilometers (BMA Data Center, n/a). It is located on Chao Praya River's low flat plain, which stretches to the Gulf of Thailand, so it is easily to be flooding when rainy season and drainage clogging by solid wastes. This target area is selected by many reasons. Additionally, there is rapid urbanization, development and this city is also the tourist destination. Huge population comes from registered and nonregistered population. They have been the causes for large resources consumption as well as pollution emission at the same time. According to Bangkok GIS (2015), there was 5,696,409 of registered population in Bangkok while the density was 3,631 persons per a square kilometer. This number has increased in every year as well as a nonregistered population number.



(1) Thailand



(2) Bangkok

Figure 11 The locations of Bangkok and Thailand

Courtesy of Google map

Moreover, the study was designed to gather the data regarding plastic bags use such as satisfaction for store, expectation of getting plastic bags, double plastic bags behavior, attitude and perception of threat, use and reuse frequency and socio-demographic information. The description of studied variables is shown in **Table 9**.

Table 9 Description of studied variables

Variables	Description
GEN	Gender of respondent; 1 – if the respondent is female. 2 – if the respondent is male.
AGE	Age of respondent; 1 – if the respondent is 19 or younger than 19 years old. 2 – if the respondent is between 20-30 years old. 3 – if the respondent is between 31-40 years old. 4 – if the respondent is between 41-50 years old. 5 – if the respondent is 51 or older than 51 years old.

Table 9 Description of studied variables

Variables	Description
ACC	Accommodation type of respondent; 1 – Detached House 2 – House estate 3 – Condominium 4 – Apartment 5 – Flat 6 – Others
EDU	Highest education level of respondent; 1 – Primary school 2 – Secondary school 3 – College graduate 4 – Undergraduate 5 – Graduate 6 – Higher education level 7 – Others
INC	Monthly income of respondent; 1 – Less than 15,000 Baht 2 – 15,000-25,000 Baht 3 – 25,001-35,000 Baht 4 – 35,001-45,000 Baht 5 – More than 45,000 Baht
EXP	Expectation for free plastic bags. 1 – if the respondent expects for free plastic bags 2 – if the respondent does not.
DOU	Double plastic bags behavior 1 – if the respondent accepts for double plastic bags 2 – if the respondent does not.
USE	Plastic bag use frequency (5 scales, Always to Never)
REUSE	Plastic bag reuse frequency (5 scales, Always to Never)
ATT	Attitude of respondent on plastic bags issue (1 question, 5 points)
PER	Perception of respondent on plastic bags issue (3 questions, 5 points each)

Table 9 Description of studied variables

Variables	Description
SUP	Support for plastic bag levy 1 – if the respondent supports plastic bags levy 2 – if the respondent does not.

3.3 Design information and treatment groups

3.3.1 Design information

Descriptive information is intended to use as one of information provisions which based on descriptive social norm. In addition, descriptive social norm refers to the perception about what others do (Cialdini, Kallgren and Reno, 1991). Phuphisith (2017) also used this kind of information concerning waste separation to show to the respondents about the number of people who do waste separation in Bangkok along with the numbers from Seoul and Tokyo, which were cited from Lee, Kurisu and Hanaki (2013). Hence, this study will show the respondents about the information of worldwide average plastic bags use per capita per day such as in Japan, USA, Taiwan, Ireland and Thailand. Bar chart of the numbers of plastic bags use in each country with text explanation, see in **Figure 12.**

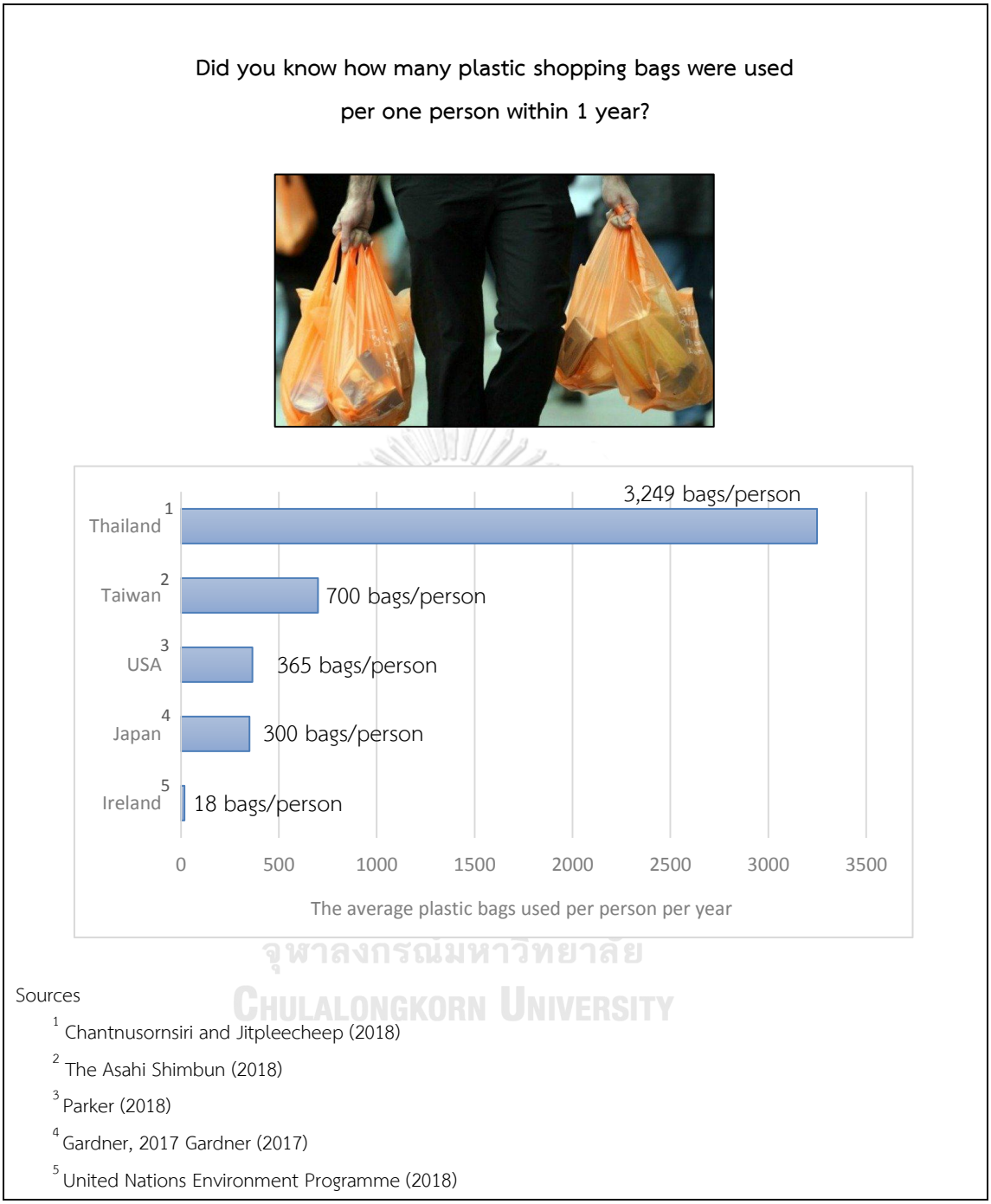


Figure 12 Descriptive information about the average plastic bags uses in Thailand, Japan, USA, Taiwan and Ireland.

A previous study from Kikuchi-Uehara, Nakatani and Hirao (2016) used the information on the concept of life cycle thinking (LCT) based on a comparison between reusable shopping bags and disposable plastic shopping bags. Besides, this information shows the reader about the various stages of entire plastic bags life

either before and after using them, which emit carbon dioxide throughout the life cycle. Likewise, Phuphisith (2017) also used life cycle thinking based information to see attitude and perception changes on pro-environmental behavior which are waste separation and refill product behavior. Consequently, this study then established the illustration with text explanation of the plastic bag's LCT based information described how much carbon dioxide (CO_2) was emitted throughout plastic bag's life cycle, see in **Figure 13**.

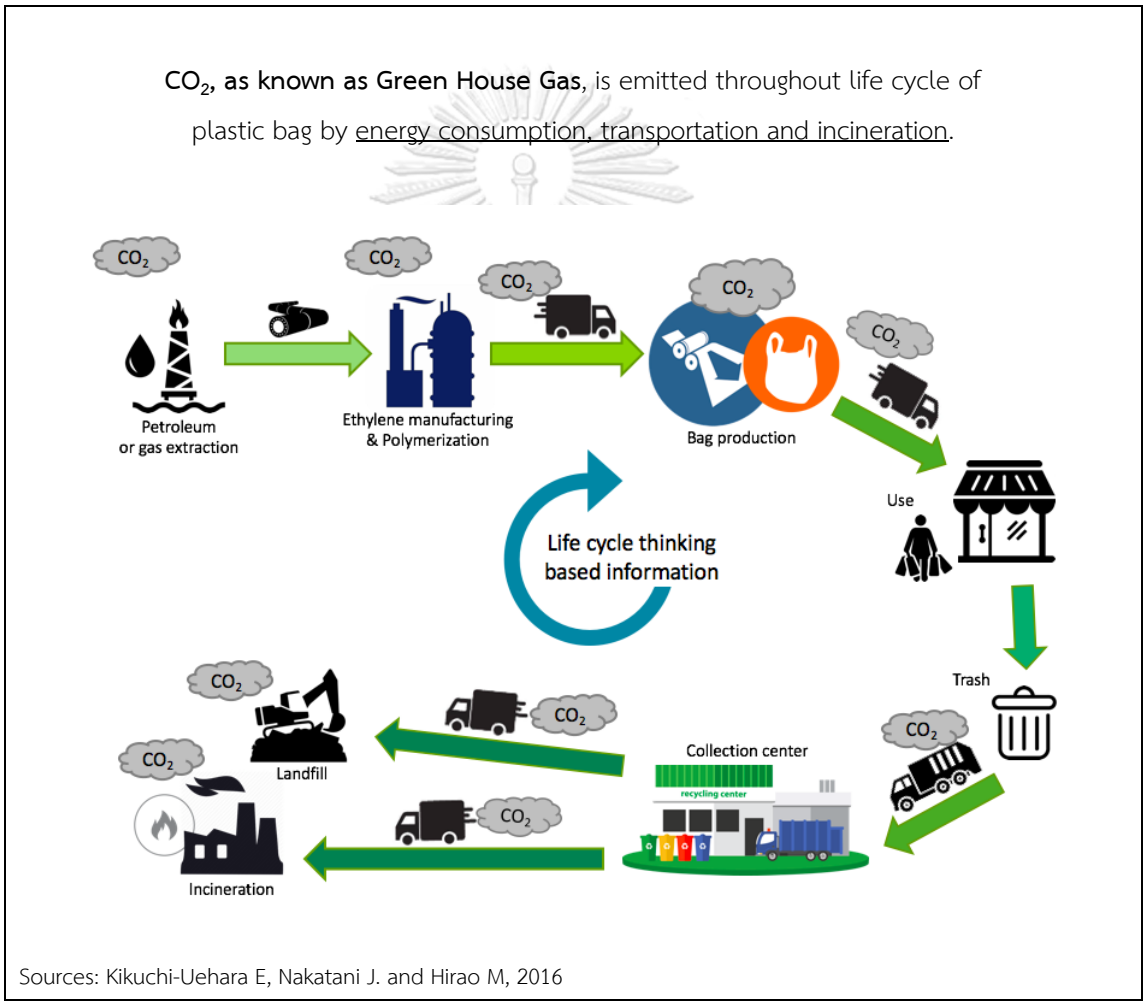


Figure 13 Life cycle thinking (LCT) based information about the average plastic bags uses in Thailand, Japan, USA, Taiwan and Ireland.

3.3.2 Treatment groups

This study randomly divided the respondents in online survey into 5 major groups, Group 1, Group 2, Group 3, Group 4 and Group 5. Each of them would face with the different kind of sequence and information provision in the questionnaire. Except Group 6 which is respondents who currently use or involve with plastic bag in their shopping trip, see details in **Figure 14.**

Group 1 - Descriptive information

According to the sequence of questionnaire in **Figure 14**, the respondents the respondent will be divided by their use frequency. The respondents in this group is the people who pass the before intervention part and certainly are not answer "Never" in "Use frequency". Besides, they will face only the descriptive information in the intervention part before answering in after intervention part and socio-demographic part.

Group 2 - Descriptive + Economic approach

This group is similar to the previous group but they will be asked about the willingness to pay for improving plastic bags waste management after face the descriptive information. This group might indicate the effect from information provision on willingness to pay (WTP) price comparing with **Group 5** which asking them WTP without prior provided any information.

Group 3 - LCT-based information

The pattern is the same with the **Group 1** but they will face only life cycle thinking (LCT) based information instead. The potential of this information will be discussed comparing with other kind of intervention.

Group 4 - LCT-based information + Economic approach

The respondents in this group are shown by both LCT based information and WTP question before going to after intervention and socio-demographic questions.

Group 5 - Economic approach

After the respondents answer the questions in before intervention, they will be brought to WTP question only without providing any information in the intervention part. However, the WTP question is actually not the information provision so the attitude and perception of threat are exempted to ask the respondents but the other aspects are spared to analyze in case of there are significant differences.

Group 6 - Who don't use plastic bag

For who answer "Rarely or Never" in the question asking about "How often do you use or ask for a plastic shopping bags at the supermarket or convenience store in your daily life?" will be then asked the reason why they are not prone to use the plastic bags in their shopping trip. After that, the respondents who only select "Never", are in Group 6, will be brought to the socio-demographic question without passing the intervention part whereas who answers, "Rarely" will be back to the next question before leading to the intervention part.

3.4 Questionnaire sequence

Additionally, the questionnaire sequence is quite significant and required carefully designed to ensure that either the respondents can easily answer those questions from the starting question to the end without any confusions or sufficient data are collected vary on each different kind of intervention tool. The respondents were grouped into 6 major sequences following, see details in **Figure 14**

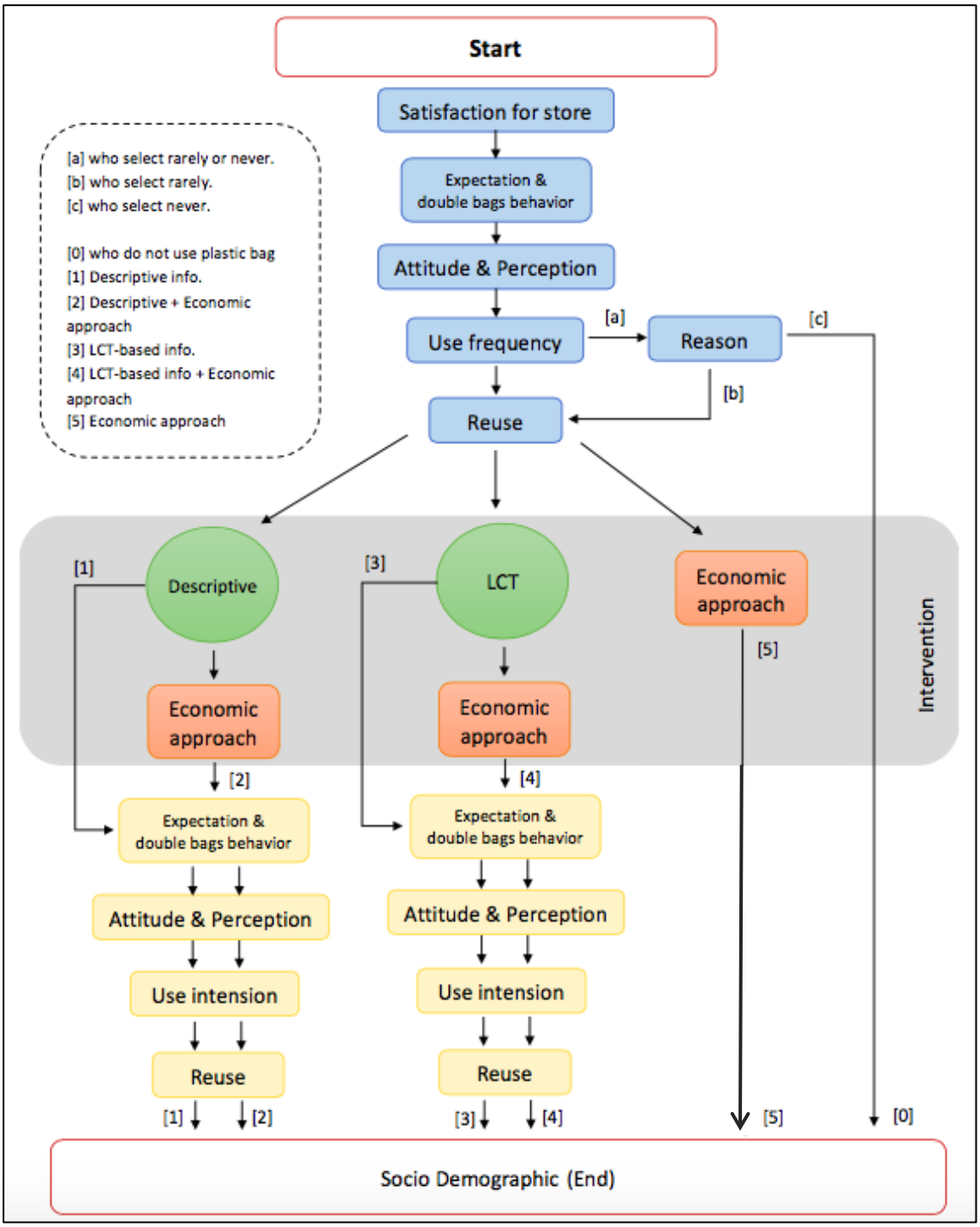


Figure 14 The sequences of questionnaire

3.5 Questionnaire design

The questionnaire had been developed to elicit the aspects related with the respondent's expectation, satisfaction for store, attitude, perception, use frequency, intention, reuse and double bags behavior at the point of view of plastic shopping bags use.

