

TAIWAN'S PLASTIC DILEMMA:
ASSESSING THE ENVIRONMENTAL EFFICACY OF RECYCLING PROGRAMS AND
SINGLE-USE PLASTIC BANS ON CONSUMER HABITS

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Abstract

While concerns over environmental degradation rise and governments are seeking new ways to minimize pollution, single-use plastics continue to dominate consumer and industry spaces globally. There are high levels of pollution through all stages of the plastic process, from its initial production using fossil fuels to its end-of-life cycle in landfills or as microplastics in the ocean or soil. Thus, the increased consumption of single-use plastics has had a devastating impact on wildlife and humans alike. In Taiwan, the recycling industry is a robust and normalized part of everyday life. However, recycling has become such a prolific solution to waste that consumers fail to identify the destructive nature of their purchasing habits. The first question of this thesis centers around the extent to which recycling infrastructure in Taiwan contributes to consumers' complacency with using single-use plastics. The second question of this thesis asks how Taiwan's 2030 plastics ban lacks concrete support to effectively decreasing single-use plastic product consumption. Although Taiwanese people have overwhelmingly positive perceptions of environmental protection and steadfastly recycle, they consume high amounts of single-use plastics as part of a cycle of unsustainable consumption habits, undermining efforts to reduce plastic consumption. Therefore, I argue that Taiwan's recycling industry cannot withstand continued overconsumption and single-use plastics, and effective government policies are key to limiting plastic waste. This thesis stands apart from existing literature because it emphasizes the relationship between Taiwanese consumers and the recycling industry, thus emphasizing the role overconsumption plays in waste generation. As Taiwan seeks to enact a ban on four types of single-use plastics by 2030, it is important to determine the efficacy of the policy and its possible impact on Taiwanese society.

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Chapter 1: Introduction

A thin stretch of beach comes into view on a misty morning, the waves rhythmically moving in and out on the sandy shore. Interspersed with the yellow sands are splotches of bright, unnatural colors. White, blue, red, pink, and all manner of colors are spread across the surface of the natural landscape. Each speck of color is a different piece of trash. Plastics of every size and purpose litter the beach: the remains of a nylon fishing net, a plastic toothbrush, children's toys, and plastic cutlery. Although some items may have been left by beachgoers, most are deposited by heavy rainfall and winds from different areas on the island, as well as some trash being washed ashore by the waves. There are no beaches untouched by some form of litter, and the biggest culprits are single-use plastics (Re-Think, 2023).

A frequent sight on beaches across Taiwan is the disposable lunch box. It is the friend of a college student eating before classes or an office worker taking a quick lunch break. The paper cardstock construction is reinforced with thin layers of polypropylene plastic that protects consumers' hands from an oily mess but simultaneously damages the environment due to difficulties with recycling it.

The classic takeout plastic soup spoon can't be forgotten either. It is made from a relatively flimsy plastic, but still gets the job done. Almost every restaurant in Taiwan has some version of the plastic spoon, in addition to convenience stores and night markets. While it is capable of being recycled, this type of single-use item is so frequently used that it is difficult to find and recycle all of the spoons that are thrown out regularly.

Along with more random pieces of plastic waste found on the beaches, these items are common examples of the single-use disposable products trend. As consumer culture has

prioritized convenience and efficiency, products that allow for fast consumption and easy disposal have grown in popularity. However, the quality of these products is still expected to be rather high, so many products contain some type of plastic. What comes with more durable, synthetic products are increasingly difficult-to-recycle polymers (NPR, 2019). And while they break down, these products will inundate themselves in the sands and waters of Taiwan and other beaches across the world. The microplastics that chip and crack off from this waste will get into the digestive systems of marine life, in fish and birds that people may eventually eat (Chatterjee & Sharma, 2019).

For an island nation like Taiwan, marine pollution poses a serious threat to the careers of thousands in the fishing and tourism industries. Taiwan has limited space available for landfills, and has historically incinerated most of its trash, thus contributing to air pollution. With these factors in mind, it is detrimental for Taiwan to produce high amounts of waste, especially non recyclable waste. Taiwanese consumerism has been on the rise as society embraces the goods of international corporations and strongly holds onto convenience in commercial spaces. As early as the 1980s, Taiwan established itself as an economic power within Asia, commonly referred to as one of the four “Little Tigers of Asia” (McGregor, 1999). This shift in economic standing has propelled Taiwanese society towards higher rates of consumption that contradict historically positive attitudes towards environmental sustainability (Olivier & Fulco, 2021). While some initiatives by the Taiwanese government have intended to reduce the amount of single-use plastic used by consumers, there has been very limited success over the years. As Taiwan hopes to enact a ban on 4 types of single-use plastics by 2030, it is important to determine the weak points of these government policies and devise solutions for more effective legislation (Tamponi, 2023).

Researchers typically assess Taiwan as having a robust recycling program due to its higher recycling rates and government policies, but recent scholars acknowledge how current consumer habits contradict recycling efforts (Greenpeace, 2020; Kuo, 2010). Policies focused on limiting plastic production and proper recycling infrastructure have been assessed internationally for their shortcomings and successes, with general agreement that ineffective policies are hindering sustainable development (Kaza et al., 2018; OECD, 2022a). Lee emphasizes the importance of global trends in plastic recycling as a guideline for domestic policies in Taiwan (Lee, 2019). Plastic usage and recycling policies in Taiwan continue to evolve over the years, implementing a variety of industry and consumer-focused policies influenced by established cultural attitudes and global shifts in environmental awareness. This work aims to examine how current recycling policies fail to effectively prevent or minimize the use of single-use plastics in Taiwan (Herberz et al., 2020). Tsai also assesses policy effectiveness during the Covid-19 pandemic and finds that existing plastic reduction policies are not only failing to decrease plastic usage, but actually facilitating its rise through inconsistent enforcement (Tsai, 2022). However, it is also important to question the importance of recycling within the cycle of consumption.

When the famous phrase “reduce, reuse, recycle” is used to promote more sustainable practices, recycling is always last. This phrase is intentionally dividing the three terms based on their level of importance, with reduction being most critical. If recycling is expanded but there isn’t a reduction in consumption, then inevitably recycling will not be able to compete (Sun & Trudel, 2017). However, when using terms like “sustainability,” “eco-friendly,” and “mitigation efforts,” recycling is often at the forefront of conversations. This shift in priorities may be explained through the vague language used by governments and programs in their environmental policies. What does sustainability mean, and by what measurement does it help the environment?

Why is recycling touted as a critical sustainable activity, when it has a variety of flaws related to energy consumption, scale, and efficiency? Language can obscure the nuance necessary for finding effective solutions to plastic pollution.

Researchers have analyzed the various recycling methodologies in Taiwan that aim to minimize pollution and waste production, encompassing individual, industrial, and governmental levels. However, there is a gap in the literature on how Taiwan's recycling system has contributed to the increase of single-use plastics by developing a culture that values recycling instead of reduction. In addition, there is limited research taking a critical approach as to how Taiwanese citizens contribute to a cycle of unsustainable waste production through their consumer habits, even while recycling regularly. Scholarly research generally agrees that Taiwan has developed an efficient recycling system that is respected by citizens and industry alike; however, I intend to argue that this recycling system undermines plastic reduction by sending a message to Taiwanese consumers that consumption does not need to slow down. It is critical to understand why support for environmental protection coexists with unsustainable consumerist behavior when developing environmental policies.

This is a policy analysis paper that utilizes a variety of pre-existing primary and secondary literature, such as publicly available statistics, surveys, and government policies. A policy analysis is relevant to answering the questions in this paper because it breaks down the necessary elements of an effective single-use plastics policy while providing context for the unique position of Taiwan's plastic policies. Several of the sources used in this paper are originally in Traditional Chinese as they come from government organizations or Taiwanese news sources. Research papers related to sustainability, single-use plastics, Taiwanese history, and recycling are used to provide insight into the context of Taiwanese environmental policy and

better understand consumers' sociological behavior. Statistical data from Taiwan's Ministry of Environment has been translated into English, analyzed, and represented as graphs. Survey data from non-governmental organizations are also provided, such as detailed information from Greenpeace Taiwan. News articles from both Taiwanese and international newspapers have also been used to corroborate governmental policy timelines and public opinion.

This thesis is divided into three empirical chapters that each focus on different aspects of Taiwan's single-use plastics dilemma. Chapter 2 focuses on Taiwan's history of recycling, recent recycling rates, and recycling misconceptions. Chapter 3 delves into the psychology behind consumer choices in an environmentally-friendly context, determining what factors affect sustainable behavior. Finally, Chapter 4 describes the 2030 Taiwanese four-types single-use plastics ban and the ways in which legislation can both reduce and exacerbate environmental issues.

Chapter 2: The Carefully Crafted Narrative of Recycling

2.1 Introduction

The waste produced from food, daily activities, and special events, all form a cohesive story about human life. For archeologists, a large number of discoveries have been made from ancient waste sites (Murray, 2016). When societies remain in one location for many years, there will inevitably be a lot of waste that must be dealt with. Therefore, waste generation is an inescapable part of society that should not be overlooked or villainized. Everyday life is full of countless items that must be discarded for safety or health concerns, but there are also many items thrown away out of convenience. In the modern age, the composition of waste has shifted from organic to synthetic materials, further complicating the process of waste disposal.

