Analyzing the Implications of a Green Tax on Single-Use Waste Plastics in Costa Rica

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Abstract

Plastic pollution threatens the health of marine organisms and humans. Our project worked with the MarViva Foundation to gauge Costa Ricans' interest regarding the implementation of a green tax on single-use plastic products through consumer surveys. We researched case studies and other published information supporting the implementation of a green tax. We concluded that the majority of Costa Ricans support a green tax and that legislation on plastic products is likely to be successful given the proper public and retailer education.

Executive Summary

Impacts of Single-Use Plastics

One of the greatest threats to the health of Costa Rica's marine ecosystems is plastic pollution. Approximately 8 million tons of plastic are disposed into the ocean globally every year. The human population has produced more plastic in the past 10 years than it has in the past century (D'Alessandro, 2017). The increase of plastic pollution and plastic waste has a negative impact on ocean ecosystems and marine life. Since plastic is non-biodegradable, it will only break down to a certain extent through photodegradation into very small pieces of plastic between 0.33 mm and 5mm in size, also known as microplastics and nanoplastics. Fish consume these plastic microfibers which move up the food chain through trophic transfer. Not only is the environment in Costa Rica negatively affected by plastics, but human health is also at risk. Plastic waste is also known to have a detrimental impact on human health through the food chain, sources of income, and access to food.

Photo taken at Playa de Coco in Guanacaste Province

The MarViva Foundation

The MarViva Foundation is a non-profit organization in Costa Rica that promotes marine conservation through political advocacy, participatory processes, and partnerships (MarViva, n.d.). Through its Chao Plástico Desechable Campaign, MarViva is working to educate consumers on the negative environmental and health effects of plastics and encouraging them to choose alternatives to single-use plastic products. The campaign is also working to promote legislation focused on protecting marine ecosystems through funding from a 'green tax' on single-use plastic bags and bottles. This green tax would counteract the negative impacts of environmentally harmful products by using the funds generated for sustainable projects to improve marine environmental health in Costa Rica.

Executive Summary

Project Goals & Objectives

Our project focused on compiling valuable information that MarViva needed in order to proceed with their campaign. To persuade legislators to support the Chao Plástico Campaign, MarViva needed supporting evidence about the environmental and health impacts of plastic pollution as well as examinations of case studies from around the world to determine the likelihood of success of a single-use plastic policy. MarViva also needed to predict how Costa Ricans would respond to the implementation of a plastic regulation, as legislators were concerned about their constituents' response to a green tax on single-use plastics.

The goal of this project was to analyze the implications of regulating single-use waste plastics in Costa Rica and to provide recommendations regarding the implementation of MarViva's green tax. The following objectives were used to accomplish our goal:

- Compile scientific evidence in regard to the environmental and health benefits of reducing plastic pollution.
- Create a document outlining multiple case studies regarding the implementation process of an environmental legislation on single-use waste plastics and its respective outcomes.
- Determine how citizens of Costa Rica will respond to the implementation of a national green tax on single-use plastics through analyzing consumers' willingness to pay.
- Provide recommendations and supporting evidence for a green tax on single-use plastics to MarViva through a detailed document and an additional tool that can be provided to legislators with condensed and summarized information.

These objectives allowed us to focus our data collection on what would benefit MarViva and Costa Rica as a whole. We gathered scientific evidence pertaining to the need for a green tax on single-use plastics, analyzed the success rates of multiple case studies along with their respective approaches, and determined how stakeholders would respond to help provide MarViva with useful and relevant recommendations.

Surveying Consumers at an Auto Mercardo in Herradura

Our Approach

We distributed surveys regarding consumption habits to consumers at a popular grocery store in Costa Rica, Auto Mercado, along with public areas including Parque Recaredo Briceño in Nicoya and Plaza de la Cultura in San José. The data collected allowed us to determine how the consumer would react to a green tax on single-use plastics. We focused on consumers because they would be directly affected by the tax. We compiled this information and analyzed trends in the data. After gathering all the necessary data and research, we created a full report in support of the legislation along with a short fact sheet and presentation to be used by MarViva to help gain the support of legislators for the green tax legislation.

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Key Takeaways

Contributing Factors for a Successful Implementation of a Plastic Policy

1. A Strong Campaign Strategy

One key finding from the case studies was that the most successful plastic policies contained a public awareness campaign to educate stakeholders about the new policy. For example, when Ireland implemented its levy on plastic shopping bags, they started a poster and leaflet campaign to educate the public on the new tax that would be applied to plastic shopping bags at point of sale and what alternatives were available to them instead of plastic bags. This educational campaign began in December of 2001 when the levy was first passed which gave ample time for the public to become familiar with the levy before it was implemented in March of 2002 (Killian, 2003). Similarly in South Australia, a strong public awareness campaign encouraged a behavioral change and educated the public, preparing them for the ban when it was eventually fully implemented in 2008.

2. The Slow Introduction of a Green Tax

We found that the most successful policies were those that were slowly introduced in order to give the public an adequate amount of time to adjust to a green tax before it is actually placed on single-use plastic products. By slowly introducing the green tax, it allows consumers and retailers to be educated on what the new policy entails and how they will be affected. Retailer education is especially important because they are the ones who will be enforcing the green tax. For example, when Delhi, India first implemented the ban, there was a lack of information relating to why the ban was being implemented and a lack of availability to cheap alternatives, making it very ineffective as 94% of citizens still used plastic bags (Gutpa, 2011). When the government revised the legislation, they found that raising awareness and support of the regulation while slowly introducing the policy allowed for consumers behaviors to adapt to the changes.

In Buenos Aires, Argentina, the government implemented a tax in only specific supermarkets, which allowed a comparison to be made between the single-use plastic usage in stores with and without the tax. Through an observational study, they found that the amount of reusable bags increased not only in stores with the tax, but also in stores that had not yet implemented the tax due to a change in consumer behavior. By slowly introducing the tax, consumers are able to adjust and change their consumption habits.

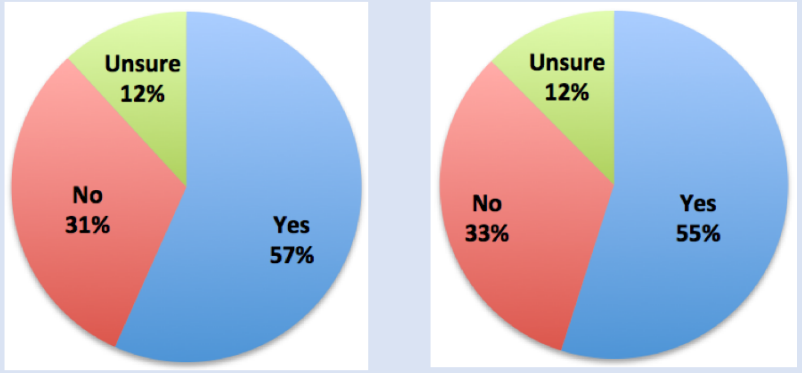
3. Provide Alternatives

Additionally, we found that countries that provided alternatives had a higher success rate than those who did not. A plastic ban that was revised and later implemented in Delhi, India and a plastic tax in Portugal were both successful due to readily available alternatives to plastic bags.

Consumer Survey Analysis

Willingness to Pay

The survey revealed that 57% of respondents were willing to pay a tax on plastic bags and 55% of respondents were willing to pay a tax on plastic bottles. The majority of respondents identified that they would be in favor of a plastic tax which indicates that the majority of Costa Ricans would have a positive response to MarViva's proposed tax.