Moreover, the questionnaire had been originally intended to conduct in pre-test surveys before deploying them to collect the data in the main one. In addition, the pretest survey had been developed associated with Urban Engineering, The University of Tokyo and Environmental Engineering, Chulalongkorn University.

This process of surveys aimed to check and adjust the questions in questionnaire whether the respondent or reader precisely understand the whole context and eliminate any redundant questions and ambiguity at the same time. Furthermore, both of English and Thai versions had also established to collaborate with Japanese project advisors and the survey company before Thai version was then translated to harvest the feedback from Thai respondents.

The pre-test surveys had shortly been conduct from January 13th to January 18th, 2018 by E-mail distribution with students from Chulalongkorn University. At that time, it applied the double ended question in the economic approach part to grain the data. Moreover, respondents in the pre-test survey were not willing to pay for when the plastic bags price is 4 Baht. Therefore, the range of the payment card table was established between 0-10 Baht, extended the maximum range for the flexibility of the payment card.

The main questionnaire was designed with the series of questions which is separated into 4 main parts 1) Before intervention part, 2) Intervention part 3) After intervention part and 4) Socio-demographic part. However, before getting start, there is the brief introduction to describe the exact type of plastic bags that would be mentioned in this questionnaire which is "Before getting started, for your information, a type of plastic shopping bags that we mention in this questionnaire is only **"T-shirt plastic shopping bag"** which are normally distributed for free in supermarket and

convenience stores, as shown in **Figure 15**. Plastic bags for food packaging are excluded. . The questionnaires are presented in **Appendix I.**

Figure 15 T-shirt plastic shopping bags from supermarket and convenience store.

3.5.1 Before intervention part

According to the mentioned design, the before intervention part includes the questions to gather the individual information. Firstly, a satisfaction of stores had been set to investigate which service (welcome smile and nice service, free plastic bags, clean store, cashless payment, Rewards/points or else) provided by supermarket and convenience store that most affects to the respondent's decision for their shopping trip. Expectation regarding the individual belief of whether the supermarket and convenience store have to provide a free plastic bag in each purchasing. Meanwhile, the double plastic bags behavior, attitude and perception of threat on plastic bags were also put in the questionnaire to elicit the nature of the respondents and they are asked about frequency of plastic bags use as well as the reasons for barely or not using them and reusing plastic bags behavior afterward.

3.5.2 Intervention part

In this part, there are two types of information provision, descriptive and life cycle thinking (LCT) based information, which would show to the respondents before analyzing the changes in each item. Besides, economic approach, contingent valuation method is used in this part to elicit the respondent's willingness to pay for improving plastic bags waste management.

Not only descriptive and life cycle thinking (LCT) based information those would be shown in this part but economic approach is also used as intervention to elicit the willingness to pay for improving the plastic bags waste management. As the previous study by Challchareonwattana (2015), the payment card technique had been applied to estimate the maximum willingness to pay for supporting the municipal solid waste management. However, the hypothetical situation or market should be provided before the respondents face to the willingness to pay question to avoid any misunderstand about the payment of levy and make them answer the price related to that particular situation follows the message in **Figure 16**.

Hypothetical situation

People usually discard their solid wastes without any payment responsible for managing the amount of waste generated. However, the effective and suitable solid waste managements need an adequate budget to mitigate and preserve the environmental quality.

Plastic bag waste is one kind of solid wastes which continue to increase in the waste stream and could cause a chronic environmental problem. Plastic bag is usually given to the customers for free at most stores in Thailand. After a short-time of utilization, plastic bags are discarded and then become plastic bags waste. Nonetheless, only some of them will be conveyed through the effective and suitable solid waste management systems, which eventually be disposed to landfill or entered a recycle process.

To set up an effective plastic bag waste management, Thai government allows to use polluter pay principle to collect the plastic bags levy. It mainly aims to improve the efficiency of plastic bags waste management for a better environment.

Suppose the supermarket and convenience stores stop provide any plastic

shopping bags for free. However, if you still want to keep using plastic shopping bags, you have to purchase them as plastic bag levy. In addition, “the certain size” of plastic shopping bag which is 30 cm. x 50 cm. is the only size, with its suitable thickness for multiple reuse, which the shops are allowed to sell.

Figure 16 Hypothetical situation in the payment card

Moreover, as mentioned above, the particular or certain size of the plastic bag, which would be provided to customers who pay for the levy, is also placed in the payment card to ask the willingness to pay from the respondents in payment card. The reason for setting only one size of plastic shopping bag is to make customers think twice when they buy only few things that they can carry by themselves plus, its dominant characteristics, the size and more thickness, allow the purchaser to reuse them. Besides, it can help the shop owner and relating federal department easily organize the revenues from plastic bag levy in the same time. The size of plastic bag is shown in **Figure 17**.

Figure 17 The certain size of plastic shopping bags, provided by supermarket and convenience store when starting to charge.

Consequently, the respondents are asked that “According to the hypothesis market, are you willing to pay if the supermarket and convenience store start to charge for a plastic bag levy? and how much would you be willing to pay per one plastic bag as maximum?” and the payment card with the range between 0.5-10 Baht (0.016-0.31US$), 0.5 Baht (0.016US$) of interval, would be shown to the respondents

for making their decisions whereas there is 0 Baht choice for who would be not willing to pay, see in **Figure 18**. Moreover, the addition question concerning public support for this kind of policy also placed afterward, see in **Figure 19**.

➢ According to the hypothesis market, are you willing to pay if the supermarket and convenience store start to charge for a plastic bag levy? and how much would you be willing to pay per one plastic bag as maximum?

○ Yes, I am willing to pay for plastic bag. **(Please select your maximum willing to pay for one plastic bag) (Only one answer)**

Price: Baht/bag

0.5	1	1.5	2	2.5
3	3.5	4	4.5	5
5.5	6	6.5	7	7.5
8	8.5	9	9.5	10

or others _____ Baht/ 1 bag

○ No, I am not willing to pay for any plastic bag. (0 Baht)

Figure 18 The questions asking about the wiliness to pay with the payment card.

➢ If the government **starts to conduct this policy by starting to charge for the plastic bags levy** in order to improve plastic shopping bags waste managements, **would you support this policy**?

○ Yes, I will ○ No, I will not

Figure 19 The question asking about the public support of the plastic bags levy.

3.5.3 After intervention part

After the respondents experience the information provision in the intervention part, they would face the series of questions further in this after intervention part which are divided into the following aspects. The expectation that whether supermarket and convenience store still have to provide them plastic shopping bags for free. As well as the double bags behavior also asks the respondents again whether they change their thought after information provision or not. Attitude and perception of threat then ask as same as in Before intervention part to observe any changes while use and reuse intentions also help to investigate the trends of plastic bags waste and consumption in the future after they are all receive in different kind of information provision.

3.5.4 Socio-demographic part

Finally, the end of the questionnaire is placed by the socio-demographic which consists of the question asking about the respondent's gender, age, accommodation type, highest education level and monthly income. According to Ahmed and Gotoh (2006) and Mitchell and Carson (1989), it was found that the socio-demographic question is best placed at the end of the questionnaire because they are more relaxed about the interview and less likely to take offense at having the interviewer probe into his or her private life.

3.6 The situations of plastic bag management investigation

This research will be able to reflect the current situations on the different levels of plastic bags management through the perspectives of manufacturers, policy makers, retailers and customers by the interview.

Manufacturing level, such as Thai Plastic Industries Association, Plastic Industry Club of the Federation of Thai Industries, represents to the perspective of plastic bag production on current plastic bags situation and also the effects on the business that they might experience when plastic bag levy is imposed.

While the situations about previous and current plastic bag reduction campaign are gathered on national policy making organization such as Department of Environmental Quality Promotion, Chulalongkorn university and Mahidol university. They can reflect the campaign obstacles which cause ineffectiveness and discontinuity. Plus, this study investigates effectiveness of each form or type of information provision for plastic bag reduction, which were used so far. The feasibility and readiness of national plastic bag levy in the future.

The shopkeeper and retailer, based on 1) commercial area, 2) residential area and 3) tourist area, are also asked about their experiences and achievements on any plastic bag reduction campaign. Besides, the question on whether or not the plastic bag levy might impact to their sale as well as other perspectives are collected. The interview will be done on the different kind of stores for example traditional market, convenience store and grocery store. So, it ensures that the adequate information is collected.

Furthermore, customers of those stores in each area are meant to express their thought about the plastic bag levy. The interview focuses to elicit the change of plastic bag use, willingness to pay, supportive and other perspectives if their supermarket or retailer starts to apply an economic approach such as plastic bag levy.

Eventually, the perspectives and situation on the total respondents (between 100-200) are discussed and concluded to the factor that express to both achievements and failures on previous and current plastic bag reduction campaigns in Bangkok. Besides, they would show their thoughts on the effects if the plastic bag levy is imposed in this country. The investigation for situations of plastic bag management in different levels is shown in **Table 10**.

Table 10 The investigation for situations of plastic bag management in different levels

Manufacturer	Policy maker	Retailer	Consumer
• Plastic Industry Club of the Federation of Thai Industries	• Department of Environmental Quality Promotion • Chulalongkorn University	• 7-Eleven • Traditional market	• 7-Eleven • Traditional market

3.7 The evaluation of information provision effects

This research also investigates about the effects of information provision which are descriptive and life cycle thinking based information on attitude, perception and behaviors changes.

The attitude and perception scores, 5-point scale, between before and after each information provision are compared. They are also checked the statistical difference between before and after information provision among treatment groups by paired test as well as the behaviors changes such as use and reuse behaviors after information provision. Meanwhile, the ratios of expectation for plastic bag and double bag behavior are compared between before and after information provision, see more in **Table 11**.

Table 11 Information provision analysis before and after information provision (descriptive and life cycle thinking based information)

Interested variable	Analysis	Output
Attitude	Paired t-Test	Statistical difference between attitude score before and after information provision.
Perception	Paired t-Test	Statistical difference between perception score before and after information provision.
Use behavior	Sign Test	Statistical difference between use frequency and use intention score before and after information provision.
Reuse behavior	Sign Test	Statistical difference between reuse frequency and reuse intention score before and after information provision
Expectation for plastic bags	McNemar's Test	Statistical difference between expectation for plastic bag ratio before and after information provision
Double plastic bags behavior	McNemar's Test	Statistical difference between double plastic bag behavior ratio before and after information provision

3.8 Willingness to pay (WTP) analysis

Contingent valuation method with payment card is used to elicit willingness to pay for plastic bag levy. This research assumes that the value of willingness to pay of each respondent as WTP_i, and the equation of willingness to pay is defined in **Equation 1**

$$WTP_i = X_i'\beta + u_i \qquad \textbf{Equation 1}$$

Where X_i' are characteristics of individuals (i) while β is the coefficient of the characteristic and u_i is an error term that is normally distributed with mean at zero.

Due to the willingness to pay value is latent, so it is assumed that the willingness to pay is between the choices that the respondents select as lower

interval, WTP_{ll}, and the next choice of value which is higher interval WTP_{hh} in the payment card, explained in **Equation 2**

$$WTP_{ll} \leq WTP_i \leq WTP_{hh} \quad \textbf{Equation 2}$$

However, from the limitation of interval regression, it was assumed that the actual willingness to pay from respondents who answer for 0 Baht might be in between 0 Baht and 0.5 Baht which is the lowest number in the payment card as shown in the **Equation 3.** Conversely, the respondents who answer above the number in the payment card express in **Equation 4.**

$$\Pr(X_i'\beta + u_i < WTP_{o.5\,Baht}) \quad \textbf{Equation 3}$$

$$\Pr(X_i'\beta + u_i > WTP_{10\,Baht}) \quad \textbf{Equation 4}$$

WTP_i was evaluated by interval regression via STATA 15, while maximum likelihood technique was also applied to find the probability of individuals' likely contribution. Besides, the relationship between willingness to pay and socio demographic are also determined by regression analysis in either the treatment groups with or without information provision.

3.9 Recommendations

The study will formulate the recommendations based on the results from behavior analysis and willingness to pay sections, which might be useful for the future researches and policy makers. They would consist of the domestic trend of plastic bags use, analyzed willingness to pay for plastic bags levy along with the potential of each information provision type that affect to the changes of customer behaviors for plastic bags use and reuse.

Furthermore, the perspectives on the situation of plastic bag management can be useful for setting the future solution for plastic bag management because there will be a compromise among production, policy maker, retailer and customer. Eventually, the recommendations are based on how much rate should be set as

national plastic bags levy, what type of information provision should be provided for customer, the perspectives, among production, policy maker, retailer and customer, on the situation of plastic bag management in Thailand.

3.11 Research timeline

The research timeline is shown in **Table 12**. It indicates about the implementation and revision period of this research, which has been done from November 2017 to December 2018. Besides, the planning period was also planned after the questionnaire deployment as well.

Table 12 The research implementation and revision period

	2017		2018										
Activities	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Oct	Nov	Dec
Set the objectives and scope													
Review worldwide plastic bags managements and techniques													
Select parameter, area and design information provision													
Set research methodology													
Questionnaire design and development													
Plan and contact for primary data collection on situations of plastic bag management													
Interview about plastic bag management in perspectives of production, policy, distribution and customers													
Results analysis													
Discussion and conclusion													
Thesis writing and defense													

CHAPTER IV
RESULTS AND DISCUSSION

4.1 Situation about plastic bag use trends

Data and information were gathered by using two approaches; online survey and face to face interview. Online survey (N=555) investigated about the potential of information provision and willingness to pay (WTP) estimation. While, another set of data were gathered by face to face interview called as field survey (N=409) to estimate willingness to pay and to investigate plastic bag use behavior. However, the potential of information provision was not a main focus on the respondents via field survey. Comparison between the results from online survey and the WTP value are discussed in this chapter.

4.1.1 Socio demographic characteristics

(a) Online questionnaire survey

The demographics of respondents from the online survey in this study show that there are 555 of respondents in total which are divided in 5 major groups as mentioned in the previous chapter. 118 (21.3%), 110 (19.8%), 107 (19.3%), 108 (19.5%) and 108 (19.5%) of respondents are in Group 1, Group 2, Group 3, Group 4 and Group 5, respectively. On the other hand, there is the group of respondents who do not use plastic bag in their daily life as Group 6 which is only 4 respondents or 0.7%.

However, the study focused only 5 major groups who currently use plastic bags in their daily life. The respondents show the percentage of males, 43.1% and females, 56.9%. Most respondents were in 20s and 30s of ages, lived in detached house, graduated at undergraduate degree as the highest education level. Most of them also have monthly income in the range between 15,000-25,000 Baht. See more details in **Table 13**.