Similarly, all of human history is filled with evidence of recycling and reusing items as a cornerstone of life. One of the earliest examples of recycling is in Japan during the Heian period, when paper documents were recycled into new sheets that could be resold to stationary businesses (Hunter, 1978). Although this is the earliest documented example of systematic recycling, recycling as a personal practice has certainly existed since the beginning of humanity. The basic definition of recycling is to take an item or material and process it for reuse (Merriam-Webster, n.d.). Therefore, communities have been recycling in both official and unofficial capacities for thousands of years as a way to preserve resources. Even as industrialization revolutionized the manufacturing process, many people continued to repurpose their older items.

However, with the proliferation of plastic in the early 1900s, companies slowly began switching from traditionally recycled materials, like glass bottles, to plastic versions that could be thrown away. It is important to address why plastic has been the preferred choice of

manufacturers since the 1950s. The durability of plastic during shipping, lower energy costs during production, and convenience for consumers all contribute to a very efficient product (Andrady & Neal, 2009). On the other hand, glass containers are prone to breaking, require a high amount of energy and water to recycle or refill, and are quite heavy (Andrady & Neal, 2009). The recycling culture of the previous generations seems to have gone out of fashion with the proliferation of plastic, likely due to its cheaper price, durability, and light weight qualities. With the rise of globalization, manufacturers were increasingly interested in the efficiency of plastic packaging. When environmentalism became mainstream in the 1960s and 1970s, recycling was rebranded under the lens of an environmentally conscious practice. Therefore, recycling transitioned from an everyday part of life to a political message (Kat Eschner, 2017; Kidwell et al., 2013).

In conversations surrounding effective waste management and “green” efforts to decrease consumption, recycling is often attributed as the key to ending sanitary landfills, incineration, and plastic litter. For decades, there have been global efforts to increase recycling rates for a variety of materials and ensure recycling options are more widely available. Shortcomings related to waste reduction often emphasize a lack of proper recycling, as opposed to highlighting other systemic issues. However, consumers should question why recycling is treated like a simple solution for waste generation, only lacking sufficient public support. Although recycling rates are still at a relatively low level when compared to global consumption, the amount of recycled waste has greatly increased over time. And yet the recycling industry is unable to effectively mitigate waste reaching the environment. Why do governments, industries, and consumers have a misguided understanding of recycling’s place in sustainable development? The promotion of recycling in Taiwan has proved counterproductive to its initial goal of reducing waste by duping

consumers into believing discarded plastic is handled by the recycling industry. In actuality, the rise in plastic waste in Taiwan has placed a strain on recycling and made consumers blind to their negative environmental impacts.

The purpose of this chapter is to address global and Taiwanese trends in waste production and briefly introduce the origins of recycling. Waste generation will be compared with plastic recycling rates to provide a clear picture of what happens to plastic in Taiwan. Finally, this chapter will analyze the relationship consumers, industries, and governments have with recycling to explain the disconnect between consumption patterns and recycling attitudes. The overarching argument of this chapter is that the Taiwanese recycling industry is not currently capable of handling large influxes of plastic waste, and the process of recycling has been obfuscated over time to the point where consumers are unaware of the difficulties associated with recycling a plastic product. This chapter contributes to the larger argument that recycling is used to validate consumerist culture by acting as a vague ‘solution’ to a constant stream of plastic waste.

2.2 Rise in Global Waste

To better understand Taiwan's relationship with waste production, it is critical to first address the international waste crisis. The Global Plastics Outlook has found that plastic consumption is at an all-time high, with an estimated 353 million tonnes of plastic waste worldwide in 2019 (OECD, 2022a). The average school bus weighs between 12 and 15 tonnes, so the amount of plastic waste generated in 2019 equates to approximately 2.35 million school buses. Based on the average of OECD nations, only 9% of plastic is recycled, leaving the remaining 91% to be incinerated, buried in landfills, or mismanaged (OECD, 2022a). As nations continue to develop their industrial sectors and the average income level increases, waste

generation will inevitably rise (Kaza et al., 2018). The World Bank projects that lower-income nations will produce three times as much waste by 2050; thus, waste generation will become exceedingly high when combined with the unsustainable consumption patterns of high-income nations (Kaza et al., 2018). The urbanization of lower-income nations causes a boom in industry that can account for some of this increased waste because citizens gain purchasing power and industries produce more waste when expanding their product output.

2.3 Taiwanese Waste Production

Historically, Taiwan has had a relatively unique experience with industrialization when compared to nations in the West. Taiwan has been under the control of various entities throughout its long history, but industrialization only began during the 1950s. When the Nationalist Party fled after the Chinese Civil War in 1949, they gained control of Taiwan and created an industrial hub (Sedaghat, 2018; Formosa Plastics Group, 2021). Prior to Nationalist control, Taiwan's primary industry was agriculture, and Taiwan could accurately be described as a lower-middle-income country, only having a Gross National Income (GNI) of USD 1,460 in 1950 (Bolt and van Zanden, 2020). However, Taiwan quickly invested in the petrochemical industry with help from the United States, and by 1987 Taiwan was considered a high-income country with a GNI of USD 13,705 (Bolt and van Zanden, 2020). With that, one of the largest plastic conglomerates in the world was born: Formosa Plastics Group (台灣塑膠公司)(Sedaghat, 2018). Over about 50 years, Taiwan went from a largely agrarian society to a world leader in plastic production, to the point that the Taiwanese coined the phrase “petrochemical kingdom” (石化王國) (So, 2014). Today, the Formosa Plastics Corporation produces a variety of

intermediate raw materials that will eventually become plastic products, earning an annual revenue of USD 251,647,250 in 2022 (Hoover's Company Records, 2023). The development of the industrial sector allowed for a greater variety of industries to pop up in Taiwan, higher disposable incomes, and the development of a middle class. This rapid economic shift resulted in Taiwan becoming one of the few high-income countries in Asia.

When it was a lower-middle-income country, Taiwan faced a variety of dilemmas with waste production. Waste management requires resources and space, two things that Taiwan was severely lacking. Without much financial security, the government couldn't develop a structured waste management system, much less streamline it for efficiency and environmental safety (Liao et al., 2001). With an area of 36,200 km², Taiwan does not have much land that can safely accommodate a landfill (CIA, 2023). During the early years of Taiwan's industrial growth, there were a variety of issues with industrial waste being dumped in areas near residential housing, resulting in serious health issues for locals (Liao et al., 2001). Government-designated landfills did not exist in Taiwan until 1980, and incineration followed in the early 1990s (Tsai, 2018). As a lower-income nation, Taiwan did not have the necessary infrastructure in place to accommodate a newly developed industrial sector.

Now, as a high-income nation, Taiwan faces a new string of challenges in its waste management system. Consumerism is more prevalent due to disposable incomes, so it is necessary to have a more robust waste and recycling program. In addition, higher-income countries typically have older populations that continue to contribute to waste generation over long lifespans. Overall, Taiwan has handled this dilemma well, having a well-developed and effective waste management system that reduces the waste ending up in landfills and incinerators (Ministry of Environment, 2022; Maynard 2019). The type of waste being produced also

transforms with economic development, as service industries centered on a convenient and efficient experience rise in popularity. Benoit, Klose, and Ettinger (2017) developed a framework for convenience in services and demographic characteristics, and they found that there is a positive correlation between higher income, age and expectations for a convenient service experience.

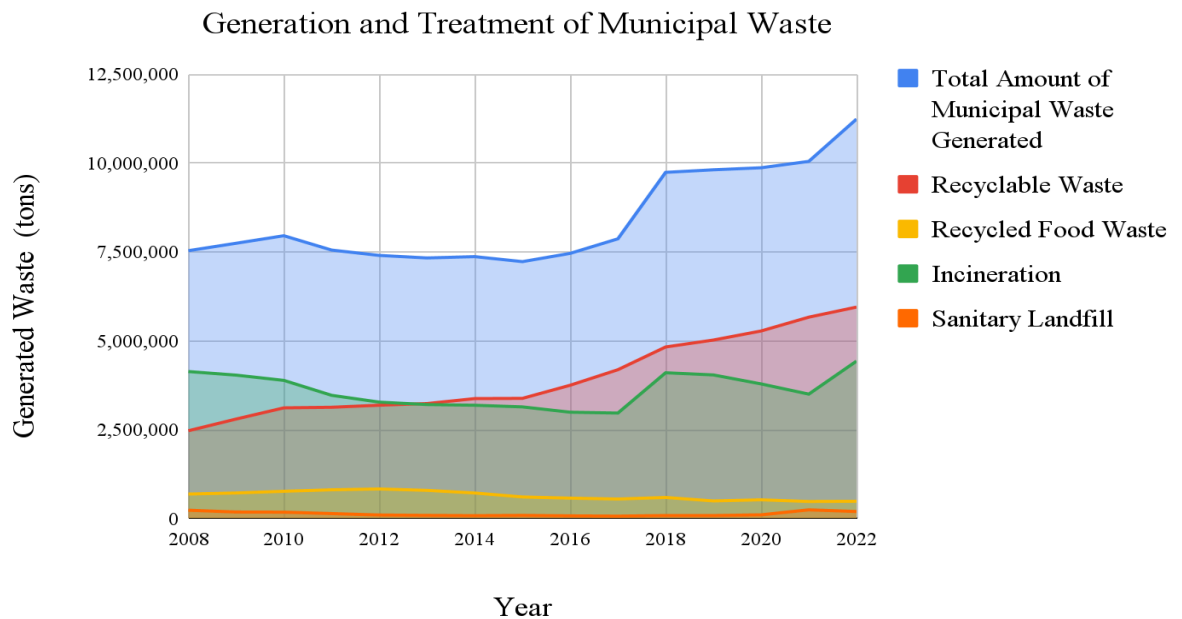
Taiwan can feel like a land of convenience due to the high number of convenience stores and roadside stands selling food and items. 7-Eleven is a key example of the high value placed on convenience, as it has over 6,600 7-Eleven locations existing as of 2023 (Chang & Chen, 2012; Overseas Community Affairs Council, R.O.C., 2023). Based on sustainability reports conducted by 7-Eleven, customers across Taiwan consumed 9,748.37 metric tonnes of single-use plastics in 2022 (President Chain Store Corporation, 2022). Therefore, Taiwan is dealing with issues of high consumption that may be related to the increased disposable income of its citizens.