Willingness to Pay: Plastic Bags (left) & Plastic Bottles (right)

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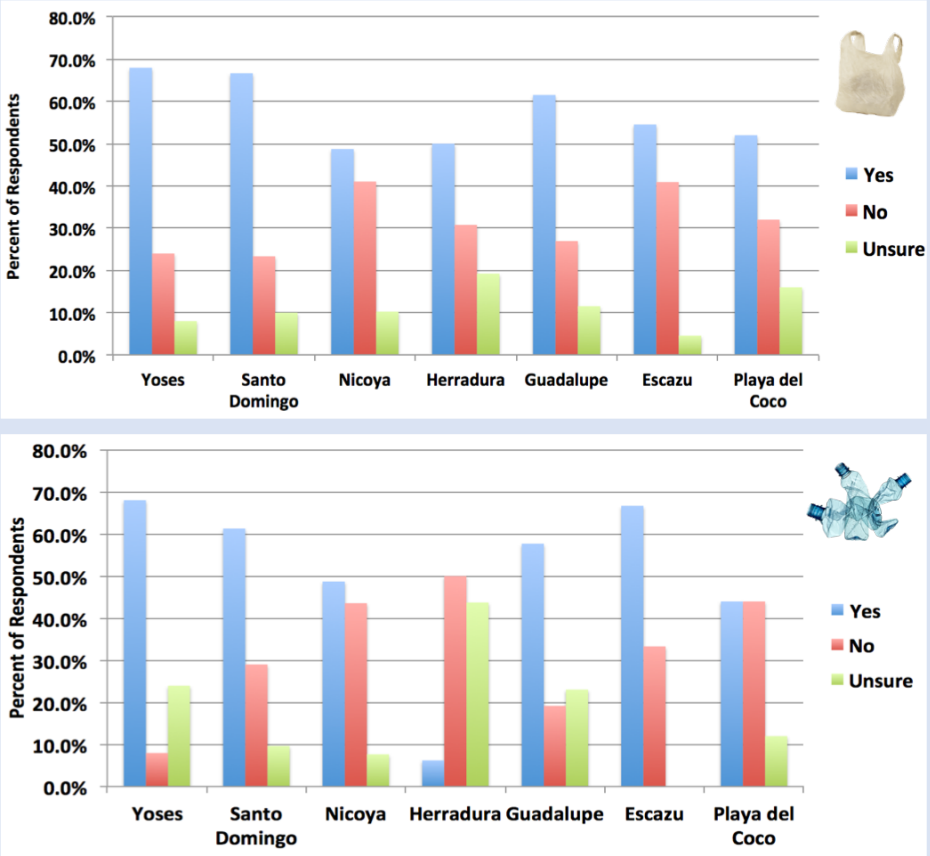
Additionally, our survey results showed that San José residents were more willing to pay a green tax on plastic bottles and bags than residents of areas outside of San José. Based on these data, we recommended that MarViva expends more resources preparing rural areas for the implementation of the plastic tax in comparison to the city areas like San José as those rural areas are more hesitant of a tax.



Willingness to Pay based on Location for Single-Use Plastic Bags (Top) & Bottles (Bottom)

Recommendations

Recommendations from Case Studies

Although MarViva has already begun educating citizens of Costa Rica about the impacts of single-use plastics through their Chao Plástico Campaign, we recommended that an additional campaign tailored directly toward educating the public on their proposed green tax would be beneficial when preparing Costa Ricans to positively respond to a green tax on single-use plastic products. The slow introduction of a green tax is also recommended. This could be done in multiple ways including the implementation of the green tax at certain supermarkets or specific cities before requiring the whole country to follow the legislation. We recommended that MarViva create a document for retailers outlining the requirements of the new policy and consequences of inaction. This document would also include a section recommending acceptable alternatives to plastic bags that stores can provide for their customers. If MarViva encourages Costa Rican retailers to provide reusable canvas bags or cardboard boxes at check-out, this would significantly contribute to the success of their tax.

Tax Rate

Based on our survey results, we suggested that MarViva place their plastic tax at approximately 100 colones per plastic bag or bottle. The majority of respondents who did not already use reusable shopping bags or water bottles said that 60 colones was the price point that they were willing to pay for a plastic tax on both shopping bags and water bottles. After the lower price point options, the highest price point option was the most popular choice indicated by survey respondents. For this reason, we suggested that MarViva chooses 100 colones as their price point for their green taxes as it satisfies the desire of the majority of respondents. Additionally, a tax that is slightly above the desired price point indicated by residents will further encourage them to change their plastic use habits.

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Using our data on the average number of bags and bottles used per week by our survey respondents and census data on the population of Costa Rica, we calculated a rough estimate of the number of plastic bottles and bags used in Costa Rica per year. Using this estimate and the assumption that the implementation of the tax will result in a 50% decrease in the amount of plastic products used in Costa Rica, we calculated the revenue that could be collected through the implementation of a 100 colones per single-use plastic product tax. Given this assumption, the tax would raise roughly 57,885,622,600 colones (101 million USD) per year through single-use plastic bags and roughly 33,573,633,600 colones (58 million USD) per year through single-use plastic bottles.

Moving Forward

In future years, work on the Chao Plástico Desechable Campaign could be continued through a follow-up study that measures the success of the green tax if it is implemented. This work could focus on gauging the feedback that consumers have on the green tax, how they feel it could be changed or improved, and if they feel the green tax has had a positive impact on Costa Rica and its ecosystems. The survey could also focus on asking questions regarding consumers' behavior before and after the implementation of the green tax to see if there was a behavioral change. Based on consumers' responses on the follow-up study, the green tax could be altered to be the most effective.

MarViva Poster in Downtown San José

Conclusion

In regard to the impacts of our project, we believe that a successful green tax could have far reaching positive impacts on human health, the wellbeing of marine ecosystems in Costa Rica, and the success of the industries that rely on healthy marine ecosystems such as the fishing and ecotourism industries.

Surveying Consumers in Herradura

By providing supporting research about the dangers of plastic pollution, case studies, and survey results, our project accomplished MarViva's main goals to further their initiatives. We surveyed 198 Costa Rican residents on their plastic usage and views on the implementation of a plastic policy and then reported this information back to MarViva. The majority of respondents to our survey, were both in favor of the implementation of a green tax and believed that a plastic tax would improve the plastic pollution problem in Costa Rica. Additionally, our research into case studies showed that the implementation of plastic policies, specifically plastic taxes, in other nations were successful in changing plastic consumption behaviors of consumers and those same practices could be implemented in Costa Rica to create a successful policy here as well. Most importantly, we established that most Costa Ricans desire to change plastic usage in their country and support MarViva's work to create legislation to enact this change.

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Authorship

This report entitled, Analyzing the Implications of a Green Tax on Single-Use Waste Plastics in Costa Rica, was collectively edited and revised by Nolan Bell, Sabrina Napoli, Carly Neeld, and Shannon Ring. The introduction, abstract, executive summary, and appendices were collectively written by all authors.

Nolan Bell: Nolan Bell contributed to writing the background in *Waste Plastics and Recycling* and *Sustainability Efforts Regarding Single-Use Plastics in Costa Rica* sections. He contributed to the methodology by writing the introduction and objectives 1, 2, and 4. He contributed to the findings section by writing about the *Impacts of Single-Use Plastics, Delhi, India, Germany, Israel, Portugal,* and the *Consumer Survey Responses and Analysis* section.