Table 13 Demographic characteristic of the online respondents

	Groups of respondents						
Variables	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
Numbers	118 (21.3%)	110 (19.8%)	107 (19.3%)	108 (19.5%)	108 (19.5%)	4 (0.7%)	555
Gender							
Male	46.6%	42.7%	35.5%	42.6%	47.2%	50.0%	43.1%
Female	53.4%	57.3%	64.5%	57.4%	52.8%	50.0%	56.9%
Age							
20-29	34.7%	49.1%	41.1%	42.6%	33.3%	0%	39.8%
30-39	39.0%	29.1%	35.5%	35.2%	43.5%	50.0%	36.6%
40-49	18.6%	18.2%	15.9%	19.4%	18.5%	50.0%	18.4%
50 or more	7.6%	3.6%	7.5%	2.8%	4.6%	0%	5.2%
Accommodation							
Detached House	44.1%	40.9%	53.3%	37.0%	47.2%	50.0%	44.5%
House estate	28.8%	23.6%	20.6%	34.3%	21.3%	0%	25.6%
Condominium	5.9%	6.4%	8.4%	8.3%	7.4%	25.0%	7.4%
Apartment	11.9%	14.5%	10.3%	11.1%	12.0%	0%	11.9%
Flat	3.4%	7.3%	2.8%	1.9%	4.6%	25.0%	4.1%
Others	5.9%	7.3%	4.7%	7.4%	7.4%	0%	6.5%
Education							
Primary school	3.4%	3.6%	3.7%	3.7%	0%	0%	2.9%
Secondary school	16.9%	12.7%	14.0%	13.0%	15.7%	0%	14.4%
College graduate	7.6%	10.9%	8.4%	9.3%	9.3%	0%	9.0%
Undergraduate	66.1%	65.5%	63.6%	68.5%	65.7%	75.0%	65.9%
Graduate	5.1%	6.4%	10.3%	5.6%	8.3%	0%	7.0%
Higher	0%	0.9%	0%	0%	0%	25.0%	0.4%

Table 13 Demographic characteristic of the online respondents

	Groups of respondents						
Variables	**1**	**2**	**3**	**4**	**5**	**6**	**Total**
education level							
Others	0.8%	0%	0%	0%	0.9%	0%	0.4%
Income							
Less than 15,000 Baht	23.7%	21.8%	22.4%	24.1%	19.4%	0%	22.2%
15,000-25,000 Baht	36.4%	40.0%	30.8%	34.3%	35.2%	50.0%	35.5%
25,001-35,000 Baht	17.8%	17.3%	23.4%	18.5%	19.4%	0%	19.1%
35,001-45,000 Baht	12.7%	9.1%	11.2%	12.0%	13.9%	0%	11.7%
More than 45,000 Baht	9.3%	11.8%	12.1%	11.1%	12.0%	50.0%	11.5%

(b) Field questionnaire survey

Besides, this study also gathered the information by face to face interview with different group of respondents. The demographics of respondents from the field survey show that there are 409 of respondents in total. The responses show the percentage of males, 44.3% and females, 55.7% which are similar to the characteristics of online survey. Most respondents are also in 20s and 30s generation, lived in detached house, and graduated at undergraduate degree as the highest education level. Besides, most of them also have monthly income in the range between 15,000-25,000 Baht. See more details in **Table 14**.

Table 14 Demographic characteristic of the field respondents

Variables	Field respondents
Numbers	409
Gender	
Male	44.3%
Female	55.7%
Age	
20-29	44.7%
30-39	26.7%
40-49	16.1%
50 or more	12.5%
Accommodation	
Detached House	28.4%
House estate	27.4%
Condominium	13%
Apartment	18.1%
Flat	3.7%
Others	9.5%
Education	
Primary school	2.7%
Secondary school	5.1%
College graduate	8.6%
Undergraduate	74.3%
Graduate	8.3%
Higher education level	1%
Others	0%
Monthly income	
Less than 15,000 Baht	32.5%
15,000-25,000 Baht	33.3%
25,001-35,000 Baht	15.4%

Table 14 Demographic characteristic of the field respondents

Variables	Field respondents
35,001-45,000 Baht	9.3%
More than 45,000 Baht	9.5%

4.1.2 Trends of plastic bag use behavior

(a) Online questionnaire survey

The current trend of plastic bag use from online respondents (N=555) shows that there is quite moderate frequency in plastic bag use. Mostly about 43% of all respondents use plastic bags sometimes follows by respondents who use plastic bags "often" (27%) and "always" (24%). However, there are some respondents who initially avoid and do not use any plastic bags. Proportion is about 0.7% of all respondents as shown in **Figure 20**.

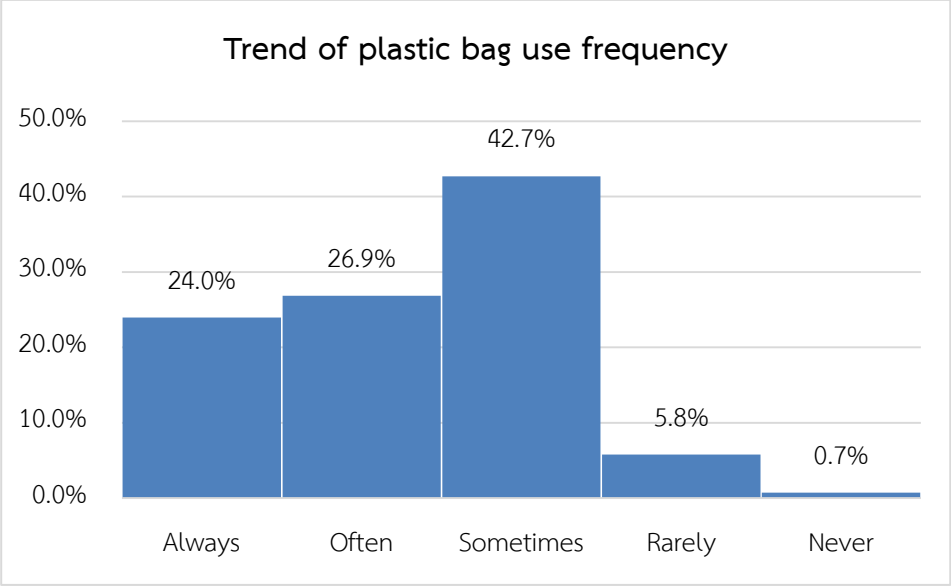


Figure 20 The plastic bag use frequency (online survey)

In addition, 36 respondents who selected "Rarely" and "Never" of their plastic bag use frequency provide, is because they thought it is more environment friendly if they do not use a plastic bag (61%). They also indicated that rarely or

never using or accepting any plastic bag is their habit (22%). The detail is shown below in **Figure 21**.

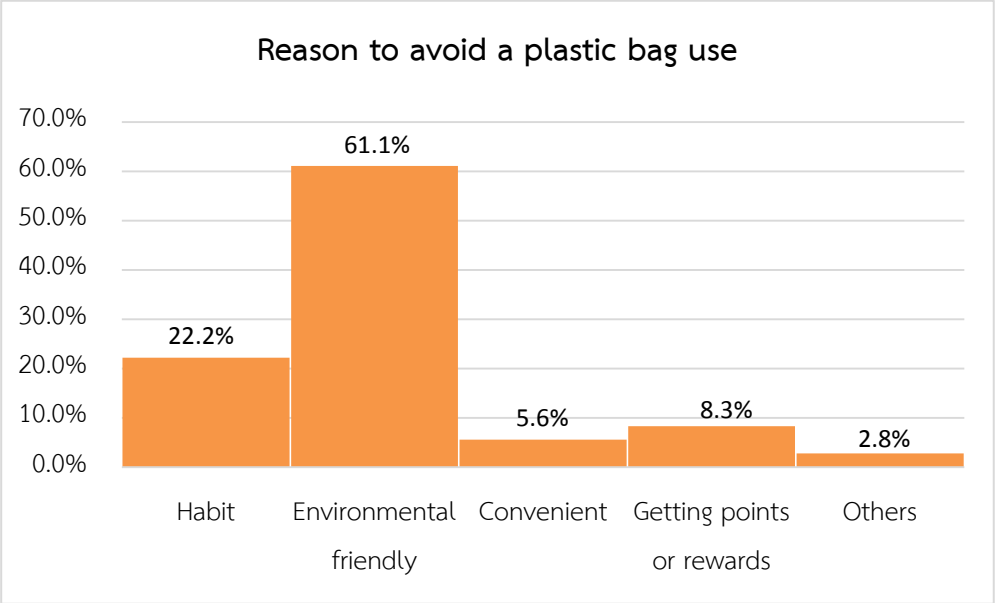


Figure 21 Reason for rarely or not using plastic bag (online survey)

Figure 22 shows the respondents' reasons or factors for making decision when they go shopping at supermarket. The results indicate that about a half of respondents prefer to have a nice service by the store (52%) follow by rewards and points (19%), clean store (14%) and cashless payment (7.2%). These services make most customers satisfied. The respondents expect that any store or supermarket should promptly provide those services for them. However, there were only a minority of respondents who want the store to provide a free plastic bag (6.3%). So, it might prove that people might think free plastic bag is unnecessary service for them to decide to go to any store or supermarket nowadays. Hence, the trend of plastic bag use is quite moderate.

Figure 22 Satisfaction for store (online survey)

From respondents who are involved with plastic bag use, the result indicates that most of them always reuse their plastic bags (around 45%). On the other hand, around 1.1% of them are prone to throw plastic bags away even only after first use. See more in **Figure 23**

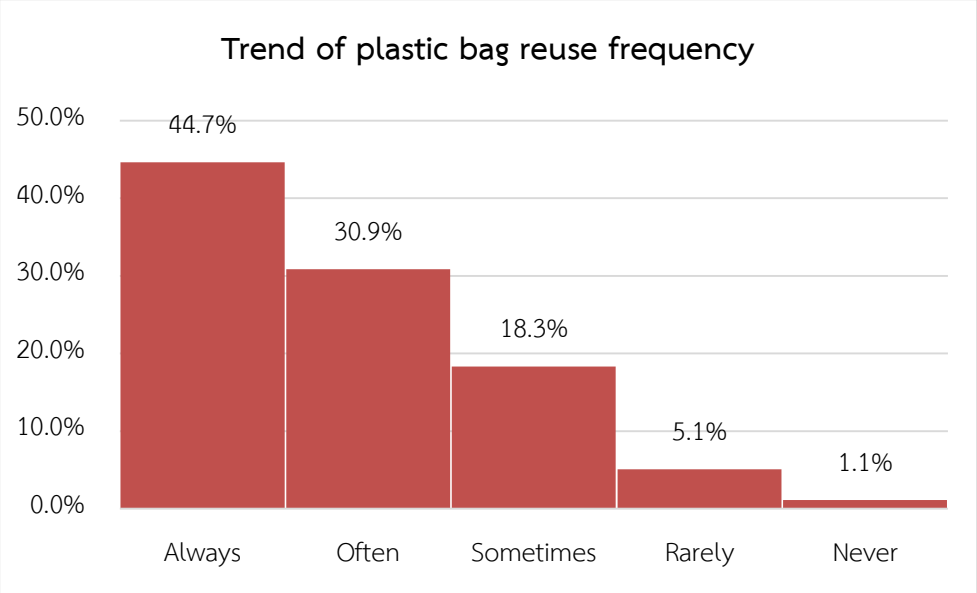


Figure 23 The plastic bag reuse frequency (online survey)

(b) Field questionnaire survey

The current trend of plastic bag use from face to face interview respondents (N=409) shows that the plastic bag use trend is also moderate frequency similar to the information from online survey. Approximately 49% of all respondents use plastic bags in sometimes follows by respondents who selected “often” (32%) and “always” (13%). However, there are no respondents who select “never” or initially do not use any plastic bags in the face to face interview as shown in **Figure 24**.

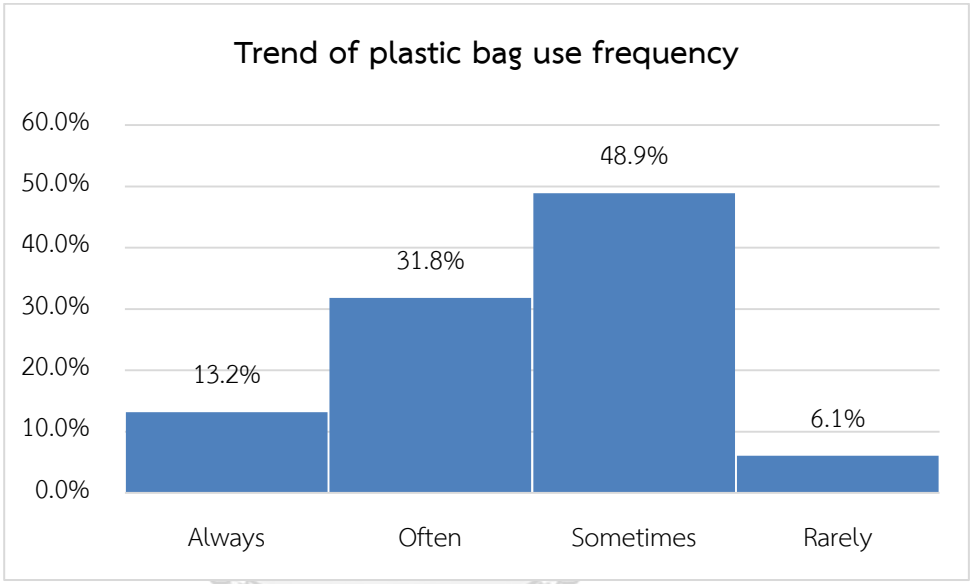


Figure 24 The plastic bag use frequency (field survey)

Plus, there are 25 respondents who selected “Rarely” for their plastic bag use frequency. The reasons, which explain their use frequency, are that they thought it is more environment friendly if they do not use a plastic bag (36%). Plus, they also indicated that rarely using or accepting any plastic bag is their habit (32%). The detail is shown below in **Figure 25**.

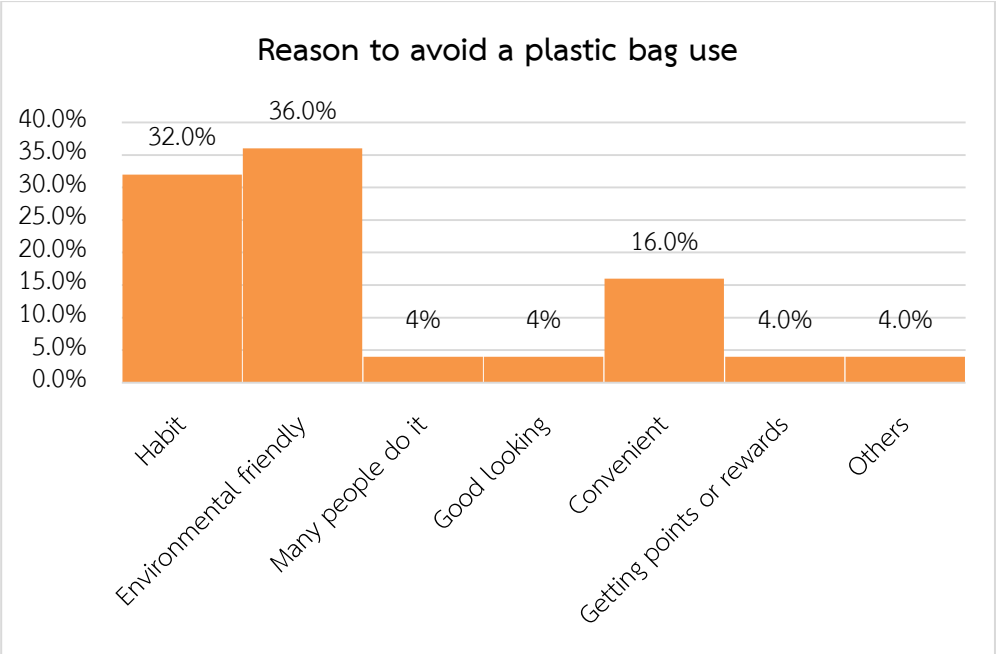


Figure 25 Reason for rarely or not using plastic bag (field survey)

Figure 26 shows about the respondents' reasons or factors for making decision when they go to shopping at supermarket. The results show that around 68% of respondents desire to be delivered by nice service by the store follow by clean store (16.1%), points and rewards (9.8%) and cashless payment (2.9%).

These services make most customers satisfy or expect that any store or supermarket can promptly provide those services for them. However, providing a free plastic bag is the last thing that makes people go to shopping at stores which is only 1.2%. So, the respondents from both online and field survey that a free plastic bags option is unnecessary for them. In addition, the other option most respondents state that they desired the cheap price and the products with good quality of from the store.

Figure 26 Satisfaction for store (field survey)

Regarding the plastic bag reuse behavior, 32% of respondents always, 28.9% often and 30.3% sometimes reuse their plastic bags. On the other hand, 4.4% of them never reuse the plastic bags even only after first use. See more in **Figure 27**.