2.4 Taiwanese Recycling Rates

Taiwan's Ministry of Environment, formerly the Environmental Protection Agency, has kept diligent records of recycling rates and waste management for several years. This information has been translated from Traditional Chinese into English, and the analysis provided below was developed based on analyzing the trends of all three chosen data sets. I have represented some of this information into graphs as a way to better visualize the overall trends in waste and plastic recycling in Taiwan. Figure 1 shows the total amount of municipal waste generated in Taiwan from 2008 to 2022 (Ministry of Environment, 2023a). It also displays the amount of waste recycled, incinerated, or discarded in sanitary landfills. There was also a section called "other" which may account for litter, but this data was not consistent over the 14-year scope of the data

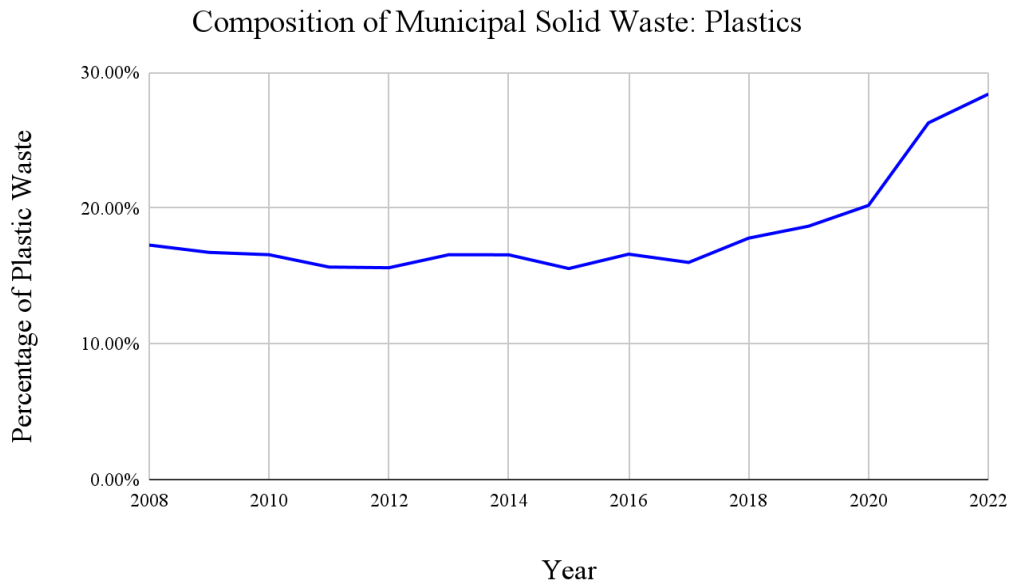
collection, so I chose to remove it from the graph. An important factor to consider when discussing waste output is population growth, as an increasing population accounts for higher levels of municipal waste. However, Taiwan currently has one of the lowest birth rates in the world, which has steadily declined since 2015 (National Development Council, 2023). Therefore, fluctuations in population size are unlikely to account for increases in waste in this situation. Since 2008, Taiwan has had a steady incline in its gross domestic product (GDP), going from 415.9 billion USD to 760.46 billion USD in 2022 (O'Neill, 2023). However, waste generation only saw a large increase starting in 2018. This indicates that GDP is not the only factor impacting waste generation in Taiwan.

Figure 1:



Across the span of a few months in 2018, the total amount of municipal waste significantly rose. During this time of rapid growth, recycling did continue to increase, but not at a rate comparable to the higher waste generation. From 2017 to 2018, the total amount of municipal waste increased by nearly 200,000,000 metric tons, while recyclable waste only increased by 600,000 metric tons. Instead, incineration rates increased by approximately 1,200,000 metric tons, despite lower incineration rates in previous years. This data is worrying considering the large increase in total municipal waste is not supplemented by increasing recycling, but instead an increase in incineration rates.

Figure 2:



Furthermore, the Ministry of Environment collected the composition of municipal solid waste in Taiwan and tracked how specific materials increased or decreased in prevalence over time. According to the data presented in Figure 2, plastic comprised approximately 20% of municipal solid waste in 2020, beginning a trend of increased plastic waste consumption (Ministry of Environment, 2023b). Between 2008 and 2017, the amount of plastic waste

generated in Taiwan appeared relatively stable, but an increase in 2018 and a spike in 2020 illustrates a shift in consumption patterns. Over two years, the plastic composition of municipal solid waste increased from 20% to nearly 30%. The rise in plastic waste is also evident in Figure 1, due to the total increase in generated waste between 2020 and 2022. Although it is unlikely that plastic completely accounts for this surge in municipal waste, it does indicate that plastic is an increasingly prevalent material. Knowing that the new influx of waste starting in 2018 resulted in incineration, much of this plastic waste may have been incinerated instead of recycled.

Figure 3:



Finally, Figure 3 displays the amount of recycled plastic containers in a regulated recycling system between 2008 and 2022 (Ministry of Environment, 2023c). This data illustrates a slight increase in the recycling of plastic containers over 14 years, along with several years of decreased recycling. This data did not specify what constitutes a plastic container, and the

provided Chinese, *sujiao rongqi*, is also relatively vague. Most likely, this data refers to plastic food or storage containers, not plastic cups or bottles. With that in mind, this recycling data does not indicate the recycling level for all plastic waste in Taiwan. However, this data can be compared with Figure 2 to illustrate how recycling rates have failed to keep up with increased plastic consumption. Since plastic now comprises approximately 30% of Taiwan's annual municipal waste generation, recycling rates for plastic products should have risen to account for more plastic waste. Instead, recycling rates have barely increased from previous years. Based on the estimated percentage of plastic present in Taiwan's total municipal waste, recycled plastic containers only comprise about 6% of recyclable waste. Therefore, this data is only confirming a small amount of plastic has been properly recycled.

As waste generation has increased in Taiwan, the recycling rate has failed to keep up. Although a steady increase in recyclable waste is positive, it does not appear to effectively mitigate large influxes of waste, and incineration increases instead. Knowing that plastic is becoming a more prevalent material found in municipal waste may suggest a lack of plastic recycling in recent years. In addition, the static level of plastic container recycling indicates that recycling may not be capable of handling more plastic waste. Thus, recycling appears to be stifled by ever increasing plastic consumption. Plastic recycling is much more complicated than most consumers know, and the Taiwanese recycling system does not seem to hold up fully to recent consumption patterns.

2.5 Recycling as a BandAid Solution

Recycling should not be the only solution to plastic waste because of the tedious collection process and degradation in plastic quality. As previously mentioned, only 9% of all

plastic ever produced has been recycled, and nearly 22% of plastic is neither recycled nor disposed of properly (OECD, 2022). Instead, millions of pieces of plastic have contaminated soil and water across the globe. Although recycling systems can alleviate the burden of necessary plastic products, they are incapable of effectively recycling all plastics. Therefore, consumers should be more aware of what factors enable or inhibit plastic recycling.

The various types of resins used to create plastic products make sorting a tedious task, but it is critical as each resin or combination of resins requires different recycling processes. Both in Taiwan and abroad, most recycling cans do not specify which types of plastics they take. A restaurant will oftentimes have a bin designated for “plastics,” but it is the consumer's job to decide which plastics should go in there. This system requires the recycling companies to collect, sort, and ultimately dispose of any resin types that cannot be recycled. Consumers are not privy to this selection process, so they may assume that everything they place in the recycling bin will be turned into new products.

Another complex factor of plastic products is their degradation in quality after recycling. Unlike glass or metal, plastic quality decreases every time it is recycled. Some plastic polymers can never be recycled due to the particular characteristics of their materials or because of the additives present when they are manufactured (Roosen et al., 2020). A team of chemical engineers analyzed virgin high-density polyethylene (HDPE) against recycled HDPE, ultimately finding a distinct drop in quality and safety (Petroviča et al., 2022). Virgin plastics are defined as polymers that have never been recycled or altered after their initial processing. Even when plastic products are successfully recycled, the new product may be a combination of recycled and virgin plastic that cannot be recycled again (Hicks, 2020; Petroviča et al., 2022). Furthermore, this

recycled plastic is chemically weaker than virgin plastics and can even contain more harmful chemicals than before.

2.6 The Recycling Dilemma of Single-Use Plastics

There is a lack of transparency regarding the amount of single-use plastics annually recycled. According to the Minderoo Foundation, 139 million metric tons of single-use plastics were produced in 2021 from virgin polymers (Charles & Kimman, 2023). Despite single-use plastic production increasing by about 6 million metric tons since 2019, recycling has only increased by 0.4% (Charles & Kimman, 2023). Furthermore, this increase is only seen in industrialized nations with more strict recycling standards. Single-use plastics are present in both industrialized and developing countries, so it is difficult to determine how many single-use plastics are slipping through the cracks.