Sabrina Napoli: Sabrina Napoli contributed to writing the background in *Waste Plastics and Recycling* and *Sustainability Efforts Regarding Single-Use Plastics in Costa Rica* sections. She contributed to the methodology by writing the introduction and objectives 1, 2, and 4. She contributed to the findings section by writing about the *Impacts of Single-Use Plastics, Ireland, France, Belgium, Summary of Campaign Strategies Used in the Case Study Locations, Summary of Factors Affecting the Success of Legislation in Other Countries* and the *Consumer Survey Responses and Analysis* section. She contributed to the recommendations by writing about *Public Awareness Campaigns*.

Carly Neeld: Carly Neeld contributed to writing the background in *The Proposed 'Green Tax' Legislation* and *Tools for Advancing Environmental Campaigns*. She contributed to the methodology by writing objective 1, 2, and 4. She contributed to the findings section by writing about *Ireland, South Africa, Buenos Aires, Argentina, China, Delhi, India, South Australia,* and *Consumer Survey Responses and Analysis*. She also contributed to the *Deliverables and Project Accomplishments* section and the *Conclusions* section.

Shannon Ring: Shannon Ring contributed by writing about *The MarViva Foundation* and *Tools for Advancing Environmental Campaigns*. She contributed to the methodology by writing the introduction and objectives 1, 2, 3, and 4. She contributed to the findings section by writing about *China* and the *Consumer Survey Responses and Analysis* section. She contributed to writing the *Deliverables and Project Accomplishments* section, all parts of the *Recommendations* section, and the *Conclusions* section.

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Chapter 1: Introduction

The presence of plastic waste in the ocean and the negative effects it has on marine ecosystems is a growing problem. A study found that the human population has produced more plastic in the past 10 years than it has in the past century (D'Alessandro, 2017). This increase in plastic in the ocean has resulted in harsh consequences for marine life and ocean ecosystems. Plastic waste has also had a detrimental impact on the human food chain and health, sources of income, and access to food. Modern culture has developed a dependency on using single-use plastics such as straws, disposable cutlery, plastic bottles, and plastic shopping bags in their day-to-day lives. Single-use plastic products are convenient because these products are cheap, abundant, and easily disposed of. This non-biodegradable pollutant can remain in water and soil indefinitely and poses a significant, long lasting threat to the environment.

Costa Rica seeks to change consumption habits and eliminate the use of single-use plastics with the support of policymakers and the public. Government advocates hope to have at least 80% of the country's companies and businesses replace their disposable plastic packaging by 2021 (Aguilar, 1999). Currently in Costa Rica, the use of recycling has proven to be an insufficient way to encourage the decline of plastic waste. Many recycling facilities lack the tools needed to process the recycled waste, resulting in a large amount of the waste being exported overseas or not recycled at all.

One group working to decrease plastic pollution in Costa Rica is the MarViva Foundation. The MarViva Foundation is a non-governmental organization that promotes marine conservation through political advocacy, participatory processes, and partnerships. Their work helps sponsor new policies and standards along with raising awareness and cultivating a change of attitude relating to marine issues (MarViva, n.d.). Through their Chao Plástico Desechable campaign, they have worked to educate consumers on the negative environmental and health effects of plastic pollution and encourage them to choose alternatives to single-use plastic products. The campaign is also working to promote legislation focused on protecting marine ecosystems through funding from a 'green tax'. This green tax would counteract the negative impacts of environmentally harmful products or services by using the funds generated from the green tax for sustainable projects and therefore promoting sustainable habits by consumers.

Although significant progress in MarViva's campaign had been made and a clear goal was set going forward, they were missing valuable information that they needed in order to proceed with their campaign. Congressional elections were held in early February of 2018 during the Chao Plástico Desechable campaign, which was an important time for the campaign as the new policymakers would be the individuals voting on the legislation to implement the green tax. MarViva needed to obtain more information on plastic regulations and their success rate in other countries to convince policymakers that the new legislation would be successful. They also needed to know how Costa Ricans would respond to the implementation of a plastic regulation, as legislators were concerned about their constituents' response to a green tax on single-use plastics. Additionally, MarViva wanted to gain more information on the positive environmental and health effects of limiting single-use plastic products in order to present strong arguments to government officials arguing for the implementation of regulations for these products. This research was important in order to provide MarViva with the necessary tools to promote the pending legislation in a convincing manner and gain the support of current and incoming policymakers.

Our project aimed to provide government officials of Costa Rica with evidence in support of a plastic bag and bottle green tax. We researched the negative effects of single-use plastics on humans and the environment, prior case studies regarding legislative approaches for reducing single-use plastics, and analyzed consumers' willingness to pay a single-use plastic green tax. These findings were then used to help provide support for MarViva to dispense to legislators in order to prove the need and want for a single-use plastic green tax among Costa Rican residents. Our goal was to obtain this information for MarViva in order to provide convincing information for government officials to implement the new plastic policy.

Chapter 2: Background

Costa Rica has developed into an environmentally conscious nation that takes pride in its endeavors to live sustainably (Mckeone, 2011). From 1940 to 1987, Costa Rica's focus was not on sustainability and environmental protection, but rather productivity. The country's landscape changed from having 75% forest cover to only 21%, after a large portion of the land was converted for farming and pasture (Costa Rica, n.d.). Most of Costa Rica's income came from agricultural goods. Eventually, Costa Rican leaders realized this profit was not sustainable as the productive land soon turned ineffective as the soil became infertile (Costa Rica, n.d.). A decline in forest cover and a rapid degradation of natural habitats encouraged Costa Rican government officials to realize the benefits of retaining a healthy ecosystem (Costa Rica, n.d.). Laws and regulations began to be implemented to encourage more conservation efforts. Less trees were being cut down and banana exports increased. Along with this, Costa Rica focused on attracting more tourists while retaining sustainable, productive habits.

Costa Rican coasts have become heavily dependent on the health of their marine ecosystems. Two of the largest industries in Costa Rica are fishing and aquaculture (Nielson-Munoz & Wehrtmann, 2009). If fish populations decline due to increased plastic pollution, these industries will suffer as well as the economic well-being of Costa Rica as a whole. Another large industry in Costa Rica is ecotourism, with the coastal and marine ecosystems of Costa Rica being an important drawing factor for tourists (Weaver, 1999). Like fishing and aquaculture, the industry of ecotourism is dependent on healthy marine ecosystems. In this chapter, we evaluate waste plastics and recycling in Costa Rica, review MarViva's campaign, their proposed legislation, and effective campaigns and surveying techniques.

2.1 Waste Plastics & Recycling

To address the issues of waste plastics in Costa Rica, we researched the recycling programs currently in place in Costa Rica and import and export statistics regarding plastics for the nation. The plastics in circulation in marine ecosystems contain pollutants that harm human health and marine ecosystems. Understanding the waste management and recycling policies in Costa Rica is a critical step to addressing the issue of plastic pollution in the environment. Similarly, knowing the source of single-use plastics helps us to determine where a policy would be most influential on a national scale.

2.1.1 Recycling Programs in Costa Rica

Current recycling and other waste management systems in Costa Rica are failing to combat plastic waste pollution. The amount of solid waste generated in a year in Costa Rica exceeds 1 million tons, with a majority being dumped into four main landfills (Center for Clean Air Policy, 2013). The National Solid Waste Management Commission (NAMA) found that most of the emissions from the Ordinary Solid Waste (OSW) sub sector in Costa Rica comes from methane gas emissions at landfills and dumps (Center for Clean Air Policy, 2013). Most funds for solid waste management in Costa Rica are spent on landfill disposal fees, resulting in a lack of funds for the development of other solid waste management methods. As a result, the amount of plastic waste found in landfills and in the ocean increases.