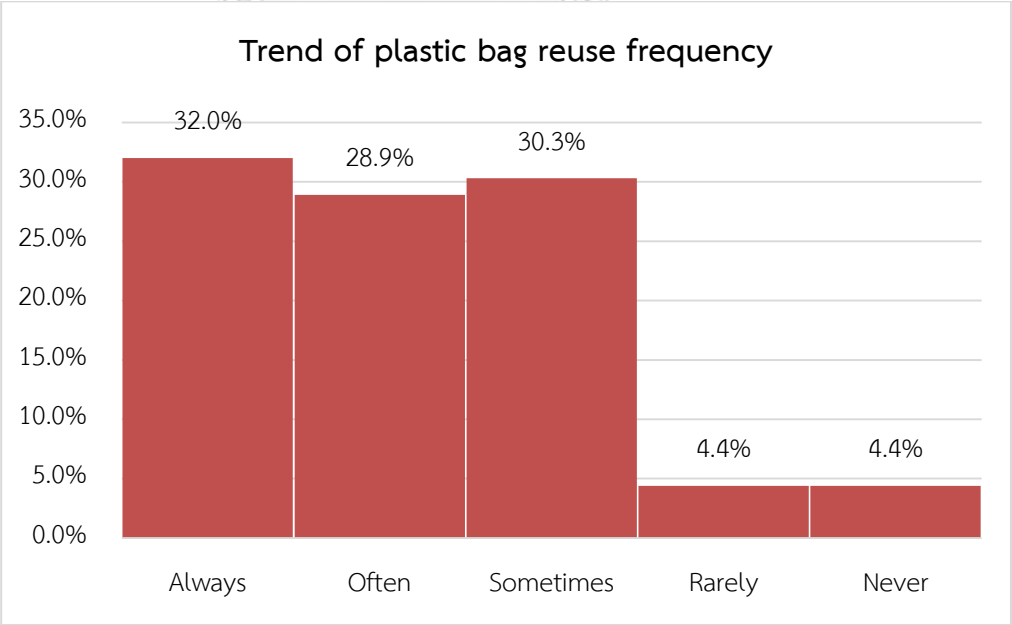


Figure 27 The plastic bag reuse frequency (field survey)

4.2 Information provision for plastic bag reduction

This study investigated the potentials of each type information on behavior changes. The results analyzed only from the respondents from online survey. Group 1 is with descriptive information. While, Group 3 is with LCT based information. However, the baseline practice of each behavior which came from field survey respondents would also present in this part as well.

4.2.1 Behaviors after information provision

In general, most of respondents in this study expect a free plastic bag when they go shopping at the stores because they believe that a plastic bag is a privilege that the customers suppose and deserve to be given as the one of services from the store. However, after information provision, the results in **Table 15** show that the respondents in all groups tend to have significantly less expectation for a free plastic bag at store. Especially, Group 1, with descriptive information only, can establish lowest expectation for a free plastic bag than before intervention ($p<0.01$).

Table 15 Expectation for a free plastic bag after intervention

	Numbers of a free plastic bag expectation			
	Before intervention	After intervention	Changes	Test of difference
Group 1 (N=118)	86 (72.9%)	54 (45.8%)	32 (27.1%)	Chi-square= 24.025, **p=0.000**
Group 3 (N=107)	80 (74.8%)	64 (59.8%)	16 (15%)	Chi-square= 8.654, **p=0.001**

However, in the large group of field respondents, the respondents (N=409) by face to face survey show the much lower percentage of expectation for a free plastic bag at store. The result in **Table** 16 shows that 222 of respondents or 54.3% currently expect a free plastic bag from a store.

Table 16 Expectation for a free plastic bag (field survey)

	Numbers of a free plastic bag expectation	
	Expected	Not expected
Respondents by field survey (N=409)	222 (54.3%)	187 (45.7%)

Double plastic bags use behavior was investigated in this study. In addition, it refers to the customers' behavior about receiving the second plastic bag when it offered by the store as double bags to reinforce and support to the first one when they buy heavy or a lot of things. The respondents in all groups tend to be refuse the double plastic bags after intervention ($p<0.01$). Moreover, descriptive information seems to be the information that can make respondents in Group 1 do not want to accept the double plastic bag than other groups ($p<0.01$), as shown in **Table 17** below.

Table 17 Double plastic bags use after intervention

	The numbers of double plastic bags acceptation			
	Before intervention	After intervention	Changes	Test of difference
Group 1 (N=118)	81 (68.6%)	36 (30.5%)	45 (38.1%)	Chi-square= 24.025, **p=0.000**
Group 3 (N=107)	89 (83.2%)	54 (50.5%)	35 (32.7%)	Chi-square= 33.029, **p=0.000**

Moreover, the respondents (N=409) from face to face survey also show the ratio of double plastic bag acceptation at store. The result shows the high ratio which indicated that 342 of respondents or 83.6% currently accept double plastic bag from a store.

Table 18 Double plastic bags use (field survey)

	Numbers of double plastic bags acceptation	
	Accepted	Not accepted
Respondents by field survey (N=409)	342 (83.6%)	67 (16.4%)

This study also investigated the differences between the current plastic bag use frequency and the plastic bag use intention after information provision in **Table 19** for each group. The 5-choices scale is also used which ranges from high (1) to low (5) which are "Always" to "Never", respectively. Consequently, the differences came from use intention level minus use frequency level.

Table 19 Use intention and use frequency after intervention

Groups	Use intention - Use frequency Before intervention and After intervention				Test of difference Sign test
	Negative differences [a]	Positive differences [b]	Ties [c]	Total	
Group 1	6	66	46	118	Z=-6.593, **p=0.000**
Group 3	10	59	38	107	Z=-5.779, **p=0.000**

[a] Use intention < Use frequency, [b] Use intention > Use frequency, [c] Use intention = Use frequency

Therefore, the positive difference implies to the improvement for the intention of plastic bag reduction after information provision. So, both groups show that they intent to use less plastic bag after information provision ($p<0.01$).

The differences between plastic bag reuse and intention are investigated after intervention. The 5-choices scale is also used which ranges from high (1) to low (5) which are "Always" to "Never", respectively. However, the negative difference

implies to the improvement of the intention of plastic bag reuse. See details in **Table 20**.

Table 20 Reuse intention and reuse frequency after intervention

Group	Reuse intention - Reuse frequency Before intervention and After intervention				Test of difference Sign test
	Negative differences [a]	Positive differences [b]	Ties [c]	Total	
Group 1	30	22	66	118	Z=-0.971, p=0.166
Group 3	21	31	55	107	Z=-1.248, p=0.106

[a] Reuse intention < Reuse frequency, [b] Reuse intention > Reuse frequency, [c] Reuse intention = Reuse frequency

The results show that Group 1 samples with descriptive information has more negative differences than positive differences. The users tend to reuse plastic bags more after intervention. Nevertheless, Group 3 with LCT based information shows more positive differences which indicate that providing life cycle thinking based information might not potentially promote reuse intention where the nature of reuse frequency is already high before intervention.

The finding similar to the results from Phuphisith (2017) found that LCT information and descriptive information can increase the intention of pro-environmental behavior in case of waste separation. In addition, the research indicated that even both kinds of information provision can increase the intention of waste separation, but they were not statistically different between the group with information and the one without information or control group.

4.2.2 Attitude and perception after information provision

The attitude about preserving environment and natural resource conservation by reducing the use of plastic bags is tested in this study. The study examines the changes in mean score between before and after information provision. 5-choices scale ranges from high (1) to low (5) which are “Strongly agree” to “Strongly

disagree", respectively. The study found that all groups with information provision can gradually increase the attitude score. They are all not statistically significant ($p>0.1$) as shown in **Table 21**. Additionally, the results from Phuphisith (2017) also indicated that both LCT and descriptive information can create a small increase in the attitude about waste separation after information provision. Although, it is statistically insignificant, however, LCT based information showed significantly higher score of attitude about refill product after information provision ($p<0.5$). (Phuphisith, 2017)

Table 21 Attitude score after information provision

Groups	Attitude Before intervention		Attitude After intervention		Paired t-test (2-tailed)
	Mean	S.D	Mean	S.D	
Group 1 (N=118)	1.47	0.781	1.40	0.681	t=1.268, df=117, p=.207
Group 3 (N=107)	1.57	0.825	1.50	0.705	t=1.182, df=106, p=.240

Besides, the respondents (N=409) by face-to-face survey also examine the mean attitude score by collecting the score data from high (1) to low (5) scale as same as in online survey. The result shows that 1.63 (S.D=0.684) is the mean score for attitude about preserving environment and natural resource conservation by reducing the use of plastic bags. It shows that the respondents from field survey have less attitude score than before intervention's attitude score of the respondents from both online survey groups. See in **Table 22**.

Table 22 Attitude score between online and field survey

	Field survey (N=409)		Online survey (Before intervention)			
			Group 1 (N=118)		Group 3 (N=107)	
	Mean	S.D	Mean	S.D	Mean	S.D
Attitude score	1.63	0.684	1.47	0.781	1.57	0.825

Three statements of perception of threat PER_1, PER_2 and PER_3, which are “Plastic bags can lead to a critical environment issue”, “We must not put off but rather emphasize measures against plastic bags uses.” and “We must reduce plastic bags uses as soon as possible.”, respectively. The provided statements and make the respondents indicate their opinions on the same scale as the attitude scale. Those perception statements are concerning environmental issue from plastic bag, emphasis of plastic bag reduction measure and enthusiasm of plastic bag use reduction. This study aims to obtain the score between before and after information provision. However, the 5-choices scale ranges as same as it used to determine the attitude score.

Table 23 Overall perception score after information provision

Groups	Overall perception Before intervention		Overall perception After intervention		Paired t-test (2-tailed)
	Mean	S.D	Mean	S.D	
Group 1 (N=118)	1.6186	0.73091	1.4661	0.69202	t=3.790, df=117, **p=.000**
Group 3 (N=107)	1.6417	0.64704	1.5857	0.64888	t=1.542, df=106, p=.126

So, in **Table 23**, the study found that both groups with information provision can increase overall attitude score in both groups. The group with descriptive information or Group 1 shows that it is a significant increase of mean score about overall perception after information provision ($p<0.01$).

Table 24 Perception score on environmental issue from plastic bag

Groups	Perception 1 Before intervention		Perception 1 After intervention		Paired t-test (2-tailed)
	Mean	S.D	Mean	S.D	
Group 1 (N=118)	1.55	0.758	1.46	0.700	t=1.777, df=117, p=.078
Group 3 (N=107)	1.64	0.719	1.58	0.714	t=1.061, df=106, p=.291

Table 25 Perception score on emphasis of plastic bag reduction measure

Groups	Perception 2 Before intervention		Perception 2 After intervention		Paired t-test (2-tailed)
	Mean	S.D	Mean	S.D	
Group 1 (N=118)	1.60	0.797	1.50	0.793	t=2.087, df=117, p=.039
Group 3 (N=107)	1.64	0.745	1.56	0.689	t=1.646, df=106, p=.103

Table 26 Perception score on enthusiasm of plastic bag use reduction

Groups	Perception 3 Before intervention		Perception 3 After intervention		Paired t-test (2-tailed)
	Mean	S.D	Mean	S.D	
Group 1 (N=118)	1.70	0.927	1.44	0.723	t=3.957, df=117, **p=.000**
Group 3 (N=107)	1.65	0.766	1.62	0.722	t=0.684, df=106, p=.495

Table 24-26 present the results of each perception topic. To determine the increase of perception level, it was found that only the perception statement number 3 or the perception on enthusiasm of plastic bag use reduction. The result shows that there is an increase of perception score on this topic in Group 1 who received the descriptive information which consequently results to the overall perception. Therefore, LCT based information in this study does not seem to affect perception change. The related study from Kikuchi-Uehara, Nakatani and Hirao (2016) suggested that the efficacy of LCT based information which is used to foster their environmental awareness might be not good if the respondents have low level of LCT skill. However, to promote the skill of LCT, the complexity of information has to be considered to prevent any misunderstanding in the future work as well.

Furthermore, the respondents (N=409) from face to face survey collect the mean perception score with high (1) to low (5) scale as in online survey. The result shows that the overall perception score is 1.78 (S.D=0.608). Briefly, it implies that the respondents from field survey also have less overall perception score than overall perception score in before intervention of the respondents from online survey groups. See in **Table 27.**

Table 27 Perception score between online and field survey

	Field survey (N=409)		Online survey (Before intervention)			
			Group 1 (N=118)		Group 3 (N=107)	
	Mean	S.D	Mean	S.D	Mean	S.D
Overall perception	1.78	0.608	1.62	0.731	1.64	0.647
Perception 1	1.73	0.734	1.55	0.758	1.64	0.719
Perception 2	1.72	0.661	1.60	0.797	1.64	0.745
Perception 3	1.88	0.744	1.70	0.927	1.65	0.766

Both attitude and perception score from face to face interview indicate is lower than the scores from online survey. According to Ahmed and Gotoh (2006), there might be some bias between two interview techniques that could cause the result differences. For examples, an interviewer presence and ease of respondents accessing between online and face to face survey in developing countries.

4.3 Willingness to pay for plastic bag reduction

Two groups of respondents both from online and field survey were conducted the willingness to pay estimation for the plastic bag management in this part. Plus, the differences of willingness to pay between two groups of methods would be discussed.

4.3.1 Willingness to pay analysis by the online survey

This study also conducted the willingness to pay analysis for plastic bag waste management by using online survey. In addition, there are 3 groups of respondents to be investigated in this part. The contingent valuation method (CVM) is used to elicit the willingness to pay for plastic bag waste management as plastic bag levy by using payment card technique.

The results found that total respondents, who were treated with economic approach as one of their interventions (N=326), are willing to pay for the plastic bag levy around 54.9% (54.5% of Group 2, 50% of Group 4 and 60.2% of Group 5). It also shows that even there are respondents who are not willing to pay but they seem to support the plastic bag levy. 70.2% of total respondents will support if the government implements plastic bag levy measure (72.7% of Group 2, 63% of Group 4 and 75% of Group 5) The respondents who face with the descriptive information support the plastic bag levy higher than the one who face LCT information which is shown in **Table 28**.

It represents that people are more willing to pay and support when they know how many plastic bags that they used in their daily life rather than just knowing the pollution from plastic bag's life cycle. However, the highest percentage of support is

in Group 5. It implies that the respondents without any information provision might initially support the plastic bag levy.

Table 28 Proportions of willingness to pay and levy supports of online survey

	Willingness to pay for plastic bags levy		Supports the national plastic bags levy	
	Yes	No	Support the levy	Not support the levy
Total (N=326)	54.9%	45.1%	70.2%	29.8%
Group 2 (N=110)	54.5%	45.5%	72.7%	27.3%
Group 4 (N=108)	50.0%	50.0%	63.0%	37.0%
Group 5 (N=108)	60.2%	39.8%	75.0%	25.0%

The selected value of willingness to pay choices shows in **Table 29**. The choices from 0 Baht to 10 Baht with 0.5 Baht of interval were provided to the respondents in all groups. Then, the data is later calculated by interval regression to obtain the willingness to pay for plastic bag waste management.

Table 29 Willingness to pay proportions in payment card of the online survey

Willingness to pay values	Group 2 with descriptive information		Group 4 with LCT information		Group 5 without information provision	
	Frequency	%	Frequency	%	Frequency	%
0 Baht	50	45.5%	54	50.0%	43	39.8%
0.5 Baht	29	26.4%	16	14.8%	29	26.9%
1 Baht	18	16.4%	21	19.4%	14	13.0%
1.5 Baht	2	1.8%	2	1.9%	1	0.9%
2 Baht	5	4.5%	7	6.5%	4	3.7%
2.5 Baht	0	0.0%	1	0.9%	0	0.0%
3 Baht	2	1.8%	1	0.9%	5	4.6%
3.5 Baht	0	0.0%	0	0.0%	1	0.9%
4 Baht	0	0.0%	0	0.0%	1	0.9%
4.5 Baht	0	0.0%	0	0.0%	0	0.0%
5 Baht	2	1.8%	2	0.2%	3	2.8%
5.5 Baht	0	0.0%	0	0.0%	0	0.0%
6 Baht	0	0.0%	0	0.0%	0	0.0%
6.5 Baht	0	0.0%	0	0.0%	2	1.9%
7 Baht	0	0.0%	1	0.9%	1	0.9%
7.5 Baht	1	0.9%	0	0.0%	0	0.0%
8 Baht	0	0.0%	1	0.9%	0	0.0%
8.5 Baht	0	0.0%	0	0.0%	1	0.9%
9 Baht	0	0.0%	0	0.0%	0	0.0%
9.5 Baht	0	0.0%	0	0.0%	0	0.0%
10 Baht	1	0.9%	1	0.9%	2	1.9%
Others	0	0.0%	1	0.9%	1	0.9%
Total	110	100.0%	108	100.0%	108	100.0%

The interval regression, which is censored regression, is used to determine the mean willingness to pay values as well as their influencing factors in each group shows in **Table 30**. There are 3 groups in this study which are investigated about the willingness to pay.