The Resin Identification Code (RIC) distinguishes between different plastic polymers and is integral to properly recycling plastic items. The RIC categorizes different polymers typically used in plastic production and identifies their unique properties, most notably their thermal conductivity (BBC, n.d.). These plastics must be separated so that they melt at the correct temperatures when being recycled. However, single-use plastics are not necessarily easy to identify nor are they composed of easily recyclable polymers. Although plastic water bottles may only be composed of polyethylene terephthalate, their thin plastic labels and plastic bottle caps are composed of entirely different polymers that cannot be recycled with the bottle (NPR, 2019). Furthermore, some of the most prolific and harmful single-use plastics are thin films, such as plastic bags, plastic wrap, and shrinkwrap. These forms of plastic can be harmful to recycling machines and damage them, costing recycling companies thousands of dollars (NPR, 2019).

In 1970, the US held a competition to develop a recycling symbol for waste, and Gary Anderson won with the now ubiquitous Mobius triangle (Jones, P., & Powell, 1999). Although the purpose of this symbol was originally to identify recyclable products, its implementation has been twisted over time. Now, the Mobius triangle is used in tandem with numbers. These numbers are the RIC that identifies the type of polymer used in a plastic product (Cheung, 2021). Because of the Mobius triangle's association with recycling, many consumers erroneously assume all products with the symbol are recyclable. However, many of the polymers used to create plastics cannot be recycled in standard recycling centers. According to a survey conducted with 808 American participants, nearly 82% believed the Mobius triangle indicated a product could be recycled (Latkin et al., 2022). Because the RIC has long been controversial for confusing consumers, California's Attorney General has recently opened an investigation into oil industries perpetuating misinformation about recycling to consumers (State of California Department of Justice, 2022). This confusion not only manipulates consumers into believing more products can be recycled, but it also floods recycling centers with unusable material. This situation is particularly impactful for Taiwan because a large portion of consumers do attempt to recycle. Therefore, if each consumer is incorrectly categorizing one or two items in their recycling, it can add up to millions of plastic material needing to either be resorted or trashed at the recycling facility.

2.7 The Emotions Behind Recycling

In the 21st century, governments and citizens alike treat recycling as a remedy to an ever growing consumerist lifestyle. This reliance on recycling is connected to the political and financial incentives of corporations. There was a shift from industry responsibility to consumer

responsibility when it came to recycling. Although many communities in the United States and abroad don't have access to recycling facilities, companies continued to emphasize the role consumers played in waste production (Lindwall, 2021). This focus on consumer choice kept industries from investing in recycling infrastructure for their waste, ignored issues with products' life spans, and recontextualized recycling as an individual's responsibility as opposed to a necessary part of industrial infrastructure. Taiwan does break against the mold of industrial responsibility, as the Waste Disposal Act ensures that industries are responsible for waste generation and disposal (2017). In Taiwan, an integral element of the recycling system is "extended producer responsibility," where industries are responsible for funding recycling of their waste and products (Waste Disposal Act, 2017). However, even with industry investment in Taiwan's recycling system, the reliance on recycling to eliminate waste has contributed to a culture of overconsumption.

Based on the research of Jesse Catlin and Yitong Wang (2012), consumers may be more willing to consume products when they believe recycling is available. The premise of this experiment centered around participants testing the quality of a pair of scissors by cutting paper into various shapes. Participants that were provided a recycling bin at the start of the experiment produced almost three times as much waste as participants that were provided a trash bin. Catlin and Wang (2012) posit that although they cannot make any direct connections between the observed behavior in their experiment and abstract theory, they consider consumer guilt or pride as worthy ideas for future study.

Monic Sun and Remi Trudel (2017) expand upon these ideas by looking at the psychology of consumers who recycle. They argue that consumers are generally waste averse and any perceived unnecessary waste will result in negative emotions. In their study, respondents

were asked a series of hypothetical questions involving wasting or recycling items. Most responses were in support of preventing waste and recycling when waste was inevitable. Once it was reasonably determined that people respond negatively to waste and use recycling to mitigate feelings of guilt, Sun and Trudel (2017) experimented with scenarios where recycling was available to see how participants would change their consumption habits. Within the three different experiments, participants with the recycling option typically used higher quantities of the provided items than participants with the trash option. These results corroborate consumers' aversion to waste, and the mitigating effects of recycling. Recycling can be viewed as a loophole to waste generation, where the amount of waste produced is irrelevant if it is eventually recycled. However, recycling requires a great deal of time, money, and energy. Although recycling can support waste management systems, it is often treated as a tool by consumers to ignore increased consumption.

2.8 Conclusion

Plastic waste is only growing more and more, with the OECD (2022b) estimating that plastic waste will rise by almost two-thirds in 2060. Taiwan, although possessing an effective recycling model that receives public support, has also increased its total municipal waste over the past 5 years (Ministry of Environment, 2023a). The argument of this chapter states that recycling can obscure consumers to the limitations of its industry, as seen in the Ministry of Environment statistics. An increasing amount of waste incinerated corresponded with a rise in plastic waste, information that the average Taiwanese consumer is unaware of. Despite the growth of plastic waste in Taiwan, plastic recycling rates have not significantly improved, and there has been a noticeable spike in incineration. When looking at Taiwan's recycling system, it may be easy for

consumers to generate more waste in the misguided belief that recycling negates harmful consumption. However, recycling has failed to outweigh the negative impact of overconsumption, and yet it is still viewed as the core of an environmentally responsible society. This misconception can be connected to industries that are capable of maintaining the status quo by misrepresenting the process of recycling to consumers. Instead of developing better materials, returning to reusable containers, or promoting a circular economy, companies seek to misguide consumers into believing that they are responsible for recycling, and that small action will be enough to save the environment.

Chapter 3: The High Cost of Convenience

3.1 Introduction

Environmentalism has become one of the most globally recognized and respected social movements, with every country having its own environmental organizations and causes. However, when ideologies spread internationally, they can become watered down or disillusioned. Although many people understand the core values of environmentalism, it can be difficult to properly implement them within one's life. In a society focused on economic development and growth, consumers can be misled on what actually amounts to an environmentally friendly action versus one that is merely perfunctory. Many people aspire to be environmentally responsible, but sometimes the interest to appear environmental ultimately makes their behaviors more harmful.

Meanwhile, global consumerism has steadily risen since the beginning of the 20th century (Stearns, 2006). Although consumerism spread quickly in Western societies, some cultures were less immediately affected by the traditionally European version of consumerism. Despite years of trade with European powers, Chinese culture wasn't influenced by consumerism for decades due to the high number of impoverished, rural Chinese that lacked purchasing power (Stearns, 2006). The traditional class divide within Chinese society also kept consumerism at bay since consumerist mentalities would cause all social classes to covet similar products (Stearns, 2006). With the political revolution came government support for consumerism, as revolutionary Sun Yat-sen invested into China's first department stores (Stearn, 2006). When the Kuomintang, or Nationalist Party of China fled to Taiwan, the support for consumerism and industrial growth only increased (Cheng, 2001). Eventually, consumerism touched almost every country in the world.

Despite the international recognition of environmentalism, consumerism has only increased in the 21st century. Stores are more convenient now, with easy shipping from around the world and disposable items that make drive-thrus a breeze. Although these choices are easy for consumers at the moment, they contribute to an ever growing number of plastic waste that regularly breaks down into microplastics and pollutes the Earth. Understanding the impact of single-use plastics, the reasoning for increased plastic consumption must be addressed within the modern context of convenience culture. Additionally, consumer behavior should be critically analyzed under the shadow of environmental attitudes. In Taiwan, consumers have undermined the sustainability of recycling by making choices centered on feeling “environmentally friendly” without properly considering their actual environmental impact. These choices can be explained by various sociological theories involving the relationship between environmental knowledge and behavior, as well as the “warm glow” effect experienced when feeling sustainable.

The purpose of this chapter will be to determine what relationship exists between environmentalist attitudes and concrete eco-conscious behaviors. Taiwan’s historical relationship with both waste management and environmentalism will be discussed to provide a clear view of how supportive Taiwanese people are of sustainable development. Analysis of a Greenpeace Taiwan survey will provide an additional framework for understanding public perceptions of single-use plastics. Ultimately, the psychological factors that contribute to environmental decision-making are used to understand the nuanced ways in which people grasp “environmentally friendly” actions. This chapter argues that environmental attitudes do not directly correlate to environmental action, and can instead increase the likelihood of ‘behaving’ environmentally friendly in ways that are harmful to the environment. In the case of Taiwan, an

environmentally conscious public does not reduce the amount of issues related to overconsumption or the prioritization of convenience over sustainable practices.

3.2 Environmental Attitudes in Taiwan

Taiwanese people have supported environmental policies and protections for several decades, especially since the reinvention of their waste disposal system (Liao et al., 2001; So, 2014). The previously mentioned expansion of the petrochemical industry in Taiwan during its formative economic years incited a strong sense of environmental urgency in Taiwanese people that has persisted over the years. Ming-Sho Ho delves into the history of Taiwanese resistance to petrochemical pollution from 1987 to 2011, with large-scale protests and the establishment of environmental NGOs providing a platform for worried citizens (So, 2014). The Homemaker's Union (主婦聯盟) in Taiwan rose in prominence during these tumultuous years due to an overwhelming concern for local communities due to illegal waste dumping by various industries, especially the petrochemical industry (Liao, 2001).