Although many recycling programs are present in Costa Rica, there is a lack of facilities to process the recycled waste, resulting in recyclable materials, such as steel and aluminum, being exported and processed internationally. Another reason why recycling programs in Costa Rica are not reaching their full potential is because most of them are still based on a pre-sorting system. This type of system requires citizens to separate their recyclable material at home, which many find undesirable and inconvenient (Costa Rica News, 2015).

2.1.2 Plastic Import and Export Statistics

To address the issue of plastic pollution in Costa Rica, we needed to identify the amount of plastic in circulation in addition to current waste management systems. By understanding the average national volume of plastics in circulation, we can better gauge the impact of a green tax in Costa Rica.

Costa Rica imports and exports millions of dollars worth of plastic every year. In 2016, Costa Rica was the 67th largest exporter in the world, exporting 9.9 billion USD worth of goods, and the 65th largest importer in the world, importing goods valued at 14.7 billion USD (Simoes, 2017). These exports and imports include a growing number of plastics. According to The World Bank, in 2016, Costa Rica imported 1.4 billion USD and exported 597 million USD worth of plastics and rubber. The majority of Costa Rica's imported plastics and rubber came from the United States at approximately 50% of plastic imports (635 million USD). Following this was Mexico as the source of 6% of plastic imports (88 million USD), Guatemala as the source of 4% of plastic imports (56 million USD), and Colombia as the source of approximately 4% of plastic imports (45 million USD). Most sales came from exported plastics and rubber, with 29% being sold to the United States (235 million USD), followed by 17% to Panama (64 million USD), 13% to Nicaragua (54 million USD), and 9% to Guatemala (40 million USD) (World Trade Organization, n.d.).

In 2016, Costa Rica exported 1.37 million USD worth of plastic and rubber waste to China. The pressure for Costa Rica to reduce its plastic consumption became even more important due to China closing its borders to all plastic waste imports. The ban, which was announced in July of 2017 and went into effect in January of 2018, restricted the import of 24 different types of plastic waste. Before the ban in 2018, China received 7.3 million tons of waste paper, plastic, and metals, accounting for more than half of all global imports (Futurism, 2017). Since the ban on January 1st, many nations and cities already reported large build ups of plastic waste such as Canada, Ireland, Germany, and large port cities like London and Hong Kong (Freytas-tamura, 2018).

China's ban on 24 different types of plastic waste leaves nations without their main waste disposal method. This has left nations with mountains of plastic waste that are harmful for not only the environment but also human health, which is one of the reasons why Costa Rica is working toward being free of all single-use plastics in most municipalities and businesses by 2021. Many of the types of single-use plastics that are used are generally not recycled, or are recycled at

unsustainable rates. Given the challenges around recycling plastics, strategies for reducing plastic pollution must focus on reducing use.

2.2 The MarViva Foundation

The MarViva Foundation was founded by Stephan Schmidheiny in 2003 with the goal of working toward protecting the health of marine ecosystems in Panama, Colombia and Costa Rica. The foundation was based on the work of a group of environmentally concerned philanthropists that travelled through Panama, Costa Rica, Ecuador and Colombia in 2002. The founders used the information that they gathered on this trip to produce a model for creating policy and management procedures for the betterment of marine ecosystems. The foundation began work in Panama and Costa Rica, which later grew to expand into Colombia. MarViva continues its efforts in these three countries to protect marine ecosystems and raise social awareness among the citizens of these countries on what they can do to protect and preserve them. Their three main goals are to improve inter-institutional strength between the groups that rely on marine ecosystems, such as fishermen and members of the ecotourism industry, create responsible markets based on marine ecosystems to prevent over-exhaustion of resources, and create marine spatial planning for industries and stakeholders that work with marine ecosystems (MarViva, 2017).

Since its founding, MarViva has headed several initiatives and campaigns aimed at improving the health of marine environments. In Costa Rica specifically, the focus has been on sustainable fishing, preparing coastal communities for rising sea levels due to climate change, and working with the Costa Rican government to create management techniques and legislations to protect marine ecosystems. We assisted MarViva with their Chao Plástico Desechable campaign, which aimed to reduce the amount of single-use plastic products entering the ocean as plastic pollution (MarViva, 2017).

2.2.1 Chao Plástico Desechables Campaign

MarViva began working on the Chao Plástico Desechable campaign in 2015. Chao Plástico Desechable translates to Goodbye Disposable Plastic, which is the main goal of the campaign, getting both producers and consumers to say goodbye to disposable plastic in exchange for more environmentally friendly products. The campaign was designed to tackle the issue of plastic pollution in different ways. One aspect of the campaign is raising awareness among consumers

regarding the negative environmental effects of using single-use plastic products such as plastic water bottles, disposable cutlery, straws, plastic shopping bags and more. Additionally, the campaign encourages consumers to replace these disposable plastic products with products such as reusable glass water bottles, long-lasting shopping bags, and other, more sustainable options (MarViva, 2016).

Aside from raising awareness amongst everyday consumers and citizens, the campaign has also targeted lawmakers. They have done this by appealing to legislators to implement a green tax on single-use plastics for consumers that will provide funding for the protection of marine ecosystems (MarViva, 2016).

2.2.2 The Proposed 'Green Tax' Legislation

The legislation that MarViva created is titled "Ley de Creación del Fondo Nacional para Incentivar la Conservación de los Servicios Ecosistémicos del Mar y de los Recursos Marino y Costeros" (FONASEMAR), which translates to "Law to Create the National Fund to Encourage Conservation of the Ecosystem Services of the Ocean, the Marine and Coastal Resources." While MarViva has already written the legislation, it needs to be passed by congress in order to be implemented in Costa Rica. Article 1 of the legislation states the purpose of the law is to define the legal, financial, and operational structure necessary to provide funding to conservation projects that relate to conservation actions, sustainable use, research, recovery of an ecosystem, and capacity building. The objectives of the law are to establish a government agency with the ability to receive funding, regulate incentives, improve the quality of life of communities and ecosystems, and develop a way to sustainably maintain ecosystem services.

The agency created by the National Fund to Encourage Conservation of the Ecosystem Services of the Ocean, the Marine and Coastal Resources (FONASEMAR) will accept applications from individuals and legal entities that are public or private, including non-governmental organizations, local community organizations, municipalities, universities, central government bodies, decentralized entities, and research centers after they have demonstrated that they have a strategic plan for their conservation and sustainability project. The agency will develop a contract with the organization that they must adhere to and provide information on the project's' progress when requested. The result of a lack of compliance would be a termination of funds to the project.

The information explaining the funding for these projects is found in Article 19 of the bill. The green tax on the plastic packaging will be based on the calculated level of the contaminating capacity of the material which will be determined by the Ministry of Health. The Ministry of Health will classify different plastics as high, average, or low contaminating capacity based on the contamination levels of each packaging type. To do this, the Ministry of Health will investigate the materials and manufacturing process, the period of decomposition without proper handling, and the difficulty of substitution and reduction of the compounds of the packaging.

The green tax would be collected in the first 15 days of each month after the manufacturer has presented a declaration of the containers, packaging, and plastic bags ordered in the previous month. For imports, the green tax would be collected before the shipment is dismantled. The green tax will be collected by the Ministry of Finance who will then distribute the funds to the agency created by FONASEMAR to be used for environmental purposes.

2.2.3 The Payment for Environmental Services Program

The MarViva Foundation's proposed model for their law providing funding for the protection of marine ecosystems is the Payments for Environmental Services (PES) Program. The PES Program was introduced in Costa Rica in 1996 under Forestry Law 7575 in response to rapidly declining forest cover in Costa Rica. This program aimed to increase forest cover in Costa Rica through financial incentives for landowners for reforestation efforts on their land. The law also banned the conversion of existing forest land with consequences of prison time for offenders of this law. The program is based on the idea of assigning economic value to natural landscapes that provide ecosystem services, such as forests, which provide watershed protection, carbon storage, protection from soil erosion, aesthetics and much more (Princeton University, 2016).