Firstly, respondents in Group 2 with descriptive information indicates that their mean willingness to pay for plastic bag waste management as the plastic bag levy is about 0.030 US$ or 0.98 Baht per one plastic bag. The ages of respondent, AGE, is negatively correlated with willingness to pay in group 2 ($p<0.01$). It implies that the younger respondents are likely willing to pay more for the plastic bag waste management as the plastic bag levy. It is similar to the study from Dunn (2012) which shows that older people are willing to pay less than the younger one. Because they are mostly in working class and they could be willing to pay more than be inconvenienced by having to use reusable bags. Monthly income represents negative relationship with WTP. The respondents with higher monthly income are willing to pay more than who had lower monthly income ($p<0.05$). However, Dunn (2012) found that low income respondents are more willing to pay the plastic bag levy than respondents with higher income.

The attitude and perception are also correlated with willingness to pay in this group. Their scale ranks from high to low which is "Strongly agree" to "Strongly disagree". So, *ATT* shows the positively relationship with WTP which means people with grater attitude about preserving environment and natural resource conservation by reducing the use of plastic bags are prone to be more willing to pay for plastic bag waste management ($p<0.05$). The provided statements of perception of threat make the respondents indicate their opinions on the same scale as the attitude scale. It was found that *PER_1* is negatively correlated with WTP and that means who had higher perception about environmental issue from plastic bag are likely willing to pay more for the levy ($p<0.1$). However, *PER_2* is positively correlated with WTP which indicated that people, who had lower perception about emphasis of plastic bag reduction measure tended to be willing to pay more for plastic bag waste management ($p<0.05$). Besides, *SUP* is negatively correlated with WTP and it means the respondents, who support the levy, are more willing to pay more than who do not ($p<0.01$).

Besides, the group with life cycle thinking based information as Group 4 represents the willingness to pay value for plastic bag waste management slightly

higher than the prior group which is about 0.033 US$ or 1.07 Baht per one plastic bag. *GEN* is negatively correlated with WTP or female respondents are willing to pay more than male respondents for plastic bag levy ($p<0.05$). Besides, *EDU* shows positive relationship with WTP and it implies that respondents with higher education level are prone to be willing to pay the plastic bag levy ($p<0.1$). Use and reuse intention scale ranks from high to low which is "Always" to "Never". So, the negative relationship between *USE* and WTP shows that respondent who intent to use more plastic bag after information provision in the future are willing to pay for the plastic bag waste management ($p<0.01$). Furthermore, *REUSE* is positively correlated with WTP so respondents, who do not intent to reuse plastic bag, are willing to pay for plastic bag levy ($p<0.05$). It was found that *PER_1* is positively correlated with WTP and that means who had lower perception about environmental issue from plastic bag are likely willing to pay more for the levy ($p<0.05$). *SUP* is negatively correlated with WTP and it means the respondents, who support the levy, are more willing to pay more than who do not ($p<0.01$).

On the other hand, the group without any information provision (Group 5) shows highest willingness to pay values in this study which is approximately 0.044 US$ or 1.43 Baht per a plastic bag for plastic bag waste management. Besides, the Group 5 without any information provision expresses their highest values of WTP because they are also the group which most support and willing to pay the plastic bag levy. So, it might make them more willing to pay higher than others. the attitude, *ATT*, is negatively correlated with WTP so respondents who had lower attitude about preserving environment and natural resource conservation by reducing the use of plastic bags are prone to be less willing to pay for plastic bag waste management ($p<0.1$). Moreover, *SUP* is also negatively correlated with WTP and it means the respondents, who support the levy, are more willing to pay more than who do not ($p<0.01$)

Table 30 Willingness to pay analysis (online survey)

	Group 2: Descriptive information	**Group 4: LCT+WTP**	**Group 5: without information provision**
VARIABLES	**WTP model**		
GEN	0.00516	-0.0182**	-0.00368
	(0.00765)	(0.00885)	(0.0132)
AGE	-0.0161***	-0.00249	-0.00460
	(0.00512)	(0.00592)	(0.00955)
EDU	-0.00353	0.00989*	0.00124
	(0.00435)	(0.00513)	(0.00837)
INC	0.00783**	-0.000836	-0.00216
	(0.00377)	(0.00396)	(0.00614)
USE	0.00362	-0.0112***	-0.00222
	(0.00354)	(0.00433)	(0.00702)
REUSE	-0.00711	0.00787**	0.00479
	(0.00454)	(0.00366)	(0.00667)
ATT	0.0232**	0.00291	-0.0216*
	(0.0108)	(0.00969)	(0.0125)
PER_1	-0.0193*	0.0142**	0.0196
	(0.0103)	(0.00691)	(0.0123)
PER_2	0.0212**	-0.0144	-0.000846
	(0.00855)	(0.0104)	(0.0149)
PER_3	-0.00149	-0.00500	-0.00523
	(0.00865)	(0.00900)	(0.0123)
SUP	-0.0305***	-0.0372***	-0.0407***
	(0.00871)	(0.00910)	(0.0152)
Constant	0.0658**	0.103***	0.122**
	(0.0258)	(0.0344)	(0.0508)
Mean WTP (US$)	$0.030***	$0.033***	$0.044***
Observations	110	108	108

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

4.3.2 Willingness to pay analysis by field questionnaire

Moreover, the study conducted the willingness to pay analysis for plastic bag waste management by face to face interview. The contingent valuation method (CVM) with payment card is also used to elicit the willingness to pay for plastic bag waste management as in online survey.

The results found the percentage of respondents from face to face interview (N=409), are willing to pay for the plastic bag levy around 49.1%, which is less than the percentage of any groups of respondents from online survey. The support for plastic bag levy in this field survey is around 65.3% which is lower than the group without information or Group 5 (75.0%) from online survey. See more in **Table 31** below.

Table 31 Proportions of willingness to pay and levy supports of the field survey

	Willingness to pay for plastic bags levy		**Supports the national plastic bags levy**	
	Yes	No	Support the levy	Not support the levy
Respondents from field survey (N=409)	49.1%	50.9%	65.3%	34.7%

Table 32 Willingness to pay proportions in payment card of the field survey

Willingness to pay values	Field group	
	Frequency	%
0 Baht	208	50.9%
0.5 Baht	60	14.7%
1 Baht	79	19.3%
1.5 Baht	3	0.7%
2 Baht	28	6.8%
2.5 Baht	0	0.0%
3 Baht	8	2.0%
3.5 Baht	0	0.0%
4 Baht	0	0.0%
4.5 Baht	0	0.0%
5 Baht	12	2.9%
5.5 Baht	0	0.0%
6 Baht	0	0.0%
6.5 Baht	0	0.0%
7 Baht	0	0.0%
7.5 Baht	0	0.0%
8 Baht	1	0.2%
8.5 Baht	0	0.0%
9 Baht	0	0.0%
9.5 Baht	0	0.0%
10 Baht	6	1.5%
Others	4	1.4%
Total	409	100.0%

The selected value of the choices of willingness to pay shows in **Table 32**. The choices from 0 Baht to 10 Baht with 0.5 Baht of interval were provided to the respondents in field survey. Then, the information is later calculated by interval regression to obtain the willingness to pay for plastic bag waste management. The results show that about half of all respondent were not willing to pay, but the

respondents were mostly willing to pay for plastic bag levy for 1 Baht per bag (19.3%) follows by 0.5 Baht which is 14.7%.

The regression results indicate that the mean willingness to pay for plastic bag waste management as the plastic bag levy is about 0.032 US$ or 1.04 Baht per one plastic bag shows in **Table 33**. The results of the model also indicate the influencing factors which are correlated with the willingness to pay in this study as well.

Table 33 Willingness to pay analysis (field survey)

Gained respondents by field survey	
VARIABLES	WTP model
GEN	0.00224
	(0.00458)
AGE	-0.00458
	(0.00279)
EDU	0.00307
	(0.00307)
INC	-0.00193
	(0.00231)
USE	-3.76e-05
	(0.00284)
REUSE	-0.00486**
	(0.00214)
ATT	-0.000183
	(0.00449)
PER_1	-0.00151
	(0.00422)
PER_2	-0.00700
	(0.00484)
PER_3	-0.000634
	(0.00402)
SUP	-0.0330***
	(0.00471)

Table 33 Willingness to pay analysis (field survey)

Gained respondents by field survey	
VARIABLES	**WTP model**
Constant	0.107***
	(0.0206)
Mean WTP (US$)	$0.032***
Observations	409
	Standard errors in parentheses
	*** p<0.01, ** p<0.05, * p<0.1

In the group from field survey, the regression results show that *REUSE* is negatively correlated with WTP. Respondents who initially always reuse plastic bag tend to be willing to pay more for who don't (p<0.05). Moreover, *SUP* is also negatively correlated with WTP and it means the respondents, who support the levy, are more willing to pay more than who do not (p<0.01).

4.3.3 Discussion on the willingness to pay

The willingness to pay values are different in the groups with and without information provision. The results show that respondents from online survey with information provision both with descriptive and LCT information express their willingness to pay lower than the respondents without any information provision. However, the higher willingness to pay in Group 5 or the group without information provision came from the high rate of willingness to pay and support for the levy. Consequently, the respondents are much more willing to pay and selected a high price in the payment card.

Regression analysis also proves that respondent who support the levy are likely willing to pay for plastic bag levy in both online and field survey (p<0.01). Moreover, it is the key that influences the respondents in Group 5 from online survey shows a highest willingness to pay (0.044US$ or 1.43 Baht).

However, in large group of respondents from field survey, it indicated that the proportions of willingness to pay and support for the plastic bag levy are similar to the Group 2 and Group 4 from the online survey, see in **Table 34** However, there are similar willingness to pay values which are 0.030US$ (0.98 Baht) from the Group 2 with descriptive information by online survey (N=110), 0.033US$ (1.07 Baht) from the Group 4 with LCT based information by online survey (108), 0.043 US$ (1.43 Baht) from the Group 5 without information and 0.032US$ (1.04 Baht) from the field survey group (N=409). So, using online or field survey technique, as well as with or without information provision, provides similar willingness to pay value when respondents moderately support for the plastic bag levy.

Table 34 Willingness to pay comparison

	Willingness to pay for plastic bags levy			
	Field survey	**Online survey**		
		Group 2	**Group 4**	**Group 5**
Mean WTP (US$)	$0.032 (1.04 Baht)	$0.030 (0.98 Baht)	$0.033 (1.07 Baht)	$0.044 (1.43 Baht)
Observations (N)	409	110	108	108

Moreover, it implies that this price range (around 3-4.4US$ cent or 0.98-1.43 Baht) of willingness to pay shows the prices which people can afford for the levy and getting plastic bag to use at a store. So, to limit the plastic bag use, the price is needed to be higher than the price that people are willing to pay.

Table 35 Percentage of respondents who give up on each plastic bag levy

Levy Price/bag	Group 2	Group 4	Group 5	Field group
1 Baht	71.9%	64.8%	66.7%	65.6%
1.5 Baht	88.3%	84.2%	79.7%	84.9%
2 Baht	90.1%	86.1%	80.6%	85.6%
2.5 Baht	94.6%	92.6%	84.3%	92.4%
3 Baht	94.6%	93.5%	84.3%	92.4%

Moreover, the **Table 35** above show the percentage of respondents who will give up on plastic bag levy. So, if it is set 2 times higher than the WTP results (approximately 1-1.5 Baht per bag), the price of levy will be around 6-8 US$ cents (2-3 Baht) per bag which is similar to many plastic bag levies around the world. For instance, 6US$ cent (1.95 Baht) of minimum voluntary plastic bag levy in Germany, 5p levy in large retailers which is about 7US$ cent (2.28 Baht) in England and 7US$ cent (2.28 Baht) of voluntary levy from some shop in Singapore.

Therefore, this study can provide the baseline price from willingness to pay estimation based on Thai respondents. Plus, up to 90% of respondents give up on plastic bag levy and it might make people avoid using them. Then, it eventually affects to the plastic bag reduction in the future. (The exchange rate used was 1US$ = 32.561 Baht)

4.4 Plastic bag management recommendations

The situation of solid waste management especially plastic bag waste became a major challenge in Thailand because it is unlikely to decrease by an excessive consumption nowadays. To increase understanding on overall situation and

receive the feedback from the plastic bag stakeholders, in-depth interview was conducted to elicit the information. This study gathered the experiences and feedbacks on plastic bag use and management from various key stakeholders to develop the lessons and recommendations through each point of view which consists of manufacturer, policy makers, retailers and customers. Stakeholders whom were interviewed include Plastic Industry Club of the Federation of Thai Industries, Public Education and Extension Division of Department of Environment Quality Promotion, Chula Zero Waste, CP ALL Public Company Limited (7-Eleven) and 7 vendors. The interview pictures are presented in **Appendix II.**

4.4.1 Overall plastic bag management situation

The results from in-depth interview indicated the interesting information about the situation of plastic bags use management. Policy making sector has had many efforts to limit and control the use of plastic bag in Thailand. Many measures have been established to change the attitude and behavior of plastic bag use in Thai society. Organizational measure of plastic bag reduction had succeeded. For instance, Chulalongkorn University has stopped a free plastic bag distribution and imposed the plastic bag levy instead. The revenue was collected for environmental impacts mitigation.

Furthermore, the national measures of plastic bag reduction follow the nation waste master plan (2016-2021) which are currently in the process of educating and establishing better attitude for the environment. Voluntary based measures are used and cooperate with modern trade retailers to foster the customer to minimize their plastic bags use by using points and rewards for incentives. In addition, the campaigns for plastic bag reduction with the posters and signs are also conducted in many traditional markets.

Meanwhile, 7-Eleven convenience stores explained that their plastic bag distribution is decreasing nationwide. Plastic bags are distributed to the customers for free, but the store currently sets the voluntary measure of plastic bag reduction and stops providing free plastic bag with other alternatives at some area such as hospitals, tourist islands and universities.

From the point of view of manufacturer, the current measures of plastic bag reduction are gradually reducing to the overall orders and production of plastic bag in this year even there was no effect of the production in a last few years.

The national trend of plastic bag use is still high especially from traditional market. It is approximately 40% of total plastic bag use (30% from convenience store and 30% from department store). Besides, this information matches to the perspectives of vendors in traditional markets which express that they still distribute free plastic bags to their customers. They see that it is the nice service which can keep their customer good-relationship and make consistent incomes. Because if they stop to give away plastic bags and bring an inconvenience to customers, they believe that customer will definitely not come back to their store anymore. Moreover, the customers who buy foods want more plastic bags than who buy small goods. Because plastic bag is quite necessary for containing and preventing from any contaminations in foods, however, customers who buy other small goods mostly refuse the plastic bag from vendors by themselves and put the goods together in plastic bag that they got from previous stores. Nevertheless, there is only minority of customers who bring reusable cloth bag to the market.

Although many vendors keep distributing plastic bags for free, some of them understand the consequences and environmental impact from plastic bag. They conduct the measures for plastic bag reduction. For instance, they bring the old plastic bag which is reusable for giving to customers and preparing the reusable cloth bag to customers when their purchasing is fit to terms.

4.4.2 Challenges and barriers of plastic bag management

The results from in-depth interview with plastic bag stakeholders show that the challenges and barriers of plastic bag management and control are in many aspects.

From the point of view of policy maker, the barriers and obstacles mainly are the continuity and efficacy of public relations of campaigns. Both factors are needed to be emphasized to improve people's awareness for environment. Then they change their behavior. Besides, there still lack of a working groups of plastic bag reduction

campaign in both organizational and government sectors. So, the public relations are not comprehensive and intense. Therefore, some customers disagree with the campaign especially older and occasional customers who hardly change their habit leading to the complaints for campaigns. The challenge for plastic bag reduction is public education to establish the right attitude and understanding. Then, this process would encourage the green awareness as much as possible before leading to change the excessive plastic bag use behavior. The education process is very significant to avoid the confliction between customers and retailers and to establish the readiness for conducting free plastic bag prohibition and economic based measure such as implement plastic bag levy policy instead in the future.

The convenience store experienced the major challenge which is to eliminate the habit of receiving a free plastic bag. Some of customers thought that to stop free plastic bag distribution is only the cost reduction for the store. The complaints have been found when customers do not receive any plastic bags only at some branches. There is a direct confliction between the branches of store and customers. So, they should prepare how to deal with those customers even this problem occurs only first month of implementation.