Taiwan's geographical position inclines it to focus on environmental concerns, especially on the marine ecosystem. However, as society industrializes and fewer people are directly impacted by environmental issues, the urgency to remain proactive is obscured. As illustrated in a survey conducted in 2018, Taiwanese undergraduates had low levels of environmental literacy, even while they displayed environmental attitudes (Liang et al., 2018). The elements of environmental literacy were defined as cognitive, affective, and behavioral, all of which are important to increasing the likelihood of environmental action. Of the 16 questions assessing the cognitive element, participants' average was only 58.1%, which categorized the overall level of environmental knowledge as low. For the questions assessing the affective element, participants'

scored low on willingness to learn environmental information, but their environmental awareness and values were relatively high. Finally, participants' answers for the behavioral element illustrated a high interest in following government environmental mandates but a low interest in what could be described as "extracurricular" environmental involvement, such as developing environmental initiatives, attending environmental activities, etc. The compliance of undergraduates to participate in government-enforced environmental actions as opposed to actively engaging with environmental information on a personal level exhibits an attitude of passivity in Taiwanese youth.

There is also the added factor of social responsibility, which is typically a more important factor within collectivist societies. McCarty and Shrum argue that collectivism works towards societal goals without needing immediate satisfaction, unlike individualistic values that rely more heavily on short-term cost analysis (McCarty & Shrum, 2001). This concept translates to environmental beliefs very intuitively, as environmental behavior like recycling does not have a concrete reward for individuals but instead intends to have a positive societal impact. Taiwan has been heavily influenced by Confucian thought due to its historical relationship with Mainland China and the natural dissemination of cultural values from immigration (Chen, 2014). As the core beliefs of Confucianism stem from maintaining balance within one's personal and public relationships, a collectivist mentality that values societal harmony takes precedence over individualistic dreams (Li, 2006). Therefore, it can be surmised that collectivist thought could impact the environmental attitudes of Taiwanese citizens based on fundamental cultural qualities. In the previously mentioned study of undergraduate students' levels of environmental literacy, government mandates were highly supported (Liang et al., 2018).

3.3 Survey on Single-use Plastics

In 2020, Greenpeace Taiwan (2020) conducted a survey where they asked several questions related to where participants receive single-use plastics and possible solutions to reduce plastic consumption. The plastic items that the survey focused on were bags, straws, cups, and cutlery. These four items are currently under scrutiny in Taiwan as they are the four single-use plastics that are scheduled to be banned by 2030 (Everington, 2018). The Taiwanese government has made plans to enact this ban because these four types of single-use items are some of the most common forms of disposable plastics in Taiwan. For this reason, it is important to determine their prevalence in everyday life, where they are most often used, and what strategies could help reduce consumption levels before the ban is implemented.

This 2020 survey is composed of 15 questions that break down into 4 different types: background related to single-use plastics and environment, locations where single-use plastics are procured, advice for reducing single-use plastic consumption, and questions about the 2030 single-use plastics ban. Adult respondents were found in 22 cities throughout Taiwan, and a total of 1,072 responses were collected. The following descriptions are paired with my analysis of the survey responses and their possible sociological connections to Taiwanese consumer behavior.

3.4 Background Questions

Three questions were asked that can be considered background information related to the survey. In question one, participants were asked to provide an example of a single-use plastic item. Through this question, we can see that the predominant types of plastics include plastic bags, cups, straws, containers, and cutlery. Based on the responses, it seems that the government's decision to ban the previously mentioned plastic items would make a positive

impact on what single-use plastics people regularly use. The second background question asked how seriously single-use plastics impact the environment. 72.6% of respondents believed that the environmental impact of single-use plastics is very serious, and 21.2% believed they were mildly serious. This corroborates the previous information showing that Taiwanese people are considered to be environmentally conscious, and are generally aware of plastic's harm on the environment. The third background question asked for participants to explain how these plastics impact the environment. Interestingly, participants emphasized environmental cleanliness (環境髒亂) as the top issue related to plastic, and more serious impacts, such as harming wildlife, were less common responses. Based on these responses, there is a clear understanding amongst respondents of the harm single-use plastics provide and how this impact manifests itself. However, the emphasis on the visual mess of plastic garbage may indicate that Taiwanese people think of the immediate impact of plastic more so than the larger, more dangerous qualities of plastic waste.

3.5 Location-based Questions

The second type of questions wanted participants to identify the locations where certain types of single-use plastics are most often used. The four questions all picked a different plastic product to ask about: plastic bags, plastic cups, plastic straws, and plastic cutlery. The top three locations that most respondents identified were small eateries, traditional markets, night markets, and drink shops. Unsurprisingly, these locations are all mainstays of Taiwanese culture. In addition, the purpose of these locations is to provide cheap, convenient food. To remove single-use plastics from these environments would prove challenging, as they are all meant to be convenient, on-the-go shopping areas. Traditional markets and night markets are also run by

older generations, and changing to reusable or easily recyclable items may increase costs. However, the significance of markets and specialty shops to Taiwanese culture cannot be underestimated, so finding a solution to plastic waste must fit within the confines of Taiwanese life.

3.6 Advice Questions

The third question category asked participants to give their advice as to how the government, businesses, or individuals should try to reduce single-use plastic consumption. Once again, the questions varied slightly based on the type of product it focused on. Generally, the main forms of advice were to provide discounts for consumers to bring their own reusable items, charge consumers for using disposable items, restrict manufacturers from producing as much, and have stores provide reusable items. Out of the main recommendations provided by participants, there was an emphasis on store owners to alter their policies or government to provide restrictions. The way this advice framed the issue of reducing single-use plastics seemed to highlight external factors as opposed to internal motivations. Respondents recommended that consumers receive either economic incentives or upcharges to alter consumer behavior. Considering the lengthy history of environmental justice in Taiwan, it is interesting to note how this advice largely ignores consumer responsibility. Incentives or deterrents are methods that shop owners can utilize to decrease waste, but consumers are treated as a largely passive entity.

3.7 2030 Plastics Ban

Finally, the fourth type of question asked participants about the 2030 ban on four types of single-use plastics. They were asked if they were aware of the upcoming ban, whether or not

they support it, and their level of support for reusable products as opposed to single-use plastic products. Only about 20% of respondents were aware of the 2030 ban, but 85.1% either greatly or mildly supported the ban. Additionally, 92.2% of respondents supported using reusable products more than disposable products. This survey data about the 2030 single-use plastics ban indicates that Taiwanese consumers may be unaware of environmental legislation, even though it would have a strong impact on their daily lives. Despite overwhelming support for the ban's core values, Taiwanese consumers appear to be somewhat removed from environmental policy, and it is possible that public support for the ban may decrease the sooner it is enacted. Currently, without knowledge of the ban, consumers and shop owners may feel shocked when they are suddenly expected to shift their habits and business practices.

3.8 Survey Results

This survey data provides useful insight into how everyday Taiwanese consumers view single-use plastic, where they most commonly acquire it, how to reduce its impact, and the significance of the 2030 four-types single-use plastics ban. The overall agreement on plastic waste's environmental harm and awareness of where people receive these items corroborates the environmentally friendly attitudes of most Taiwanese people. However, the emphasis on using external factors that are based in the industry and government sectors to reduce single-use plastics indicate a perceived lack of consumer integrity. Even though these respondents could choose to bring reusable items now, they may wait until there is an economic incentive, or until there is no choice.

3.9 Environmental Positivity and “Warm Glow”

Although many different cultures and faiths have valued the environment and sought to protect it, there has only recently been a concentrated push against consumerism and conspicuous consumption as environmentally detrimental practices. According to an International Science Survey from 2019-2020 spanning 20 countries, an average of 57% of people believe that climate change is a serious problem, and an average of 54% believing human activity directly contributes to climate change (Pew Research Center, 2020). As the repercussions of climate change and linear consumption models have become more apparent in recent years through exacerbated natural disasters, rising temperatures, and the influx of microplastics in ecosystems to name a few, people are increasingly worried about what the future holds.

Environmental attitudes can manifest in a few different ways. Some people believe in the concept of “voting with your dollar” where financial decisions are used to show endorsement of a company’s values (Buchanan, 1954; Newman & Bartels, 2011). In a capitalistic society, this particular method is seen as a way to promote change, in this case for environmentalist ideas, without attempting to fundamentally alter the system within which everything resides. As seen in the work of Kelly Haws, Karen Winterich, and Rebecca Naylor, consumers will be more willing to support products that appear to be environmentally friendly based on their level of green consumption values (Haws et al., 2013). Using an updated GREEN consumption scale with a total of 98 items related to consumption behavior and environmental attitudes, the researchers conduct three studies that look into willingness to purchase environmentally friendly products, the relationship frugality has with purchasing choices, and how non environmental elements of hypothetical products impact willingness to purchase said products. This research focuses

entirely upon environmentally conscious consumers to better understand their likelihood of purchasing certain products and the values attributed to a “green” product.

Studies have witnessed a positive emotional response connected to when people act in a way they deem to be environmentally friendly (Biswas et al., 2000). James Andreoni (1989) first coined the term “warm glow” to describe what he referred to as “impure altruism” where people receive a personal satisfaction from their behavior as opposed to receiving nothing in a purely altruistic form. Researchers have taken this “warm glow giving” model to examine environmental behavior. Taufik, Bolderdijk, and Steg (2015) discussed green behavior in the context of “warm glow” as a mechanism for pro-environmental behavior due to the personal value it provides. However, Van Doorn and Kurz (2021) evaluate how environmental behavior that relies on "warm glow" can result in wasteful or environmentally damaging actions. When giving university students a hypothetical situation where they were in situations that had reusable options, external media related to environmental friendliness caused students to choose the more wasteful options of a particular item. The study also showed that students acknowledged the benefits of producing less waste, but failed to reduce waste during the experiment due to influence from external environmental media that emphasized “warm glow” over the more sustainable options.