The PES Program was headed by the Costa Rican Ministry of the Environment and executed by two sub-groups: Fondo Nacional de Financiamiento Forestal [National Forestry Financing Fund] (FONAFIFO) and the Sistema Nacional de Áreas de Conservación [National System of Conservation Areas] (SINAC). When the program first began, the parties leading the efforts clearly identified both the key stakeholders in the initiative and their main goals, which were measurable and attainable. The stakeholders were identified as SINAC, FONAFIFO, the Ministry of the Environment, landowning farmers, loggers, Fundecor (an NGO that aided in developing the PES), and the Tropical Science Center (a Costa Rican organization that performed

the forest valuation studies). By identifying the key stakeholders at the beginning of the development process, the Ministry of the Environment, along with FONAFIFO, SINAC, and Fundecor, was able to create a program that protected environmental services. Along with this, income for landowning farmers increased while still respecting the rights of private property owners. This gained the support of farmers and private landowners for the PES Program. Loggers put less support behind the program as it increased regulations on the harvest of timber. They eventually gained the support of loggers when new regulations required loggers to harvest timber in a way that aligned with the conservation and sustainability messages that the timber companies were already advertising (Princeton University, 2016).

The goals that were set for the PES Program included three main objectives: "to protect existing forests, to promote forest plantations through payments to landowners, and to get as close as possible to 70% forest cover" (Princeton University, 2016). These goals were all measurable through forest cover analyses and financial payout records through the program (Princeton University, 2016).

The financial incentives that were provided for landowners depended on where the land was located and whether the land would be a successful and popular spot for ecotourism. Land owners whose land was located in areas where ecotourism was deemed to be a feasible use of the land received 10 USD per hectare of land that they converted to forest for the purpose of ecotourism. Land owners whose land was located in areas where ecotourism was not deemed to be a feasible use of the land received financial incentives to convert their farmland from cattle or crop farming to timber farming. Landowners reported to the program on their reforestation efforts and SINAC then inspected each landowner's land every year to verify that their reports were correct and all requirements of the program were met, including required density of forests and required signage postings. Once the reports were approved and the land was inspected, landowners received their payments (Princeton University, 2016).

A number of different sources gathered funding for these financial incentives. A green tax was applied to fuel sales in Costa Rica, which served the dual purpose of decreasing carbon emissions in addition to providing funding for reforestation efforts. Funding was also gathered from the sale of Certified Tradable Offsets (CTOs), which is a system in which companies can purchase CTOs in exchange for the rights to perform acts that are harmful to the environment, usually for carbon emission allowances. Private firms also made payments for the protection of

watersheds and these payments went toward the funding of the PES program. Finally, an 8 million USD donation from the Global Environmental Facility provided most of the initial funding for the program (Princeton University, 2016). Overall, the program was extremely successful. Forest cover in Costa Rica increased from 25% in 1995 to 51% in 2005 and the PES program is still in place today.

While the PES program was successful for forestry, the program cannot be applied directly to marine ecosystems due to the fact that land can be owned by private landowners but marine ecosystems cannot be privately owned (Princeton University, 2016). Instead, MarViva plans to use the PES model to provide incentives and funding for sustainability projects proposed by individuals and communities that will benefit marine ecosystems.

2.3 Tools for Advancing Environmental Campaigns

MarViva's Chao Plástico Desechable campaign is focussed on encouraging consumers to change their habits to be more environmentally friendly. These campaign efforts can be advanced through the use of effective environmental campaign techniques that have been used in the past and are proven to be successful. One important aspect of building an effective environmental campaign in collecting public input. This can be done through surveying of stakeholders. In regards to MarViva's campaign, it was important for us to determine the willingness to pay for a green tax amongst Costa Rican residents. Willingness to pay surveys can be effectively crafted using widely accepting surveying techniques, such as the Contingent Valuation method.

2.3.1 Effective Environmental Campaigns

Similar to the PES model that rests on encouraging changes in behaviors, many environmental campaigns such as the Chao Plástico Desechable campaign, call on people to change their daily habits and ways of life in order to protect and preserve the environment. These types of campaigns can be designed in various ways, but the most effective types of environmental campaigns are the ones that are formed using input and suggestions from the people that they will affect (Brulle, 2010).

Historically, social movements have followed a similar model. They are based on a "rhetoric of salvation" in which problems are presented as doomsdays and the solutions that the campaigns are suggesting are presented as saving graces. Robert J. Brulle, author of the article

From Environmental Campaigns to Advancing the Public Dialog: Environmental Communication for Civic Engagement, describes this as a "combination of threats and opportunities, nightmares and dreams that fuels social movement mobilization and social change" (Brulle, 2010, page 93). Brulle goes on to explain that a more effective social campaign model would be one based on civic engagement that "fosters the development of enlightened self-interest and an awareness of long-term community interests" (Brulle, 2010, page 93). This argument is based on the fact that citizens are more likely to participate in environmental campaigns if they have a say in how these campaigns are formed. In cases such as these, citizens are given the opportunity to include their input regarding how a particular environmental problem will be solved and when their input is included, they are more likely to follow through with this solution. Alternatively, if a few people form a campaign and present this campaign to the public, asking them to partake in a solution to an environmental problem, the solution may be out of touch with what is reasonable to ask of those citizens. By including citizens in the formation process, this disconnect can be avoided.

Another way in which environmental campaigns can be made more successful is by increasing person-to-person communication between campaigners and targeted audiences. While large-scale social media campaigns can be effective with respect to the fact that they reach large numbers of people through the click of a button, face-to-face campaigning can be more effective because messages can be tailored to the characteristics of individual recipients (Martens & Mosler, 2008). Face-to-face campaigning can present both positive and negative effects, but when executed well, can be effective. When audiences feel that a campaigner is similar to them in terms of their views or feel as though a campaigner is of a higher socioeconomic status, they are likely to align their views with what that person is advocating. Alternatively, if audiences feel as though a campaigner has drastically different views from their own or is of a lower socioeconomic status, they may align their views opposite to what the campaigner is asking of them, regardless of how they actually feel about the subject (Martens & Mosler, 2008). However, if the campaigners tailor their message, then the campaign message comes across more effectively to individuals rather than a generalized campaign message sent out to many people over mass media.

Additional campaigns have been found to be successful using different tactics, such as the 7 Doors Model. The 7 Doors Model is a tactic that has been used by South Australia's campaign to implement a ban of single-use plastics (Government of South Australia, n.d.). It uses a seven step process, as seen in Figure 1, to develop and evaluate environmental campaigns.