Moreover, the manufacturers have similar points of view. Public education is main challenge to create some change on the upstream which is plastic bag reduction and waste separation. Therefore, there will be a good environment and better system of recycling industry while encourage the national circular economy. Recycling industry is needed to be more fostered because nowadays this industry has to import the plastic waste to recycle. One of the reasons is they cannot use domestic plastic waste because this kind of waste especially plastic bag waste is always contaminated by food waste. Consequently, there is more operating cost in separating and cleaning processes. Meanwhile, manufacturer thought that the alternative or biodegradable plastic bag is not righteous solution because it costs many times of HDPE plastic bag and it is single use plastic bag which cannot recycle. Plus, when it turns to waste even it is biodegradable, but it needs the suitable and right condition for disposal unless the environmental problems still occur such as

marine life dangers and GHGs emission. Moreover, the biodegradable plastic bag waste can contaminate to the recycling system among the HDPE plastic bag waste.

Even the society should do something to change the attitude and excessive consumption on plastic bag such as stop providing a free on or using economic approach, but many vendors are concerning that plastic bag levy might cut their income still because of losing the customers. They afraid their customers will not come back and decide to go to shopping at the stores where are able to provide the same convenience to them as a free plastic bag distribution.

4.4.3 Recommendations for sustainable plastic bag management

I.Increase environmental awareness for the public

The effective solution to reach the sustainable plastic bag management is mainly based on public preparation for environmental awareness. It is necessary to create and improve environmental awareness and the right understanding to reduce the plastic bag use in the future by using information provision. This study also proves that descriptive and life cycle information can improve the environmental attitude and perception. Both kinds of information can also reduce the plastic bag use intention, a free plastic bag expectation and double plastic bag use intention after information provision. In organizational level, there ought to be serious encouragement and emphasis on plastic bag reduction in all classes and departments. In national level, the local authorized departments and local retailers have to emphasize on plastic bag campaign. Plus, both levels need the effective and adequate working groups.

However, every campaign of plastic bag reduction which affects to customers has to notify them in advance along with the information. Public relations of a plastic bag reducing campaign need to be clear and strict to same direction. People have to be informed and encouraged about plastic bag reduction consistently. Although there had been great results on plastic bag reduction in some organizational level, however, they only come from the whole system changes not customers' own decisions. Better attitude and awareness will eliminate the excessive use of plastic

bags and they both can strengthen the public readiness for a future plastic bag levy or any kind of plastic bag reduction measure.

II. Integration of managements at all stakeholder levels of plastic bag supply chain

Moreover, the effective solution will be created from the integration of every stakeholder. From the gained information, policy maker need consider and establish the clear and comprehensive plastic bag reduction measures. Those measure have to communicate in the same direction in where they are implemented. Meanwhile, plastic bag manufacturer should adjust themselves among plastic bag reduction trends. However, plastic container is still necessary in society, but the producer need to develop for the one which can be multiple reusable bag with proper size and thickness.

Retailers and other store have to give the information and in advance notices to their customers for any plastic bag measure especially when stop providing a free plastic bag. Besides, other alternatives have to be prepared for them to minimize the burdens on customers. Since a free plastic bag is not the most satisfactory service which convince customers want to go to the store in this study, retailers then should improve and emphasize on the quality of the most satisfactory services instead which are nice service, points/ rewards and clean store.

Customers also necessarily change their plastic bag use behavior and more emphasize for reusing plastic bag and bringing the reusable bag to their shopping trips.

III. Legislation for plastic bag reduction

There is feasible and necessary to conduct the plastic bag levy in the future especially in consumer level which would be a strong signal for plastic bag reduction and eventually change the plastic bag use behavior. This study support on the economic based measure rather than voluntary measure by based on the results.

Voluntary measure for plastic bag reduction seems to be a normal thing which represents only retailers' image. Furthermore, the national plastic bag should be set higher than the willingness to pay value to make people give up on using plastic bag by paying the plastic bag levy. Therefore, from the results, this study suggests that there should implement the plastic bag levy at customers level around 2-3 Baht per a plastic bag. In this range of levy, this study indicates that there would be up to 90% of respondents who give up on using plastic bag with paying that levy.

However, it should test at the area where might cause less effects to the society before starting nationwide. For instance, in modern trade retailers where most customers have higher income and they might be able to afford the levy. Plus, not only stop free plastic bag distribution and charging the levy, but it also has to be alternative bag for the customers.

Convenience stores are willing to adapt the plastic bag levy to their customers only it is legally announced and supported by the government. Furthermore, more than 80% of big manufacturers agree with the single use plastic bag levy in customer level rather than in manufacturing level. Eventually, manufacturers will push the cost to retailers and finally to the customers. Plus, there will reduce the national capacity of plastic bag production and export.

Policy maker and manufacturing sectors agree that the plastic bag levy should states the one and only size of plastic bag which has to be multiple reusable bag and then this kind of bag will be the one that customers get after paying the levy. In addition, manufacturer do not afraid that plastic bag reducing measure and upcoming plastic bag levy will affect to their production and income because they believe that the plastic bag is still needed and necessary even it is not a small size and single use, but they need to adapt to the global concerns.

Nevertheless, customers and manufacturer are concerning that the revenue from the levy collection is not transparent. So, the manufacturer suggested that the private sectors should involve and manage the revenue with the government sectors. The revenue management system should be established and traceable. It

also needs to ensure that the revenue is well spent to support the environmental protection or foster the environmental awareness in the society.

4.5 Limitations of the research

There are some limitations of this research such as questionnaire and in-depth interview.

For the limitation of questionnaire, online survey can approach only the respondents who can access the internet. The respondents might have knowledge about the computer or technology than the respondents gathered by face to face survey. Moreover, the limitation of payment card might occur by a range, centering and end point bias (Mitchell and Carson, 1989). The respondents could select the value for plastic bag levy above their actual one since there were showing many choices for making decision.

Field survey respondents can be collected only the information about the willingness to pay. To eliminate the biases which might happen by those limitations, this study then decided to investigate only willingness to pay estimation.

In-depth interview with some stakeholders in this study had some limitations. The stakeholders in this study are interviewed by face to face, but some of them had done by phone interview due to business travelling.

CHAPTER V
CONCLUSIONS

5.1 Plastic bag situations and trends of behaviors

Plastic bag are still distributed for free in the market, but some branches of big retailers started not to provide them. Meanwhile, the plastic bag production has been gradually affected by reduction measures. So, the challenge is adaptation of the manufacturers and vendors to handle the declining trend of plastic bag consumption if plastic bag reduction measures or imposing upcoming plastic bag levy are conducted.

The tendencies of current plastic bag use behaviors had been found in this study. Most respondents from both online (N=555) and field surveys (N=409) indicated their plastic bag use frequencies in “Sometimes”. This implies that the plastic bag use behavior in Bangkok is quite moderate. Nevertheless, most of them cannot avoid using plastic bag whereas only 4 respondents in online survey and none in field survey reject plastic bag use in their daily life. However, the reuse behavior trends are satisfied since the respondents indicate their plastic bag reuse frequencies as “Always” in both online and field surveys. Although most respondents from both surveys still receive the double plastic bag and expect that stores have to provide them a free plastic bag for their shopping trips. It had been proved that a free plastic bag is not the most satisfactory factor that the respondents mostly desire from the stores. However, a nice service from store, points and rewards and clean store for their shopping trips are among the key factors that respondents desire. Moreover, most of them get used to accept the second plastic bag as double plastic bag offered by stores when they buy heavy or a lot of things.

5.2 Information provision and willingness to pay for plastic bag reduction

Regarding to the results analysis, one of potential solutions for plastic bag reduction in the future is to use both information provision and economic approach.

Especially, information provision in study had been proved that both descriptive and LCT based information can reduce the intention of plastic bag use behavior. Besides, they can significantly help to reduce the expectation for a free plastic bag from store and lessen intention of double plastic bag use behavior. This study also proves that descriptive and LCT information can encourage people to have more environmental attitude and perception to reduce plastic bag use.

The willingness to pay (WTP) estimation for plastic bag waste management could be the baseline price for future plastic bag levy. Both online and field surveys express similar willingness to pay for plastic bag levy which is approximately 1-1.5 Baht per plastic bag. Furthermore, information provision is not the significant factor that affect to WTP. However, to effectively limit and reduce the national plastic bag use, a levy should be set higher than the gained result of WTP. It had been studied that if national plastic bag levy is set 2 times higher than WTP. So, there will be up to 90% of respondents who give up for the plastic bag levy around 2-3 Baht per bag. The influencing factors of WTP for plastic bag waste management mainly include age, use intention and levy support. However, the affecting levels are depending on the types of information provision.

5.3 Plastic bag management recommendations

From the results, this study analyzed 3 major kinds of recommendations which absolutely needed to be emphasized for sustainable plastic bag management.

I. Increase environmental awareness for the public

- Improve environmental attitude and awareness for people by fostering the information provision such as descriptive and LCT information.
- It subsequently strengthen the public readiness as much as possible before implement any plastic bag reduction measures in the future.

II. Integration of managements at all stakeholder levels of plastic bag supply chain

- In advance notices for plastic bag reduction measures and alternative options have to be prepared to customers by retailers.
- Since a free plastic bag is not most satisfactory service, retailers should improve and emphasize the quality of their other satisfactory services such as nice service, points/rewards and clean store.

III. Legislation for plastic bag reduction

- To stop a single plastic bag distribution and set plastic bag levy in customers level to directly change the behavior rather than using voluntary measures.
- The levy should be set higher than WTP to make most people give up on using plastic bag by paying the levy around 2-3 Baht per bag.
- It has to be implemented as a test at some area, such as at modern trade retailers, where most customers could afford the levy.
- The transparent of the revenue has to be considered for the public.

APPENDIX I

QUESTIONNAIRE

1. English version of questionnaire

Information Provision and Economic Approach for

Promotion of Plastic Shopping Bag Reduction in Bangkok, Thailand.

This questionnaire is conducted for the academic purpose only.

All information will be analyzed and published in academic journals.

Any individual data will not be opened to the public.

Before getting started, for your information, a type of plastic shopping bags that we mention in this questionnaire is only **"T-shirt plastic shopping bag"** which are normally distributed for free in supermarket and convenience stores, as shown in **Figure 1**. (Plastic bags for food packaging are excluded.)

Figure 1 T-shirt plastic shopping bags from supermarket and convenience store.

Part 1: Before intervention *[For all respondents]*

Please indicate <u>only one answer</u> of your opinion on these sentences by checking √.

Q1. Which service could make you most satisfy to go to the convenience store?

○ Welcome smile and nice service	○ Free plastic bags	○ Clean store
○ Cashless payment	○ Rewards/points	○ Others, _____

Q2. Do you expect or believe that the supermarket and convenience store **have to provide a free plastic bag** in each purchasing?

○ Yes, I do. ○ No, I don't.

Q3. *[If the answer in **Q2**. is Yes]* Why do you think the supermarket or convenience store have to provide free plastic bags to the customer?

○ Providing free plastic bags is the service that the customers should be received from the stores.

○ Because plastic bag cost already includes in the goods cost.

○ Others, _____

Q4. *[For all respondents]* Normally, **if the store offers you to provide the double of plastic bags when you buy heavy goods**. Do you accept them or not?

○ Yes, I do. ○ No, I don't.

[For all respondents]

How do you think about the following sentences?

Q5. Reduction of plastic shopping bag uses can preserve environment and conserve natural resource.

○ Strongly agree	○ Agree	○ Neutral
○ Disagree	○ Strongly disagree	

Q6. Plastic bags can lead to a critical environment issue.

○ Strongly agree	○ Agree	○ Neutral
○ Disagree	○ Strongly disagree	

Q7. We must not put off but rather emphasize measures against plastic bags uses.

○ Strongly agree	○ Agree	○ Neutral
○ Disagree	○ Strongly disagree	

Q8. We must reduce plastic bags uses as soon as possible.

○ Strongly agree	○ Agree	○ Neutral
○ Disagree	○ Strongly disagree	

Q9. How often do you use or ask for plastic shopping bags at the supermarket or convenience store in your daily life?

○ Always	○ Often	○ Sometimes
○ Rarely	○ Never	

Q10. *[If, in **Q9**., answers are Rarely or Never]* Please select only one main reason that explain why you were not using or asking for plastic bags?

○ Habit	○ Environment friendly	○ Friend recommended	○ Many people do it
○ Cool/ good looking	○ Convenient	○ Getting point or rewards	○ Others

Q11. *[Except who answer Never in **Q9**.]* How often do you reuse those plastic shopping bags?

○ Always	○ Often	○ Sometimes
○ Rarely	○ Never	

*[Respondents who answer Never in **Q9** are allocated to Group 0 and skip Parts 2-4]*

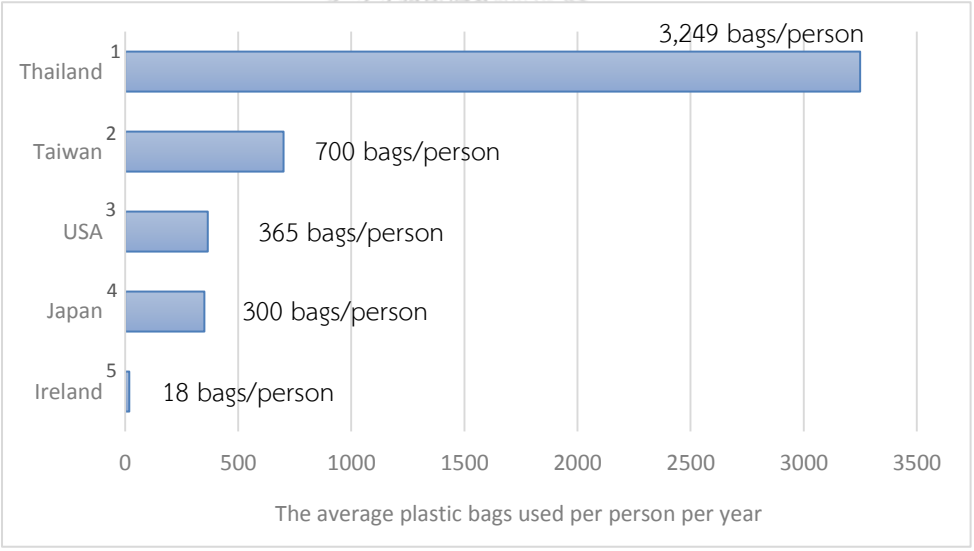
[Respondents who are allocated to Groups 5, skip Part 2]

Part 2: Intervention *[For respondents who are allocated to Group 1 and 2]*

Please consider the following information before answer the next questions.

Descriptive information

Did you know how many plastic shopping bags were used per one person within 1 year?



Sources

[1] Chantnusornsiri and Jitpleecheep (2018)

[2] The Asahi Shimbun (2018)

[3] Parker (2018)

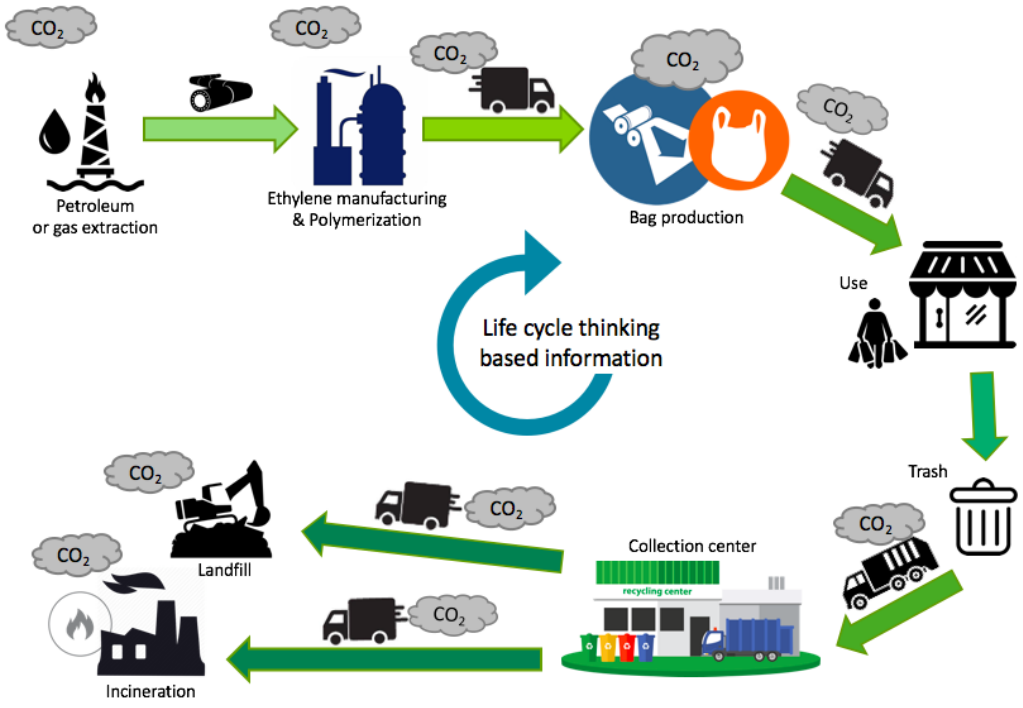
[4] Gardner (2017)

[5] United Nations Environment Programme (2018)

[For respondents who are allocated to Group 3 and 4]

Life cycle thinking (LCT)-based information

CO_2, as known as Green House Gas, is emitted throughout life cycle of plastic bag by energy consumption, transportation and incineration.