3.10 NonLinear Model of Pro-environmental Behavior

Significant research has shown that environmental attitudes can be present and not manifest into environmental behaviors. Based on the first models developed in the United States to depict the progression of environmental thought, there was a linear progression from acquiring environmental knowledge, to developing an environmental attitude, and finally exhibiting

pro-environmental behaviors that work to actively mitigate environmental impact (Burgess et al., 1998). However, various researchers have objected to this linear behavior model, and a variety of arguments have been made to explain the gap between having environmental knowledge and presenting pro-environmental behavior (Kollmuss & Agyeman, 2010). Through an extensive literature review that collects several prominent theories surrounding the gap of environmental knowledge and environmental behavior, Kollmuss and Agyeman (2010) develop a cluster of external factors and a cluster of internal factors. Existing infrastructure, economic climate, and cultural values are all external factors that can both incentivize or dissuade environmental behavior. Primary motivations versus selective motivations, level of environmental knowledge, personal values acquired throughout life, environmental attitudes, and environmental awareness are just a few of the proposed internal factors that could impact individual development of pro-environmental behaviors. This research illustrates the nonlinear relationship between environmental knowledge and environmental behavior, so the increase in environmental awareness over time does not directly contribute to more environmental behavior.

Additionally, Andreas Diekmann and Peter Preisendörfer (2023) developed the high cost low cost model of pro-environmental behavior, arguing that the strength of environmental concern diminishes as the costs of environmental behavior increase. For example, if recycling requires consumers to drive themselves to a recycling facility instead of having their recyclable waste picked up, it is likely that many people will be less willing to participate in recycling. In societies that have more accessible recycling options, high cost could occur from having to properly sort or clean recyclable waste. As discussed with the various nonlinear pro-environmental models, there could be a variety of factors that contribute to the high cost of recycling. Financial burden, time commitment, and primary or secondary motivations, are all just

a few examples as to why environmentally-aware consumers may not display pro-environmental behavior.

3.11 Conclusion

Despite consumers' inability to control industrial plastic production or government waste regulations, their environmental attitudes and underlying biases regarding what constitutes eco-friendly consumption are inextricably linked with rising global waste. The nonlinear relationship between environmental knowledge and pro-environmental behavior, along with the impact of "warm glow" on consumers' ability to critically evaluate the environmental impact of products can be connected with Taiwan's reliance on recycling. As discussed in the previous chapter, recycling is an effective way to have a more integrated, circular economy that prolongs the use of materials. However, recycling should not be considered as the primary solution to increased consumerism. Consumers have been provided inaccurate information regarding the process of recycling, the items capable of being recycled, and how often plastic is actually recycled. Fitting into the framework of warm glow, Taiwanese consumers may be more comfortable buying or using single-use plastics because they erroneously believe the plastic items will be recycled into a new material. As opposed to changing their consumption habits and cutting out unnecessary plastic products, consumers feel content to use disposable plastics due to the misguided perception that recycling will erase their wastefulness.

As seen in Van Doorn and Kurz's (2021) study of German students' disposal choices, people can be misled by environmental advertising and choose less environmentally friendly choices because they overlook reuse when told about "efficient" recycling or disposal methods. The psychology of "warm glow" and how it can manipulate the pride and guilt attached to

consumer choices is a necessary dilemma to address when looking at large scale recycling systems. When recycling is emphasized so heavily in Taiwanese society, but citizens are not given all of the necessary information regarding how to effectively recycle, people receive a misguided message that postulates “recycling” as the paramount environmental option. Spurred on by their sense of community, Taiwanese consumers may continue recycling their waste, but ultimately fail to curtail their unsustainable consumption habits.

Chapter 4: Will Taiwan Escape the Recycling Trap?

4.1 Introduction

In the twenty-first century, Taiwan has enacted innovative environmental policies, especially for the East Asia region. After dealing with decades of improper waste disposal, the Taiwanese government has made recycling and waste management major priorities (Liao et al., 2001). As early as 2002, Taiwan developed the Resource Recycling Act, a policy that emphasized the significance of having a circular economy (Fan et al., 2005). However, as plastic usage has continued to rise in recent years, environmental organizations have pushed for the Taiwanese government to address the root cause of plastic pollution: overconsumption. Reliance on the recycling system has left Taiwan in a precarious position, where an increase in plastic usage can make strides in the recycling industry irrelevant. To combat these issues, Taiwan is hoping to handle disposable plastic products by implementing a price levy and ban on certain items.

In 2018, Taiwan's Ministry of Environment announced a ban on four types of single-use plastics by 2030: bags, cutlery, straws, and cups (Lai, 2018). The goal of this ban is to limit marine pollution and microplastics that have a large impact on the health of humans and animals alike. The project timeline shows a gradual progression in restricting access to products so as to not shock consumers and business owners. Because the ban has not yet been enacted, it is not clear how effective it will be with curbing plastic pollution. However, failures to adequately promote the ban, issues with public support, and ineffectual leadership have made it unlikely that the ban will even come into effect by 2030, much less find success.

The purpose of this chapter is to introduce the methodology and implementation strategy of Taiwan's 2030 plastics ban. It will investigate what qualities make a plastic ban effective based

on how environmental policies impact consumer behavior at various stages. In addition, this chapter will consider a few international examples and compare them with Taiwan's plastics ban. Ultimately, this chapter will assess the positive and negative elements of Taiwan's 2030 plastics ban in regards to public support and long term efficacy. This chapter argues that although the 2030 plastics ban is a positive step in Taiwan's efforts to mitigate plastic pollution, there is a clear lack of consistency and resolve amongst the government that undermines the long term integrity of the ban.

4.2 2030 Four Types Single-Use Plastics Ban

At its inception in 2018, the 2030 four types single-use plastics ban was designed to slowly increase restrictions on certain plastic products until banning them completely in 2030 (Lai, 2018). These items were chosen due to how frequently they are found as marine pollution. These products are also examples of consumerism culture that prioritizes efficiency over sustainability, which also may have factored into their decision to restrict and ban these products. The timeline for this ban was co-written by the Ministry of Environment and the Marine Debris Management Platform, which is composed of eight environmental organizations.

As pictured in the table below, all four types of plastic would start undergoing restrictions in 2020, such as barring businesses from providing disposable cutlery and straws for in-store patrons. In addition, plastic bag restrictions would include a wider variety of stores, and stores with disposable cups would be encouraged to provide discounts for customers with reusable cups. These changes were a slow progression towards future restrictions, but the Covid-19 pandemic likely undermined these plastic mitigation efforts. Since so many businesses were unable to operate with customers inside, there would be an even higher number of disposable

products used for food deliveries (Tsai, 2021). Overall, it is unclear whether the 2020 benchmarks were met because there has not been evidence to suggest clear implementation and these goals involve in-store interactions that were no longer taking place.

Promotion of the Reduction or Restriction of Single-Use Plastic Products

2018		2020	2025	2030
Taiwan Marine Debris Control Action Plan	Shopping Bags	Expand the range of restricted use measures, such as all stores that issue invoices	Comprehensive restrictions on use and strengthening of price-based control of quantity	Comprehensive ban on plastic bags used for shopping
	Disposable Cutlery	Industries that currently have restricted use measures are not allowed to provide disposable cutlery for consumers dining inside	Comprehensive restrictions on use of disposable cutlery and strengthening of price-based control of quantity	Comprehensive ban on providing all kinds of disposable cutlery
	Single-Use Takeaway Drink Cups	Strengthen the incentives and discount measures for bringing your own cup and adjust pricing to control quantity	Comprehensive restrictions on use and strengthening of price-based control of quantity	Comprehensive ban on single-use takeaway drink cups
	Plastic Straws	Catering operators are not allowed to provide single-use plastic straws for their beverages	Comprehensive restrictions on use of single-use plastic straws and strengthening of price-based control of quantity	Comprehensive ban on single-use plastic straws

*This table (Lai, 2018) was translated from Traditional Chinese to English by the thesis author.

The next phase of restrictions will begin in 2025, with all four plastic items facing higher costs in order to control the quantities sold, so they cannot be provided for free. This technique is referred to as a “price levy,” where the government adds a purchasing fee to a product in order to discourage consumer behavior (OECD, 2010). Taiwan has utilized a price levy on plastic bags since 2003, but they will be increasing the price by 2025 (Chiu, 2003). Although these products will still be available, their purpose will slowly become obsolete as they are no longer a free option in stores. Finally, all four products will be completely banned from usage in 2030. In 2023, the Ministry of Environment reported that they would be expanding upon their original plan and incorporating green design and resource recycling (Chen, 2023). Currently, it is not clear if the Ministry of Environment will be able to fulfill its original promise of banning the four types of single-use plastics mentioned. Instead, it has pivoted to a numerical goal of reducing 138,000 tonnes of virgin plastic by 2030.

4.3 An Effective Ban

What constitutes an effective ban? A ban has effectively met its goals if it is able to exist in perpetuity with general public support and succeeds in preventing the product from entering the market. For an environmentally-focused ban, the erasure of the product should have a positive impact on the environment. Public opinion and level of support should act as an indicator for success because an unsupportive public will likely break the ban or find an avenue to end it. According to Huber, Wicki, and Bernauer (2020), public opinion surrounding environmental policy is most affected by the framing of the issue, the perceived effectiveness, the perceived intrusiveness, and the perceived fairness. This study focuses on Switzerland’s carbon emission reduction policies, so it is not directly comparable to plastic product bans. However,

both environmental policies use various methods to discourage consumer behavior and rely on public support. In regards to framing, a policy that seems to focus on gains is typically more popular than one that focuses on losses. In the study's example, promoting electric vehicles would be a gain and reducing carbon emissions would be a loss. For plastic bans, promoting reusable items and discounting them would be a gain, and banning plastic products would be a loss. Framing also ties into the perceived effectiveness of a policy, as the "loss-based" issue was usually perceived as ineffective regardless of policy (Huber et al., 2019). The "gain-based" issue is more often viewed as effective amongst the different policy options. If a policy is considered intrusive, it is less likely to be supported by the public because it requires a change to be made to people's daily lives. Finally, a policy that is perceived to be unfair is also less likely to receive public support because people feel that an unreasonable burden has been placed on them by a policy.