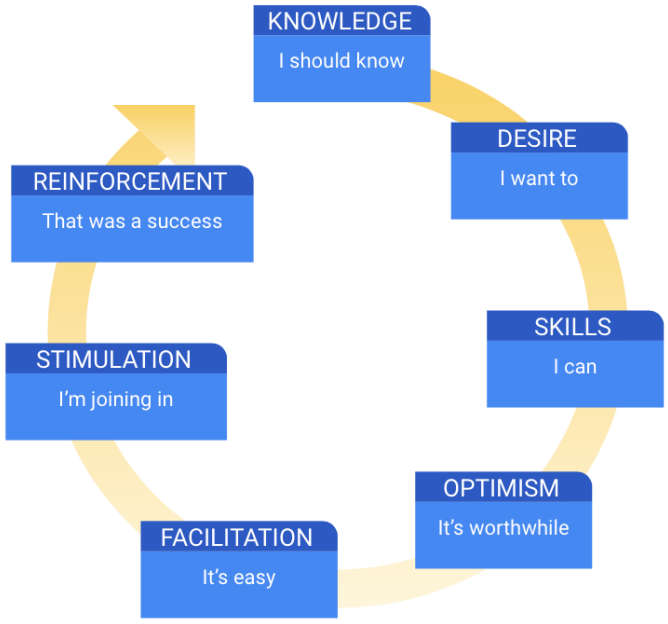

Figure 1: 7 Doors Model Diagram for Behavioral Change

The model goes through 7 phases starting with the first "door", *knowledge*. The purpose of the first "door" is to ensure that there is an awareness of the effects of the excessive use of plastic bags on the environment. This helps to establish a common purpose among the population. The next "door", *desire,* creates a sense of responsibility among people and develops the desire to give up single-use plastics through the positive advertisement campaign. The *skills* "door" uses advertisements and educational campaigns to help citizens learn the skills and gain the confidence that they need to help them give up plastic bags by educating them about alternatives. A campaign that is worthwhile and optimistic is the next "door", *optimism,* which aims to assure citizens that success is inevitable. Establishing a timeline with strict deadlines will reassure people that the regulation will be successful as it shows that they will be holding themselves and others accountable. Having a large supermarket chain participate will set an example which can be an effective way to stimulate optimism within a community (Robinson, 2007). By showing this dedication and enthusiasm about the new regulation, a greater amount of people will be more likely to support and partake in the efforts to make a change and comply with the regulation. The next "door" focuses on *facilitation* of the regulation and ensuring that the solution to the problem is convenient and easy. One way to ensure that the change in regulations is easy for everyone is by

sending out a clear message detailing the dates of when a green tax or a ban would be implemented early enough to give people time to change their habits. Each citizen and company should have a clear understanding of which bags or single-use plastics are to be regulated and which are not. This message should be given out in a variety of ways including radio, television, newspapers, email notices, letters, etc. in order to ensure that every person and company is aware of the change and its message. The next "door", *stimulation,* focuses on the tone of the advertisement campaign and distribution of information. A positive and engaging campaign is essential in order to convince people that the issue is important. This can be done through the use of celebrities, humor, or catchy advertisements targeted at different age groups. The final "door", *reinforcement,* is used to confirm that the campaign and regulation is successful, which can be done through producing positive news stories, giving grocery stores awards, and a continuation of the positive advertisement campaign. As a result, the 7 Doors Model advocates for a change in behavior and daily habits rather than enforcing the change in a way that is a burden on consumers (Robinson, 2007).

It is important to note that an effective environmental campaign is one that takes into account its audience. A campaign that is formed with the input of those who will be affected and whose message is communicated through personalized face-to-face interaction will be more effective than a campaign that is formed with little regard to the people to whom the message will be sent. The 7 Doors Model is also an effective way to make a change through human behavior and propel the success of an environmental campaign.

2.3.2 Effective Surveying Techniques for Evaluating Consumers' Willingness to Pay

An important part of determining consumers' reactions to a green tax on single-use plastics is evaluating their willingness to pay for a proposed green tax. Evaluating consumers' Willingness to Pay (WTP) requires a strategic survey design. The Contingent Valuation (CV) method elicits individuals' willingness to pay for a good service through a specified surveying method and is one of the most widely accepted methods for estimating economic values (Chotchaisathit et al., 2012). The method uses hypothetical situations and asks for statements of the amount people are willing to pay to determine the effectiveness of a green tax on single-use plastics.

Through our research, we also determined the optimal order in which survey questions should be presented. When designing the survey instrument, a statement at the beginning of the survey is necessary to briefly describe the purpose of the survey, receive consent of respondents,

and ensure confidentiality. The most important questions should be listed in the first section of the survey to ensure that respondents are engaged with the most valuable questions. The first question should relate to consumption behavior, then environmental impact awareness, and then the respondents' willingness to reduce consumption. When forming the questions, it is important to provide a reminder statement when asking a hypothetical question to provide a sense of realism. For example, reminding the respondent that reusable bags have a one-time cost and would be carried with them to the grocery store on their shopping trips (Dunn, 2012). To minimize the amount of bias present in questions, there should be an equal number of positive and negative options. The last section should inquire about demographics in order to categorize the type of respondents that are surveyed.

The Contingent Valuation method has been used in several other studies around the world. In China, Yan Wang of Shandong University studied the WTP for better air quality by surveying a sample size of 1,500 people using face-to-face interviews and a combination of hypothetical and open-ended questions to collect respondents' WTP (Wang, 2008). The hypothetical question states:

> ''Currently, the urban area in Ji'nan meets Class III air quality standards. In order to fulfill the stringent Class II air quality standards, a series of improved actions must be employed. Obviously, the implementation of these programs incurs cost, which would be directly or indirectly paid by us. When you consider your household's income and expenditure are you willing to pay this cost so that this aim can be achieved?'' and gives the option to answer "yes" or "no" (Wang, 2008).

The WTP questions asked "If you are willing to pay for air quality improvement, what is the maximum amount you would be willing, and able, to pay for it?" and provided a space to enter in a price they would be willing to pay (Wang, 2008). The results concluded that 87.9% of the population was concerned about the air quality, and 40% believed that there was no incentive to provide funding to improve the air quality (Wang, 2008). Wang's study also found that annual household income was a large factor in WTP responses along with the amount of pollution in the air near citizens' homes.

Chao-Hsiun Tang of Taipei Medical University and Jin-Tan Lui of National Taiwan University used the CV method to find the public's WTP for drug abuse treatment programs. The survey focused on hypothetical scenarios and policies and the respondents' WTP for a compulsory green tax or through voluntary donations. They conducted the survey through a telephone interview using randomly dialed numbers (Chotchaisathit et al., 2012). The results showed that the majority of the Taiwanese public was willing to pay around NT $90.00 per month for a drug abuse program and was more willing to pay through a compulsory tax than voluntary donations (Chang et al., 2007). This study gave policymakers information on the cost of the drug abuse program and provided enough information to form policies.

Jarod Dunn of Utah State University investigated the residents of Logan, Utah and their Willingness to Pay and Willingness to Accept (WTA) a green tax on plastic bags using the CV method. Dunn used the "cheap talk" technique to remind the consumer that bags have a one-time cost and would be carried with them to the grocery store in order to instill a sense of realism before asking a hypothetical question. The question used values chosen from the deviation of $0.15 which was based on the social cost of plastic bags. The question asked the hypothetical question of how much people would be willing to pay if there was a green tax on plastic bags. The options provided were $0.05, $0.10, $0.25, and $0.35. There were three rounds of pre-testing to ensure that the survey would provide accurate data. They sent the survey out as an online survey by delivering postcards to houses along with soliciting in front of grocery stores. The postcard provided a link to take the survey and a unique code to enter to win a raffle prize. About 1,200 postcards were produced and resulted in 216 replies, a response rate of 15.4% (Dunn, 2012). The estimated social cost was about $0.10 per bag, however, Dunn's research showed that an even smaller green tax on plastic bags would significantly decrease its usage.

The CV method measures hypothetical market data rather than concrete results. In order to obtain informative results about consumers' WTP, we had to discover the hypothetical amount at which they would switch to alternatives rather than single-use plastic. Using the CV method to address consumers' WTP allowed us to understand the public response to a green tax.