Source: Kikuchi-Uehara E, Nakatani J. and Hirao M (2016)

[Respondents who are allocated to Groups 1 and 3 skip Part 3]

Part 3: Economic part *[For respondents who are allocated to Groups 2, 4 and 5]*

Please read the following statement carefully before answer the next questions.

Hypothetical situation

People usually discard their solid wastes without any payment responsible for managing the amount of waste generated. However, **the effective and suitable solid waste managements need an adequate budget to mitigate and preserve the environmental**

quality.

Plastic bag waste is one kind of solid wastes which continue to increase in the waste stream and could cause a chronic environmental problem. Plastic bag is usually given to the customers for free at most stores in Thailand. After a short-time of utilization, plastic bags are discarded and then become plastic bags waste. **Nonetheless, only some of them will be conveyed through the effective and suitable solid waste management systems**, which eventually be disposed to landfill or entered a recycle process.

To set up an effective plastic bag waste management, **Thai government allows to use polluter pay principle to collect the plastic bags levy. It mainly aims to improve the efficiency of plastic bags waste management for a better environment**.

Suppose the supermarket and convenience stores **stop provide any plastic shopping bags for free**. However, if you still want to keep using plastic shopping bags, you have to purchase them as plastic bag levy. In addition, "**the certain size**" of plastic shopping bag which is 30 cm. x 50 cm. is the only size, with its suitable thickness for multiple reuse, which the shops are allowed to sell, as shown in **Figure 2**.

Figure 2 The certain size of plastic shopping bags, provided by supermarket and convenience store when starting to charge.

Q12. According to the hypothesis market, are you willing to pay if the supermarket and convenience store start to charge for a plastic bag levy? and how much would you be willing to pay as maximum per one plastic bag?

- ○ Yes, I am willing to pay for plastic bag levy. **(Please select your maximum willing to pay for one plastic bag)** (Only one answer)

Price: Baht/bag

0.5	1	1.5	2	2.5
3	3.5	4	4.5	5
5.5	6	6.5	7	7.5
8	8.5	9	9.5	10

or others, _____ Baht/bag

○ No, I am not willing to pay for any plastic bag. (0 Baht)

Q13. If the government starts to conduct this policy by **starting to charge for the plastic bags levy** in order to improve plastic shopping bags waste managements, **would you support this policy**?

○ Yes, I will ○ No, I will not

Part 4: After intervention *[For respondents who are allocated to Groups 1-5]*

Please indicate <u>only one answer</u> of your opinion on these sentences by checking √. *(Some questions might be alike in the previous part)*

Q14. Do you still expect or believe that the supermarket and convenience store **have to provide a free plastic bag** in each purchasing?

○ Yes, I do. ○ No, I don't.

Q15. *[If the answer in 2. is Yes]* Why do you think the supermarket or convenience store still have to provide free plastic bags to the customer?

○ Providing free plastic bags is the service that the customers should be received from the stores.

○ Because plastic bag cost already includes in the goods cost.

○ Others, _____

Q16. If the store offers you to provide the double of plastic bags when you buy heavy goods. Will you accept them or not?

○ Yes, I will. ○ No, I won't.

[For respondents who are allocated to Groups 1-4]

How do you think about the following sentences?

Q17. Reduction of plastic shopping bag uses can preserve environment and conserve natural resource?

○ Strongly agree ○ Agree ○ Neutral

○ Disagree ○ Strongly disagree

Q18. Plastic bags can lead to a critical environment issue.

○ Strongly agree ○ Agree ○ Neutral

○ Disagree ○ Strongly disagree

Q19. We must not put off but rather emphasize measures against plastic bag uses.

○ Strongly agree ○ Agree ○ Neutral

○ Disagree ○ Strongly disagree

Q20. We must reduce plastic bag uses as soon as possible.

○ Strongly agree ○ Agree ○ Neutral

○ Disagree ○ Strongly disagree

[For respondents who are allocated to Groups 1-5]

Q21. How often will you expect to use plastic shopping bags at the supermarket or convenience store in the near future?

○ Still use as always ○ Often ○ Sometimes

○ Rarely ○ Never use again

Q22. How often will you reuse plastic shopping bag in the near future?

○ Still reuse as always ○ Often ○ Sometimes

○ Rarely ○ Never

Part 5: Socio demographic *[For all respondents]*

Please fill your information follow these questions.

Noted: Any Individual data will not be opened to the public.

Q23. Please select your gender.

○ Female ○ Male

Q24. Please select your age.

○ Less than 20 ○ 20-30 ○ 31-40

○ 41-50 ○ More than 50

Q25. Please select your accommodation type.

○ Detached House ○ House estate ○ Condominium

○ Apartment ○ Flat ○ Others,____

Q26. Please select your highest education level.

○ Primary school ○ Secondary school ○ College graduate ○ Undergraduate

○ Graduate ○ Higher education level ○ Others,____

Q27. Please select your monthly income.

○ Less than 15,000 Baht ○ 15,000-25,000 Baht ○ 25,001-35,000 Baht

○ 35,001-45,000 Baht ○ More than 45,000 Baht

Q28. How often do you go shopping at the following stores? By checking √

	Hypermarket	Discount store	Supermarket	Drug store	Department Store	Convenient store	Traditional market	Grocery store	Whole sale market
More than once a week									
More than twice a month									
Less than twice a month									

Q29. Please check all the industrial/occupational categories applicable for any working family members in your household, including part-time and casual work.

(Please select all answers that apply)

- ○ Manufacturing
- ○ Wholesale/ retailer
- ○ Restaurant
- ○ Education
- ○ Finance
- ○ Mass media related
- ○ Market research, marketing, advertising agency
- ○ Travel agency, airline ticket agency
- ○ Service industry
- ○ Others _____

Thank you for your time.

Your information will save the country from plastic bag problems.

2. Thai version of questionnaire

การให้ข้อมูลและการใช้มาตรการเชิงเศรษฐศาสตร์เพื่อส่งเสริมการลดการใช้ถุงพลาสติก
ในกรุงเทพมหานคร ประเทศไทย

แบบสอบถามฉบับนี้มีวัตถุประสงค์จัดทำขึ้นเพื่อใช้รวบรวมข้อมูลสำหรับงานวิจัยเท่านั้น
ข้อมูลที่รวบรวมได้ทั้งหมดจะถูกวิเคราะห์ผลและเผยแพร่ลงในวารสารงานวิจัย
โดยที่ข้อมูลจำเพาะของบุคคลใดบุคคลหนึ่งจะไม่ถูกเปิดเผยสู่สาธารณะ

ประเภทของ “ถุงพลาสติก” ที่จะใช้กล่าวถึงในแบบสอบถามนี้คือ “**ถุงพลาสติกประเภทหูหิ้ว หรือถุงก๊อบแก๊บ**” เท่านั้น ตัวอย่างแสดงดัง **รูปที่ 1** ซึ่งในปัจจุบันถุงพลาสติกประเภทนี้จะถูกแจกฟรีตามซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อ (ไม่รวมถุงพลาสติกชนิดที่ใช้สำหรับบรรจุอาหารสดและผลไม้ตามซูเปอร์มาร์เก็ต)

รูปที่ 1 ถุงพลาสติกประเภทหูหิ้วหรือถุงพลาสติกก๊อบแก๊บ

***ส่วนที่** 1: Before intervention [สำหรับผู้ทำแบบสอบถามทุกคน]*

โปรดเลือกคำตอบของคุณ<u>เพียง 1 คำตอบ</u>ในแต่ละคำถาม โดยการทำเครื่องหมาย √

Q1. บริการประเภทใดในซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อ ที่ทำให้คุณเกิดความพึงพอใจมากที่สุดในการเข้าไปใช้บริการ?

○ พนักงานบริการดีและยิ้มแย้มแจ่มใส	○ แจกถุงพลาสติกหูหิ้วฟรี	○ ความสะอาดของร้านค้า
○ สามารถชำระสินค้าแบบไร้เงินสดได้	○ คะแนนสะสมหรือของรางวัล	○ อื่น ๆ, _____

Q2. คุณคิดว่าซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อ**มีความจำเป็นต้องมอบถุงพลาสติกหูหิ้วฟรีแก่ลูกค้า**ที่เข้ามาใช้บริการหรือไม่?

○ มีความจำเป็น ○ ไม่มีความจำเป็น

Q3. *[หากข้อ Q2. ตอบ ใช่]* เหตุใดคุณถึงคิดว่าซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อจะต้องมอบถุงพลาสติกหูหิ้วฟรีแก่ลูกค้าที่เข้ามาใช้บริการ?

○ เพราะการแจกถุงพลาสติกหูหิ้วฟรีเป็นบริการที่ลูกค้าควรได้รับจากร้านค้าและร้านสะดวกซื้อ

○ เพราะราคาต้นทุนของถุงพลาสติกหูหิ้วที่ถูกแจกฟรีนั้นรวมอยู่ในราคาสินค้าที่ลูกค้าได้ซื้อแล้ว

○ อื่น ๆ, _____

Q4. *[สำหรับผู้ทำแบบสอบถามทุกคน]* โดยปกติแล้วหากคุณเข้าไปใช้บริการซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อและ**ซื้อสินค้าที่มีน้ำหนักมาก ส่งผลให้ร้านค้าดังกล่าวเสนอที่จะมอบถุงพลาสติกหูหิ้วเพิ่มให้คุณอีกหนึ่งใบสำหรับใช้ซ้อนถุง** คุณเลือกที่จะรับถุงพลาสติกเพิ่มในการซ้อนถุงหรือไม่?

○ รับเพื่อซ้อนถุง ○ ปฏิเสธการซ้อนถุง

[สำหรับผู้ทำแบบสอบถามทุกคน]

คุณคิดเห็นอย่างไรกับประโยคดังต่อไปนี้?

Q5. “การลดการใช้ถุงพลาสติกสามารถช่วยรักษาทรัพยากรธรรมชาติและสิ่งแวดล้อมได้”

○ เห็นด้วยอย่างยิ่ง ○ เห็นด้วย ○ เห็นด้วยปานกลาง

○ ไม่เห็นด้วย ○ ไม่เห็นด้วยอย่างยิ่ง

Q6. “ถุงพลาสติกนั้นสามารถนำไปสู่ปัญหาสิ่งแวดล้อมที่ร้ายแรงได้”

○ เห็นด้วยอย่างยิ่ง ○ เห็นด้วย ○ เห็นด้วยปานกลาง

○ ไม่เห็นด้วย ○ ไม่เห็นด้วยอย่างยิ่ง

Q7. “เราต้องไม่ละเลยและให้ความสำคัญเกี่ยวกับมาตรการลดการใช้ถุงพลาสติก”

○ เห็นด้วยอย่างยิ่ง ○ เห็นด้วย ○ เห็นด้วยปานกลาง

○ ไม่เห็นด้วย ○ ไม่เห็นด้วยอย่างยิ่ง

Q8. “เราต้องลดการใช้ถุงพลาสติกให้เร็วที่สุดเท่าที่จะเป็นไปได้”

○ เห็นด้วยอย่างยิ่ง ○ เห็นด้วย ○ เห็นด้วยปานกลาง

○ ไม่เห็นด้วย ○ ไม่เห็นด้วยอย่างยิ่ง

Q9. ในชีวิตประจำวัน คุณขอรับหรือใช้ถุงพลาสติกหูหิ้วที่แจกฟรีตามซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อบ่อยมากน้อยเพียงใด?

○ ใช้เป็นประจำ ○ ใช้บ่อยครั้ง ○ ใช้บ้างเป็นบางครั้ง

○ แทบจะไม่เคยใช้ ○ ไม่เคยใช้เลย

Q10. *[โปรดตอบคำถามนี้ หากคำตอบจากข้อที่ Q9 คือ "**แทบจะไม่เคยใช้**" หรือ "**ไม่เคยใช้เลย**"]*

ข้อใดคือเหตุผลหลักที่ทำให้คุณเลือกที่จะหลีกเลี่ยงการใช้ถุงพลาสติก หรือไม่ใช้ถุงพลาสติกเลย?

○ เป็นนิสัย ○ เป็นมิตรต่อสิ่งแวดล้อม ○ เพื่อนรอบข้างแนะนำ ○ เพราะคนอื่นทำ

○ ทำแล้วดูดี ○ ความสะดวกสบาย ○ ทำแล้วได้คะแนนสะสมหรือของรางวัล ○ อื่น ๆ

Q11. *[โปรดตอบคำถามนี้ <u>ยกเว้น</u> ผู้ที่ตอบ "**ไม่เคยใช้เลย**" จากข้อที่ Q9]* คุณใช้ถุงพลาสติกหูหิ้วซ้ำ (Reuse) บ่อยมากน้อยเพียงใด?

○ ใช้ซ้ำเป็นประจำ ○ ใช้ซ้ำบ่อยครั้ง ○ ใช้ซ้ำบ้างเป็นบางครั้ง

○ แทบจะไม่เคยใช้ซ้ำ ○ ไม่เคยใช้ซ้ำเลย

[ผู้ตอบคำตอบ "ไม่เคยใช้เลย" ในข้อที่ Q9 จะถูกแบ่งเป็นกลุ่มที่ 0 และจะข้ามส่วนที่ 2-4]

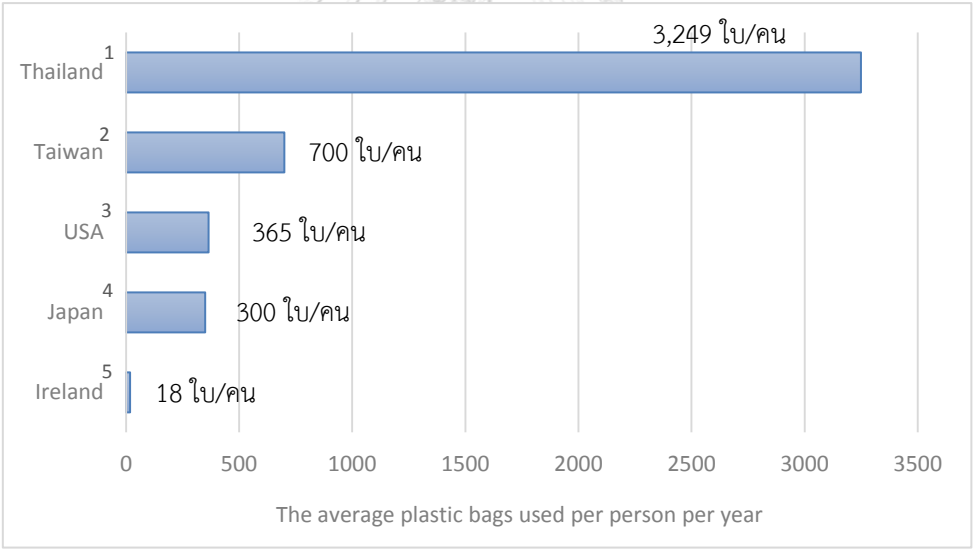
[ผู้ทำแบบสอบถามในกลุ่มที่ 5 จะข้ามส่วนที่ 2]

***ส่วนที่** 2: Intervention [สำหรับผู้ทำแบบสอบถามในกลุ่มที่ 1 และกลุ่มที่ 2 จะแสดงข้อมูลดังนี้]*

จงพิจารณาข้อมูลดังต่อไปนี้ก่อนตอบคำถามในส่วนถัดไป

Descriptive information

ในแต่ละประเทศทั่วโลกใช้ถุงพลาสติก
เฉลี่ยกันคนละกี่ใบภายใน 1 ปี



ที่มา

[1] Chantnusornsiri and Jitpleecheep (2018)

[2] The Asahi Shimbun (2018)

[3] Parker (2018)

[4] Gardner (2017)