When using this information to assess a plastic ban and price levy, there may be issues garnering public support once Taiwan enacts the later stages of the policy. Even if the policy type is viewed as effective, a price levy and product ban could be perceived as both intrusive and unfair burdens to place on the public. However, there are some clear differences between a carbon emissions policy and plastics ban that may reduce the amount of friction to price levies and bans. Carbon emissions are a serious threat to the health of the planet, but they are less visible than plastic litter present on streets or in landfills. The degree of intrusiveness and fairness placed on a car tax may be much higher than a plastic tax because of how necessary a car is perceived in comparison to disposable cups or bags. In addition, the associated price levy on a disposable product is a much smaller financial burden on consumers. Regardless, these elements of perceived effectiveness, intrusiveness, and fairness are all still important indicators to

acknowledge when questioning how much public support an environmental policy will receive. Besides analyzing what elements of a policy can contribute or detract from public support, it is also important to address the typical reactions members of the public have to government policy. Proudfoot and Kay (2014) analyze the two main ways individuals respond to government policy: reactance and rationalization. While reactance describes the negative reactions the public may have to a new policy, rationalization describes the need for the public to justify policies or situations that they are unable to change (Proudfoot & Kay, 2014). If the government implements a policy that the public is unable to shut down, then there may be a rise in support once people are required to live with said policy. Clearly, rationalization is the ideal outcome for policymakers, but is there a clear path to promote rationalization over reactance?

Rationalization is most common when a political or governmental system appears absolute; it is unlikely to change and will be permanent for the foreseeable future. Policies with this sense of absoluteness often require the public to rationalize their existence, so that they can adapt to the new status quo. Therefore, if a policy like the plastics ban is capable of existing as a constant policy that is taken seriously, it would most likely prompt rationalization from the public. For example, when Proudfoot and Kay's (2014) study conducted an experiment with a cell phone ban and told different groups that the legislation would be *definite*, *very likely*, or *somewhat likely*, participants rationalized the *definite* option, but the less certain options received a reactant response. With this in mind, it is clear that the way Taiwan's Ministry of Environment has discussed the 2030 ban will impact how supportive the public is once the later stages of the ban are enacted.

4.4 Plastic Bag Policies

Nielsen, Holmberg, and Stripple (2019) analyzed plastic bag policies around the world in 2019, looking at bans, pricing mechanisms, and even countermeasures made against plastic bag ordinances. Their research showed that banning plastic bags is the most popular form of policy, although the severity and specificity of each ban can vary greatly. Several African nations, such as Rwanda, have very strict plastic bag bans that include jail time and heavy fines for selling or carrying thin plastic bags. Not every type of plastic bag will be prosecuted, only bags with a thickness under 100 μm . For reference, the average grocery store plastic bag is around 50 μm in thickness, so Rwanda is banning a large variety of plastic bags (Nielsen et al., 2019; Polybags, 2021). The study indicates that nations without the ability to implement widespread pricing levies on plastic bags usually choose bans. Pricing levies or taxes are relatively popular when curbing plastic bag usage because they simply add a price to previously free items, such as plastic bags. This approach emphasizes consumer behavior and assumes that an additional cost will deter customers from using plastic bags. There are several examples of effective price levies for plastic bags, most notably Ireland's 2002 plastic bag levy.

Convery, McDonnell, and Ferreira (2006) looked at the effects of Ireland's plastic bag levy, both in Ireland and Europe as a whole. The chosen levy price was €0.15, a price much higher than what the majority of consumers were willing to pay based on surveys. However, the price is still low enough compared to the items bought while shopping, that consumers were deterred from using plastic bags without being inconvenienced if they required one. Additionally, the revenue from plastic bags was set aside into an Environmental Fund for future projects. This element of the levy kept the focus on environmental issues, something that other levies have failed to consider. This environmental fund could be an example of "gains-based" framing because it transformed the plastic bag levy into a project that benefited the environment (Huber

et al., 2019). In this way, consumers could recontextualize the increased price as helping the environment when they were required to purchase a bag. An important element of plastic bag policy is understanding how this product is symbolic of consumer waste while being a small percentage of total plastic litter (Convery et al., 2006). Multiple countries have outlined how plastic bags are a strong visual sign of waste, even if they are not the most common form of litter (Nielson et al., 2019). Therefore, utilizing product bans and price levies has been proven to be a viable source of plastic reduction long term.

4.5 The Latte Levy

However, pricing levies have also failed to influence consumer behavior in the past. The UK's latte levy is a prime example of insufficient planning when enacting environmental policies. In 2018, Philip Hammond, the Chancellor of the Exchequer, announced a price levy of 25 pence on disposable coffee cups, dubbed the "latte levy" (Raphelson, 2018). The reasoning behind this price levy was that disposable coffee cups comprise 30,000 tonnes of waste each year in the UK and there are only two recycling facilities capable of separating the thin plastic film from the paper body (Parliament, 2018). Therefore, it would be best to discourage public use of disposable cups in order to minimize unnecessary plastic waste. From the beginning, this policy was controversial amongst consumers and coffee corporations. In fact, major coffee brand Costa Coffee tried to lobby the UK Parliament, and contributed to the quick end of the policy (Weston, 2019). Mumford (2019) examines the latte levy using the complexities of penal taxation as described by legal philosopher H. L. A. Hart to better understand the public's discourse on the

price levy. She analyzes the sense of legitimacy the latte levy has and if “green taxes” should be used as a tool to discourage consumption.

Mumford (2019) describes the case of the puzzled consumer, who is unaware of the mechanisms behind why their coffee costs more, and only maintains their choices based on their wealth. This issue is raised in the complaints of Costa Coffee and McDonald’s, who argue that consumers suffer from high costs at the expense of a policy they believe is ineffectual (Weston, 2019). The way that the general public responded to the latte levy is indicative of reactance, because they became irate at losing their choice to use disposable cups without an additional cost. This sudden outcry of discontent was enough to repeal the plans for widespread price levies and bans on disposable cups, illustrating the power behind reactance. In contrast, the rationalization approach can strengthen the government’s policy by increasing its legitimacy in the eyes of the public (Mumford, 2019; Proudfoot & Kay, 2014). Ultimately, the latte levy failed to have legitimacy in the eyes of the public and could not withstand the scrutiny of affected businesses.

4.6 The Taiwanese Dilemma

Public opinion and understanding of the project appears to be a significant element of a successful ban or price levy. A policy must be able to accurately predict consumer behavior so that measures taken to discourage individuals’ decisions will lead to the desired outcome. The Ireland plastic bag levy was successful in large part because the policymakers determined the ideal price to discourage buying plastic bags without inciting strong negative reactions (Convery et al., 2006). Careful consideration was made to direct consumer behavior without eliminating their choices. In contrast, the UK’s latte levy did not factor corporations’ behaviors into account.

The cost of using a disposable cup was considered relatively high, and coffee companies steered consumer ire towards the levy as a weapon to shut down future cup bans (Weston, 2019). The latte levy failed to anticipate third party involvement from invested corporations and prioritize their cooperation in tandem with general public support.

Currently, the 2030 plastics ban in Taiwan has received public support, but there is still a lack of general knowledge about the timeline and implementation process. As seen in the previous chapter, only about 20% of Taiwanese participants in a Greenpeace survey were aware of the 2030 ban in 2020 (Greenpeace, 2020). The policy had already been announced two years prior and 2020 was the first year of implementation, so the lack of project awareness indicates the Taiwanese government was failing to effectively promote their plan. The longer the general public remains uninformed about this ban, the more resistance there will be to stricter regulations that “sneak up” on unaware consumers. Even though the timeline has provided several years to transition away from the plastic products, Taiwanese people may only notice in 2025 when the items are behind a paywall.

The Taiwanese government doesn't seem to have much faith in its own price levy or ban, based on the wording of the Ministry of Environment's Director of the Resource Recycling Office and Waste Management Division, Lai Yingying (Chen, 2023). In August of 2023, Lai announced a new initiative to reduce virgin plastics by 138,000 tonnes in 2030. This news incited questions about the continuation of the 2030 plastics ban. Lai did not say that the ban *would not* come into effect, but he did provide a noncommittal answer when asked if the Ministry of Environment still had the 2030 ban goal in mind, stating he would “dare not say” (「這部分我不敢說」)(Chen, 2023). The ability of the general public to rationalize this ban is stunted by ineffective marketing and unclear messaging that seems to indicate the Ministry of Environment

has reneged on the original goal of a total ban by 2030. As previously discussed, when analyzing public reactions to government policy, rationalization typically occurs when a policy has been strongly cemented in public consciousness and is perceived as a permanent fixture in society (Proudfoot & Kay, 2014). If this 2030 plastic ban is already losing support from the government, it will be difficult for the public to take it seriously.