2.4 Sustainability Efforts Regarding Single-Use Plastics in Costa Rica

Through the Chao Plástico campaign, MarViva is working toward the goal of implementing a national regulation on single-use plastics. Similar campaigns have been established to work toward that same goal. According to the United Nations Environment Programme, or UNEP, the "Clean Seas" campaign aimed to have both countries and businesses eliminate microplastics in marine ecosystems by imposing a single-use plastic regulation by 2022 (UNEP, 2017). The UNEP reports that up to 80% of waste in the ocean is plastic and that there are eight million metric tons of plastic in the ocean every year (UNEP, 2017). The costs are estimated to be at least 8 billion USD in damages to the marine ecosystems. According to the UNEP, Costa Rica is one of ten countries involved with the Clean Seas campaign. By implementing a policy on single-use plastics, the Clean Seas campaign and the Chao Plástico campaign have the ability to significantly reduce the quantity of single-use plastics and demonstrate a positive change to other countries.

The Marine Pollution Bulletin offered more information about plastic reduction efforts to reduce debris in marine ecosystems. In 1988, a complete ban of plastic disposal at sea was enacted, however, there was a need for a stronger regulation. The marine debris problem has a direct correlation to the incorrect disposal of waste on land. The Marine Pollution Bulletin states that many countries lack implementation strategies, but the most common method to enact change is by reducing single-use plastics at the source and using education campaigns (Walker & Xanthos, 2017). The aforementioned article also included a list of countries that have enacted a regulation on single-use plastics, when the legislation was established, and what the policy entails. Costa Rica does not have an existing legislation on single-use plastics; however, there are organizations that contribute to the health of ecosystems in the nation.

2.4.1 Supporting Programs in Costa Rica

A previous study of ecosystem health and sustainability in Costa Rica found that the nation had approximately one quarter of its area under a conservation regime (Aguilar, 1999). These entities protect specific areas, primarily around urban areas, through the use of private ownership and management. For example, the Center for Sustainable Development Studies in Costa Rica focuses on issues such as climate change, biodiversity conservation, land-use impacts, tourism impacts, pollution and waste management, and natural resource and waste management.

Organizations such as MarViva and the Center for Sustainable Development Studies help to ensure the conservation of Costa Rica's natural resources.

Among the entities previously mentioned, there are other impactful groups dedicated to the preservation of Costa Rica's natural ecosystems. The Planeterra Foundation has similar goals of sustainability through the education of youth about good recycling habits (Planeterra Foundation, 2012). By teaching the whole community, the REDCICLA group has the potential to positively impact the public by informing citizens about the threats of using single-use plastics. REDCICLA's program focuses on teaching the community with a step by step approach. The program is run by a government sector and is labeled "La red de reciclaje de Costa Rica" or "Recycling Web of Costa Rica" in English (REDCICLA, 2010). A third program is known as PREVDA, or Programa Regional de Reducción de la Vulnerabilidad y Degradación Ambiental. Translated to English, this means the "Regional Program for the Reduction of Vulnerability and Environmental Degradation". PREVDA is run by a combination of independent entities and the government to pass environmental laws throughout regions of Costa Rica (PREVDA, 2010). The protected areas in Costa Rica are most effectively impacted by the combined effort between community organizations and government agencies (Aguilar, 1999). These organizations also provide hope that a portion of the population cares enough about the environment to make a positive, lasting change to the nation. From their collective efforts, environmental progress occurs at multiple levels which can provide the opportunity, with increased awareness, for the issues surrounding single-use plastics.

Chapter 3: Methodology

The goal of this project was to analyze the implications of regulating single-use waste plastics in Costa Rica and to provide recommendations regarding the implementation of MarViva's green tax. The following objectives listed were used to accomplish our goal:

1. Compile scientific evidence on the environmental and health benefits of reducing plastic pollution.
2. Create a document outlining multiple case studies regarding the implementation process of environmental legislation on single-use waste plastics and its respective outcomes.
3. Determine how citizens of Costa Rica will respond to the implementation of a national green tax on single-use plastics through analyzing consumers' willingness to pay.
4. Provide recommendations and supporting evidence for a green tax on single-use plastics to MarViva through a detailed document and an additional tool that can be provided to legislators with condensed and summarized information.

These objectives allowed us to focus our data collection on what would benefit MarViva and Costa Rica as a whole. We gathered scientific evidence pertaining to the need for a green tax on single-use plastics. We analyzed multiple case studies to see how it affected stakeholders and their respective success rates. Due to the different approaches of policies implemented, investigating how they were enacted and enforced helped provide MarViva with useful and relevant recommendations.

In Costa Rica, we distributed surveys regarding consumption habits to consumers at a popular grocery store chain, Auto Mercado, and provided flyers with QR code links to an online survey in public areas including Plaza de la Cultura in San José. This method of data collection allowed us to determine how consumers would react to a green tax on single-use plastics. We focused on the consumers because they would be directly affected by the green tax. Store managers and manufacturers will pass the green tax on single-use plastics to the consumers and therefore, manufacturers will not be affected by the legislation in the same way as consumers. Our sponsor wanted to collect information about the public response in order to provide evidence and support of the green tax when discussing with legislators because policymakers' biggest concern is their

constituents' responses. We compiled information and observed trends in the data. After gathering all the necessary data and research we created a full report in support of the legislation along with a short fact sheet and memo to be used by MarViva to help convince and gain the support of legislators for the green tax legislation.

3.1 Objective 1

Compile scientific evidence on the environmental and health benefits of reducing plastic pollution.

MarViva's efforts are focused on protecting the health of marine ecosystems. The organization is devoted to the welfare of the environment and also the health of citizens of Costa Rica, Panama, and Columbia. Currently, MarViva has ongoing legislative efforts including one single-use plastic bill under consideration. Their current effort is in anticipation of the bill being brought up for reconsideration after the Costa Rican election season. MarViva continues advocating for legislators to pass the regulation on single-use plastics for the benefit of marine ecosystems and the health of citizens. In order for us to provide quality recommendations to MarViva on how they should enact a plastic policy, it was important for us to understand the magnitude of the plastic pollution issue in Costa Rica and globally as this was a key factor contributing to MarViva's ability to enact the policy. By providing evidence to correctly inform the policymakers in Costa Rica, we hoped to increase MarViva's ability to promote the single-use plastic legislation.

For an argument to be made for a regulation on single-use plastics, the research that we obtained needed to be accurate and credible. We ensured the credibility of the material we found by cross-referencing various articles, using well known sources, and finding unbiased and objective data. We determined human health, ecosystem health, and marine species' health to be the most important topics related to plastic pollution so we focused our research on these three topics.

After collecting the environmental and health evidence for a plastic policy, we compiled the data into a document for MarViva to use in their efforts to reduce single-use plastics in Costa Rica.

3.2 Objective 2

Create a document outlining multiple case studies regarding the implementation process of environmental legislation on single-use waste plastics and its respective outcomes.

MarViva aimed to implement a green tax on single-use plastics in Costa Rica to combat the growing issue of plastic waste. Before this implementation, they needed to investigate other campaigns and strategies that have been put into place around the world. This was necessary in order to learn about the effective and ineffective strategies implemented and the reasons behind their various levels of success. While we acknowledged that we would not be able to research every strategy implemented to decrease the use of single-use plastics, the information and feedback from other places around the world that we collected helped to determine an effective approach.