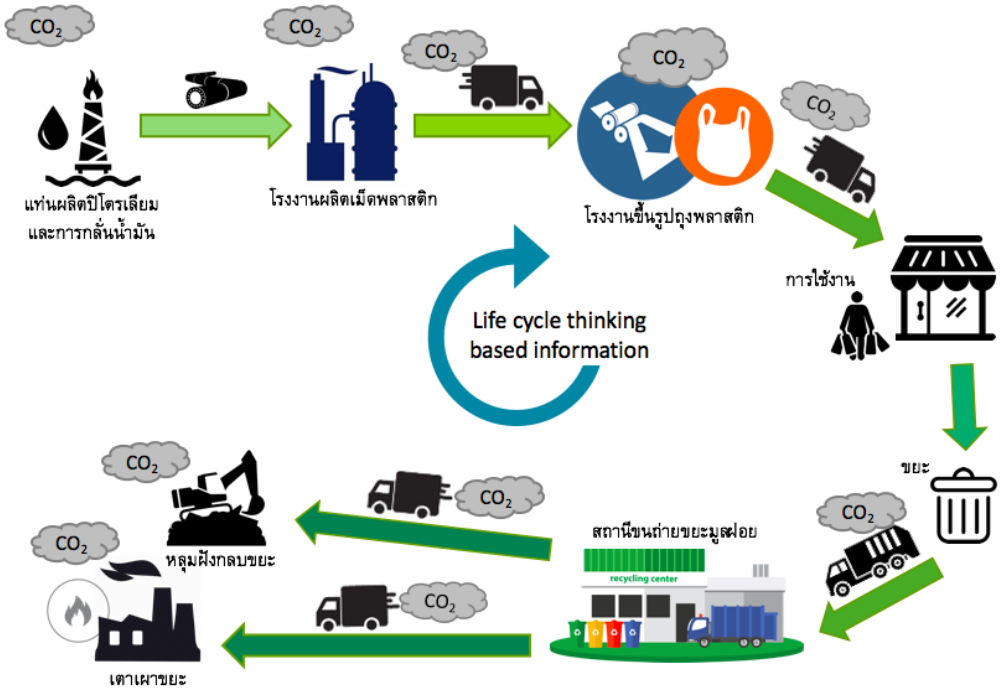
[5] United Nations Environment Programme (2018)

[สำหรับผู้ทำแบบสอบถามในกลุ่มที่ 3 และกลุ่มที่ 4 จะแสดงข้อมูลดังนี้]

Life cycle thinking (LCT)-based information

ตลอดวัฏจักรของถุงพลาสติกหูหิ้วนั้น**มีการปลดปล่อยก๊าซคาร์บอนไดออกไซด์ (CO_2)**
ออกสู่ชั้นบรรยากาศมากมาย ซึ่งก๊าซดังกล่าวเป็น**ก๊าซเรือนกระจกที่ส่งผลให้เกิดภาวะโลกร้อน**

โดยก๊าซคาร์บอนไดออกไซด์ (CO_2) จะถูกปลดปล่อยออกมาตลอดกระบวนการผลิตที่ใช้พลังงาน,
การขนส่งระหว่างจุดหมาย รวมไปถึงกระบวนการกำจัดขยะจากถุงพลาสติก แสดงดังแผนภาพดังนี้



ที่มา: Kikuchi-Uehara E, Nakatani J. and Hirao M (2016)

[ผู้ทำแบบสอบถามในกลุ่มที่ 1 และกลุ่มที่ 3 จะข้ามส่วนที่ 3]

Part 3: Economic part *[สำหรับผู้ทำแบบสอบถามในกลุ่มที่ 2, 4 และกลุ่มที่ 5*

โปรดอ่านข้อความต่อไปนี้โดยละเอียดก่อนทำแบบสอบถามในส่วนถัดไป

<u>เหตุการณ์สมมติ</u>

ในประเทศไทย การจ่ายเงินค่าจัดการขยะมูลฝอยไม่ใช่หน้าที่และความรับผิดชอบของประชาชนเมื่อพวกเขาทิ้งขยะมูลฝอยแม้ว่าขยะเหล่านั้นจะถูกทิ้งเป็นจำนวนมากหรือน้อยเพียงใดก็ตาม แต่**การจัดการขยะมูลฝอยที่ถูกต้องตามหลักวิชาการและมีประสิทธิภาพนั้นต้องอาศัยเงินทุนที่มากพอเพื่อรักษาคุณภาพสิ่งแวดล้อมที่ดีและยั่งยืนในสังคม**

ขยะประเภทถุงพลาสติกเป็นขยะมูลฝอยอีกประเภทหนึ่งที่ยังคงมีจำนวนเพิ่มขึ้นอย่างต่อเนื่องและยังก่อให้เกิดปัญหาเรื้อรังต่อสิ่งแวดล้อม ในปัจจุบันถุงพลาสติกมักถูกแจกฟรีให้กับลูกค้าที่เข้ามาใช้บริการซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อ และหลังจากผ่านการใช้งานในระยะเวลาอันสั้นถุงพลาสติกส่วนใหญ่จะกลายเป็นขยะทันที **แต่มีขยะประเภทนี้เพียงบางส่วนเท่านั้นที่จะผ่านระบบการจัดการขยะมูลฝอยที่ถูกต้องตามหลักวิชาการและมีประสิทธิภาพ** ซึ่งจะถูกส่งไปกำจัดด้วยวิธีฝังกลบหรือถูกนำไปเข้าสู่กระบวนการรีไซเคิลต่อไป

รัฐบาลไทยจึงกำหนดให้มีการประยุกต์ใช้หลักการผู้ก่อมลพิษเป็นผู้จ่าย (Polluter Pay Principle) สำหรับ**การจัดเก็บภาษีการใช้ถุงพลาสติก โดยมีวัตถุประสงค์เพื่อนำรายได้ภาษีดังกล่าวไปสนับสนุนการเพิ่มประสิทธิภาพในการจัดการขยะประเภทถุงพลาสติกเพื่อส่งเสริมคุณภาพสิ่งแวดล้อม**

ส่งผลให้ซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อ **หยุดให้บริการแจกถุงพลาสติกฟรี** แก่ลูกค้าที่เข้ามาใช้บริการ อย่างไรก็ตาม<u>หากลูกค้ายังคงต้องการใช้ถุงพลาสติกเช่นเดิม จะต้องจ่ายภาษีการใช้ถุงพลาสติกต่อถุงพลาสติก 1 ใบ</u> โดยถุงพลาสติกที่ลูกค้าจะได้รับนั้นจะเป็นถุงพลาสติกขนาด 30 ซ.ม. x 50 ซ.ม. **(แสดงตัวอย่างดังรูปที่ 2) เพียงขนาดเดียวเท่านั้น และมีความหนาที่เหมาะสมเพื่อให้สามารถใช้งานซ้ำได้หลายครั้ง**

รูปที่ 2 ขนาดของถุงพลาสติกสำหรับการจัดเก็บภาษีการใช้ถุงพลาสติก

Q12. จากเหตุการณ์สมมติข้างต้น <u>คุณยินดีที่จะจ่ายภาษีการใช้ถุงพลาสติกเมื่อเข้าไปใช้บริการซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อหรือไม่</u> และคุณยินดีที่จะจ่าย<u>สูงสุดเป็นจำนวนเงินเท่าไหร่ต่อถุงพลาสติกหูหิ้ว 1 ใบ</u>?

- ○ ยินดีที่จะจ่าย **(โปรดเลือกจำนวนเงินที่คุณยินดีที่จะจ่ายภาษีการใช้ถุงพลาสติกสูงสุดต่อถุงพลาสติก 1 ใบ) <u>(เลือกเพียง 1 คำตอบ)</u>**

จำนวนเงิน: บาท / ถุง 1 ใบ

0.5	1	1.5	2	2.5
3	3.5	4	4.5	5
5.5	6	6.5	7	7.5
8	8.5	9	9.5	10

หรือ อื่นๆ, _____ บาท/ถุง 1 ใบ

○ ไม่ยินดีที่จะจ่าย (0 บาท)

Q13. หากรัฐบาลต้องการผลักดัน**มาตรการเก็บภาษีการใช้ถุงพลาสติกตามซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อ**เพื่อส่งเสริมให้เกิดการจัดการขยะประเภทถุงพลาสติกที่ถูกต้องตามหลักวิชาการและมีประสิทธิภาพ **ท่านจะสนับสนุนมาตรการดังกล่าวหรือไม่**?

○ สนับสนุน ○ ไม่สนับสนุน

***ส่วนที่** 4: After intervention [สำหรับผู้ทำแบบสอบถามในกลุ่มที่ 1 ถึง กลุ่มที่ 5]*

โปรดเลือกคำตอบของคุณ<u>เพียง 1 คำตอบ</u>ในแต่ละคำถาม โดยการทำเครื่องหมาย √ *(คำถามจะมีลักษณะคล้ายกันกับส่วนก่อนหน้านี้)*

Q14. คุณยังคงคิดว่าซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อ **มีความจำเป็นต้องมอบถุงพลาสติกหูหิ้วฟรี**แก่ลูกค้าที่เข้ามาใช้บริการหรือไม่?

○ มีความจำเป็น ○ ไม่มีความจำเป็น

Q15. *[หากข้อ 2. ตอบ ใช่]* เหตุใดคุณถึงคิดว่าซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อ ยังคงจำเป็นต้องมอบถุงพลาสติกหูหิ้วฟรีแก่ลูกค้าที่เข้ามาใช้บริการ?

○ เพราะการแจกถุงพลาสติกหูหิ้วฟรีเป็นบริการที่ลูกค้าควรได้รับจากร้านค้าและร้านสะดวกซื้อ

○ เพราะราคาต้นทุนของถุงพลาสติกหูหิ้วที่ถูกแจกฟรีนั้นรวมอยู่ในราคาสินค้าที่ลูกค้าได้ซื้อแล้ว

○ อื่น ๆ, _____

Q16. ในอนาคต หากซูเปอร์มาร์เก็ต ร้านค้า หรือร้านสะดวกซื้อที่คุณใช้บริการเสนอที่จะมอบถุงพลาสติกหูหิ้วเพิ่มให้คุณอีกหนึ่งใบสำหรับใช้ซ้อนถุงเมื่อซื้อสินค้าที่มีน้ำหนักมาก **คุณจะยังคงเลือกรับถุงพลาสติกเพิ่มในการซ้อนถุงหรือไม่**?

○ จะยังคงรับเพื่อซ้อนถุง ○ ปฏิเสธการซ้อนถุง

[สำหรับผู้ทำแบบสอบถามในกลุ่มที่ 1 ถึง กลุ่มที่ 4]

คุณคิดเห็นอย่างไรกับประโยคดังต่อไปนี้?

Q17. "การลดการใช้ถุงพลาสติกนั้นสามารถรักษาทรัพยากรธรรมชาติและสิ่งแวดล้อม"

○ เห็นด้วยอย่างยิ่ง ○ เห็นด้วย ○ เห็นด้วยปานกลาง

○ ไม่เห็นด้วย ○ ไม่เห็นด้วยอย่างยิ่ง

Q18. "ถุงพลาสติกนั้นสามารถนำไปสู่ปัญหาสิ่งแวดล้อมอย่างร้ายแรงได้"

○ เห็นด้วยอย่างยิ่ง ○ เห็นด้วย ○ เห็นด้วยปานกลาง

○ ไม่เห็นด้วย ○ ไม่เห็นด้วยอย่างยิ่ง

Q19. "เราต้องไม่ละเลยและให้ความสำคัญเกี่ยวกับมาตรการลดการใช้ถุงพลาสติก"

○ เห็นด้วยอย่างยิ่ง ○ เห็นด้วย ○ เห็นด้วยปานกลาง

○ ไม่เห็นด้วย ○ ไม่เห็นด้วยอย่างยิ่ง

Q20. "เราต้องลดการใช้ถุงพลาสติกเร็วที่สุดเท่าที่จะเป็นไปได้"

○ เห็นด้วยอย่างยิ่ง ○ เห็นด้วย ○ เห็นด้วยปานกลาง

○ ไม่เห็นด้วย ○ ไม่เห็นด้วยอย่างยิ่ง

[สำหรับผู้ทำแบบสอบถามในกลุ่มที่ 1 ถึง กลุ่มที่ 5]

Q21. ในอนาคตคุณจะขอรับหรือใช้ถุงพลาสติกหูหิ้วที่แจกฟรีตามซูเปอร์มาร์เก็ต ร้านค้าและร้านสะดวกซื้อบ่อยมากน้อยเพียงใด?

○ จะใช้เป็นประจำเช่นเดิม ○ อาจใช้บ่อยครั้ง ○ ใช้บ้างเป็นบางครั้ง

○ อาจจะไม่ใช้ ○ จะไม่ใช้อีกเลย

Q22. ในอนาคตคุณจะใช้ถุงพลาสติกหูหิ้วซ้ำ (Reuse) บ่อยมากน้อยเพียงใด?

○ จะใช้ซ้ำเป็นประจำ ○ อาจใช้ซ้ำบ่อยครั้ง ○ ใช้ซ้ำบ้างเป็นบางครั้ง

○ อาจจะไม่ใช้ซ้ำ ○ จะไม่ใช้ซ้ำอีกเลย

***ส่วนที่** 5: Socio demographic [สำหรับผู้ทำแบบสอบถามทุกคน]*

กรุณาเลือกคำตอบของคุณจากคำถามดังต่อไปนี้

หมายเหตุ: ข้อมูลจำเพาะของบุคคลใดบุคคลหนึ่งจะไม่ถูกเปิดเผยสู่สาธารณะ

Q23. โปรดเลือกเพศของคุณ

○ หญิง ○ ชาย

Q24. โปรดเลือกอายุของคุณ

○ น้อยกว่า 20 ○ 20-30 ○ 31-40

○ 41-50 ○ มากกว่า 50

Q25. โปรดเลือกลักษณะที่อยู่อาศัยปัจจุบันของคุณ

○ บ้านเดี่ยว ○ หมู่บ้าน ○ คอนโดมิเนียม

○ อพาร์ตเมนต์ ○ แฟลต ○ อื่น ๆ,____

Q26. โปรดเลือกระดับการศึกษาสูงสุดของคุณ

○ ประถมศึกษา ○ มัธยมศึกษา ○ อาชีวะศึกษา ○ ปริญญาตรี

○ ปริญญาโท ○ สูงกว่าปริญญาโท ○ อื่น ๆ,_____

Q27. โปรดเลือกรายได้ในแต่ละเดือนของคุณ

○ น้อยกว่า 15,000 บาท/เดือน ○ 15,000-25,000 บาท/เดือน ○ 25,001-35,000 บาท/เดือน

○ 35,001-45,000 บาท/เดือน ○ มากกว่า 45,000 บาท/เดือน

Q28. ความถี่ที่คุณใช้บริการร้านค้าประเภทเหล่านี้ เป็นอย่างไร โปรดเลือกคำตอบโดยการทำเครื่องหมาย √

	ซูเปอร์เซ็นเตอร์	ร้านสินค้าลดราคา	ซูเปอร์มาร์เก็ต	ร้านขายยา	ห้างสรรพสินค้า	ร้านสะดวกซื้อ	ตลาดสด	ร้านขายของชำ	ร้านค้าปลีกในรูปขายส่ง
มากกว่าหนึ่งครั้งต่อสัปดาห์									
มากกว่าสองครั้งต่อสัปดาห์									
น้อยกว่าสองครั้งต่อเดือน									

Q29. กรุณาเลือกทุกกลุ่มของอุตสาหกรรมหรืออาชีพที่สอดคล้องกับการทำงานของสมาชิกในครอบครัวรวมถึงอาชีพพาร์ทไทม์หรือรับจ้างอิสระ เลือกได้มากกว่า)1 คำตอบที่เกี่ยวข้อง(

- ○ การผลิต
- ○ การขายส่ง หรือการขายปลีก
- ○ ร้านอาหาร
- ○ การศึกษา
- ○ การเงิน
- ○ งานสื่อสารมวลชนและที่เกี่ยวข้อง
- ○ การวิจัยการตลาด, การตลาด การโฆษณาประชาสัมพันธ์
- ○ บริษัทตัวแทนการเดินทางและท่องเที่ยว บริษัทตั๋วเครื่องบิน
- ○ อุตสาหกรรมบริการ
- ○ อื่น ๆ _____

.....ขอบคุณครับ.....

ข้อมูลของท่านจะเป็นประโยชน์ต่อประเทศในการแก้ไขปัญหาขยะถุงพลาสติกในอนาคต

APPENDIX II

INTERVIEW SURVEY PICTURES

Interview with Department of Environment Quality Promotion

Interview with CP ALL Public Company Limited (7-Eleven)

Field questionnaire survey




Interview customers and vendors in market at Ari

Interview customers and vendors at Marketing Organization for Farmers




Interview customers and vendors at Chatuchak market

Interview customers and vendors at Greenery market

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