Furthermore, Lai introduced increased recycling efforts as an important element of this new virgin plastic reduction goal. At Taiwan's 2023 Plastic Forum, the general manager of the Plastic Industry Technology Development Center (塑膠工業技術發展), Xiao Yaogui, was clear on the significance of the recycling industry as a mainstay in Taiwan (Chen, 2023). When he states that "if recycling does not become an economy, it is just a single cycle" [如果只是循環沒有變成經濟, 循環也只是一次性的循環], Xiao is emphasizing the role that recycling can play in a circular economy. Although the recycling industry should be nurtured to account for industries that will always use plastic or disposable items, it can also lead consumers to misinterpret the purpose of recycling. By shifting the focus of plastic waste onto recycling and away from plastic reduction, Xiao and the Ministry of Environment continue to perpetuate the narrative that recycling is the primary method to address plastic pollution.

4.7 Conclusion

It is difficult to determine the future of the 2030 plastics ban because there are six more years left before its complete implementation. Until then, it is important to monitor the progress of the ban's timeline and address possible concerns with the messaging and outreach of the policy. There are several positive elements to the price levy and ban that indicate an effective

plastics reduction strategy; however, there are also several warning signs that the ban will fail to meet its 2030 goals.

The inception of Taiwan's 2030 plastics ban had a strong focus on the root of the plastic waste problem: consumerism. As long as disposable plastic products are widely available, plastic waste will remain an issue that can only be solved through mitigation and the adaptation of more sustainable products. The ban has also received general support from the public once they are made aware of the policy (Greenpeace, 2020). The decision to establish progressively stricter regulations over a ten-year plan is also beneficial for consumers, businesses, and government bodies alike by giving everyone time to adjust to the changes.

However, there are a few key issues with the ban that makes its future success very precarious. Although it was out of the control of the Ministry of Environment, the 2030 plastics ban was stunted by the Covid-19 pandemic in 2020 (Tsai, 2021). At a time where businesses and consumers could familiarize themselves with policies on indoor dining and plastic usage, businesses were forced to shut down completely. Therefore, the first phase of the plastics ban could be easily overlooked by all parties. Since then, there has also been very limited public outreach about the price levy and ban phases, so many businesses and consumers may be blindsided by upcoming steps in the project timeline. The plastics ban is also a form of "loss-based" policy that emphasizes what is taken away from consumers rather than the gains made by improving sustainability (Huber et al., 2019). This type of policy framing can negatively impact public perception of the project if the promotions about the ban don't incorporate more positive elements. Finally, the reserved messaging coming from the Ministry of Environment at the Taiwan Plastic Forum indicates a return to prioritizing recycling as a band aid solution to

plastic waste. If the Taiwanese government cannot commit to enacting the 2030 plastics ban, then consumers should not be expected to support the policy and its impending limitations.

Chapter 5: Conclusion

The night air is full of music and laughter as you walk into a brightly-lit alleyway. There are a myriad of colors gracing your eyes while you walk past vendors selling every kind of food or drink imaginable. There are steamed buns with various sweet and savory fillings, fried potato balls, and bubble waffles galore. When you find the perfect snack, you take out a reusable tin and ask the vendor to fill it. The vendor takes the container from you and fills it while you grab your change. Looking over at a stall selling fresh squeezed juice, you rummage around in your bag to find a glass bottle. It seems the bottle was left at home, meaning you'll either have to buy a cup from the vendor or go without the juice. Will this be the future of night markets in Taiwan without disposable plastic?

Culturally, convenience is an integral element of Taiwan's food scene. Night markets in Taiwan start in the evenings and go late into the night, with countless locals coming to walk around and have some late night snacks. Since night market patrons walk around to different stalls, it is necessary for stands to provide disposable containers for food and beverages. Although there are some types of disposable containers without plastic, most of them can only reasonably carry dry goods without issue (Sims, 2019). The oily food of a typical night market requires plastic-lined to-go containers or plastic bags. Cardboard or paper can cause big messes if the food isn't eaten quickly, and biodegradable plastic is typically regulated as if it was a traditional plastic product (Yi, 2023). Convenience stores and small-time shops face environmental dilemmas as taking food to-go has increased the need for effective and disposable products. Furthermore, one of the most famous drinks in the world, bubble tea, is a drink from Taiwan that is always packaged in a clear plastic cup with a film cover. How will thousands of shops feel when they must start transitioning away from these different products?

The first question of this thesis has centered around the extent to which recycling infrastructure in Taiwan contributes to consumers' complacency with using single-use plastics. The second question of this thesis has asked how Taiwan's 2030 plastics ban lacks concrete support to effectively decreasing single-use plastic product consumption. Although Taiwanese people have overwhelmingly positive perceptions of environmental protection and steadfastly recycle, they consume high amounts of single-use plastics as part of a cycle of unsustainable consumption habits due to a fundamental misunderstanding of recycling's environmental role, undermining efforts to reduce plastic consumption. Therefore, I have argued that Taiwan's recycling industry cannot withstand continued overconsumption and single-use plastics, and effective government policies are key to limiting plastic waste. However, Taiwan's 2030 plastics ban does not have the necessary qualities to last as an efficient plastic reduction policy.

I introduced the history of recycling and its impact in Taiwan, and explained how integral this connection is to understanding the unique relationship between recycling and the Taiwanese public. However, data from the Ministry of Environment exhibits how increased waste generation does not lead to increased recycling rates, just incineration. Since the percentage of plastic in municipal solid waste has nearly doubled over the past few years, there appears to be a large amount that never sees the recycling center. This capacity issue paired with misinformation on recycling can cause consumers to believe all of their plastic waste is being recycled, when a significant portion is likely being incinerated.

Furthermore, consumer's environmental literacy and values attributed to recycling act as a necessary sub-topic when discussing possible shortcomings of recycling. Through the use of secondary literature, this paper illustrated how consumers can have environmental attitudes that do not lead to environmental actions. In fact, consumers can behave in ways that are harmful to

the environment because they fail to see the negative impacts of supposedly environmental actions. This concept is summarized in the term ‘warm glow,’ which can be described as a warm feeling of contentment when someone consciously chooses an “environmentally friendly” option. However, warm glow can account for why recycling is perceived as an infallible method to reduce waste, even when mitigating consumption would be a simpler and more environmental approach.

Finally, a description of Taiwan’s 2030 single-use plastics ban was integral to analyzing the effectiveness of this policy through assessing international cases and addressing the ways in which the public can react to environmental policies. The loss-based versus gain-based quality of a policy can help determine if the public will oppose or support it. A plastics ban is inherently loss-based because it removes the choice from consumers and applies penalties. However, early stages of the ban implement a gain-based approach, such as providing discounts for bringing a reusable cup. Additionally, acknowledging the different factors that lead to reactance or rationalization from the public are important to developing a long lasting ban or levy. Reactant behavior from the public is more likely when a policy does not seem strict enough, so members of the public feel like it will be overturned. Rationalist behavior typically occurs when a policy seems like it will be regularly enforced and maintained. The 2030 plastics ban does not seem to have a strict enough basis, so it may receive more backlash than a firmly established policy. Therefore, the 2030 plastics ban has promising elements, but fails to show resolve towards its own plan and will have difficulty making its goals by 2030.

This paper provides unique insight into how Taiwan’s recycling industry can lead to environmental issues due to consumer behavior. Previous studies have analyzed ‘warm glow’ and environmental behaviors, but there are few examples looking at Taiwan. This is especially

interesting because Taiwan has a well-developed recycling system that is widely supported by the public. Furthermore, this paper analyzes qualities of the 2030 plastics ban in relation to other international plastic bans and levies. By looking at international examples and researching public responses to environmental policy, I have determined some key weaknesses of this plastics ban and connected them to the larger conversation about recycling's place in environmental policy.

When looking at the future of Taiwan's environmental policy, it's important to strike a balance between reducing plastic consumption while providing alternatives for businesses and consumers. The Taiwanese public have proven themselves to be environmentally conscious, but they are also working within a capitalist economic model that requires businesses to focus on profitability. For a long time, recycling has been Taiwan's answer to maintaining economic growth while mitigating waste. However, increasing single-use plastic consumption has made efficient recycling far more difficult and there has been limited efforts to directly reduce plastic waste.

In addition, the complex relationship between recycling and consumption patterns has major implications for Taiwan and its future environmental policies. As recycling programs continue to be prioritized over plastic reduction policies, plastic pollution will remain a serious threat to the health and safety of Taiwan's marine life. It is integral that the public relationship to environmental policy is better understood by Taiwanese policy makers so that more effective strategies can be adapted or implemented in the future. When environmental policies are implemented and fail to show immediate results, they may be retracted or downgraded because of political pressure. Thus, using strategies to increase public support for a policy can save it from obscurity. Bolstering one industry that reduces pollution is not the best solution, as it provides little flexibility when problems arise. Therefore, research into recycling programs as a

supplemental industry would establish the support recycling plays while decentering it as the focus of policies.

Other future research in this topic should include more detailed survey information regarding the messaging behind recycling campaigns in Taiwan. Directly asking Taiwanese consumers about their relationship with recycling would be beneficial in drawing a link to policy messaging and “warm glow” mentalities. Further research regarding the Plastic Formosa Corporation’s involvement in the Taiwanese economy would also be helpful to understanding the economic and political barriers to reducing single-use plastics.

Since the 1990s, Taiwan has made great strides in their environmental awareness and policies, proving that sustainable development is well worth investing in. With one of the highest recycling rates in the world, Taiwan has continued to project an image of environmental friendliness that can sometimes overshadow the flaws within its system. Although the inflated significance of recycling has developed a culture of overconsumption, it also acts as a beacon of hope for the future. If proper measures are taken by the Taiwanese government to redirect consumerism away from single-use plastics, then recycling industries will be more capable of reintegrating the remaining plastic waste into a circular economic model. Ultimately, decreasing the prevalence of single-use plastics is only possible through the combined efforts of consumer awareness and governmental regulations.

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