In order to provide recommendations to our sponsor, we took into consideration several parts of the world including Ireland, South Africa, Argentina, China, India, Germany, France, South Australia, Israel, Portugal, and Belgium. The comparison of policies provided a broad perspective on different types of economies and societies. We investigated the general problem that each location faced regarding single-use plastic waste and the steps taken to measure that problem. This helped when comparing the issue in Costa Rica to other locations. Reviewing the implementation processes of different single-use plastic policies was important when providing recommendations. We also compiled information on the amount of time that each country spent preparing their residents for their legislations, as well as information on the measures they took to enforce their legislations. This research provided information that was critical to aiding the development of Costa Rica's legislation and provided evidence of successful plastic regulations in order to gain the support of other legislators in Costa Rica. Discovering the effectiveness of each type of implementation helped MarViva to better direct its campaign in a way that will leave Costa Ricans and legislators more receptive to the regulation.

3.3 Objective 3

Determine how citizens of Costa Rica will respond to the implementation of a national green tax on single-use plastics through analyzing consumers' willingness to pay.

In order to gain information on how residents of Costa Rica would respond to a green tax on single-use plastics, we surveyed shoppers at six different locations of a popular grocery store chain in Costa Rica and in public areas around San José and Guanacaste. Grocery stores were chosen as the optimal location to survey Costa Rican residents on this topic because the consumers at these locations are the people who will be most affected by a green tax on single-use plastic shopping bags as this is the predominant form of packaging for grocery store products. We chose to also survey at parks and plazas as these areas were highly populated with Costa Rican citizens in one place, making it easy to reach numerous people in a short period of time.

A 2012 study found that among the most popular supermarkets visited throughout the country, Auto Mercado is the most expensive market to purchase the most basic grocery items (Lopez, 2013). At the end of 2017, Auto Mercado was still expanding, and currently has 21 different locations throughout Costa Rica, with 11 in the capital city of San José and the rest scattered around the country. We chose to survey at Auto Mercado grocery store locations because our sponsor, MarViva, had an existing relationship with the chain. Auto Mercado grocery stores were founded by a Costa Rican family and had worked with MarViva on past sustainability initiatives, including selling only sustainably caught fish in their stores and making plans to discontinue the use of plastic shopping bags at one of their locations. Our sponsors met with the Auto Mercado management and arranged permission for us to survey at the six specific locations throughout Costa Rica. Two store locations were in the north-western region of Costa Rica, in Playa del Coco and Herradura. The four additional stores where surveys were conducted were located in central Costa Rica around San José at Multiplaza Escazu, Yoses, Guadalupe, and Santo Domingo. These supermarkets were located in areas of the country with different socioeconomic statuses which allowed for us to reach a wide range of respondents with different social and economic backgrounds among our six surveying locations. This form of surveying gave us a wide range of individuals throughout the country providing us with a diverse sampling group.

The fact that we surveyed at Auto Mercado, a relatively high end grocery store with a history of sustainability, may have introduced bias to our survey results. This is due to the fact that

the shoppers who frequent Auto Mercado, and therefore the respondents to our survey, are most likely amongst the wealthier residents of Costa Rica and value sustainability. While this bias may have been present, we took measures to eliminate this bias by surveying at the different Auto Mercado locations listed above that were located in different areas of Costa Rica in different social and financial class areas. Additionally, we collected survey responses at public spaces in addition to Auto Mercado locations in order to obtain responses from Costa Ricans who do not shop at Auto Mercado in addition to those respondents who do shop at the chain.

Along with surveying in grocery stores, we also handed out QR code flyers to allow citizens to take the survey on their own time. The flyers were handed out in a public area, Plaza de la Cultura in downtown San José. The Plaza de la Cultura is a downtown area with restaurants, storefronts, and street vendors and is mostly accessed by pedestrians as opposed to vehicles, making it an easy public space to hand out QR codes. The QR code and link on the flyer led citizens to take the survey online in either English or Spanish. The online surveying tool that we used, Qualtrics, allowed us to easily see trends in the data for those who completed the survey online. Both the online and in-person surveys contained the same questions.

Finally, we surveyed people at Parque Recaredo Briceño in Nicoya. This public park area was a green space in the middle of Nicoya where most people were sitting on benches or watching their children as they played in the park. This park was located in one of the poorest regions of Costa Rica which allowed us to reach a lower socioeconomic class of citizens than we were likely to reach in the shopping areas that we surveyed at in San José. We handed out QR codes and surveyed at both the Plaza de la Cultura and the Parque Recaredo Briceño, respectively, for approximately two hours each.

When surveying at grocery stores, we sent two members of our team to survey shoppers inside of Auto Mercado while two members of our team were positioned outside of the entrance to the store to survey people as they walked by or into the store. We had six hard surfaces and pens for people to take surveys with which allowed each team of two to survey three people at once. Due to this constraint on the number of people that could be surveyed at once, the group of two team members standing outside of the store were not always able to stop everyone that walked by, but most people were asked by the other team of two group members to take the survey once they were inside the store and shopping. To avoid asking people to take our survey more than once, the

two team members standing outside of the store only asked people to take our survey when they were on their way into the store and not on their way out of the store.

The survey addressed five topics that focused on different points of information. The first section of the survey served as a brief introduction for the respondents, while also explaining that the survey was optional and anonymous.

The second section included survey questions intended to gauge the consumption behavior of single-use plastic bags and plastic bottles by Costa Rican residents. These questions inquired about how often respondents used single-use plastic bags or plastic bottles, if they ever used reusable alternatives, and if not, why they didn't use reusable alternatives.

The third section focused on questions meant to gauge the respondents' willingness to pay a green tax. Questions that were asked in this section inquired as to what was the maximum price respondents were willing to pay on single-use plastic bottles and bags before they switched to reusable alternatives. We prefaced this section with a "cheap talk" statement in order to prepare consumers for the hypothetical Willingness to Pay question in order to provide a sense of realism of the situation. This consisted of a statement reminding consumers that reusable bags and bottles are to be carried with the consumer from home and that the green tax would instigate an additional cost on bags and bottles. This method was necessary in order to elicit an accurate response.

The fourth section of the survey contained questions that inquired about the respondent's awareness of the environmental issues caused by single-use plastic bags and bottles. These questions inquired about whether respondents thought single-use plastic products were significantly harming the environment, how they knew about plastic pollution issues, and if they thought a green tax on single-use plastic bags and bottles would help to significantly alleviate these issues.

Finally, the fifth section of the survey focused on the demographics of the respondents and asked questions about age, average monthly income, main form of transportation to and from the grocery stores and other similar questions. The demographics section allowed us to find out information about the respondents that allowed us to find patterns in our data based on social and economic backgrounds. We chose to ask about average monthly income as opposed to average yearly income because it is uncommon in Costa Rican culture for people to think about their wages in the long-term mindset of yearly incomes. Our aim with administering these surveys was to

obtain as many responses as possible in order to garner a greater understanding of the general attitude toward green taxes on single-use plastics among Costa Rican residents.

When administering the surveys in person, there was a language barrier between our team and most of the respondents who took the survey as the predominant language of Costa Rica is Spanish and our team is made up of four native English speakers. We overcame this language barrier by working in two teams of two while administering the surveys where one of us conversed with the survey respondents and the other person only listened to the conversation in an attempt to better understand the respondent's Spanish. This allowed the one person that was only listening to be able to help the person that was conversing with translations if they had trouble understanding the Spanish of the respondent. Additionally, when we approached consumers asking them to participate in our survey, we prefaced our conversations by explaining that we were not native Spanish speakers and asked them to speak slowly with us so that we could best understand what they were saying and communicate with them.

3.4 Objective 4

Provide recommendations and supporting evidence for a green tax on single-use plastics to MarViva through a detailed document and an additional tool that can be provided to legislators with condensed and summarized information.

We determined recommendations for MarViva through extensive research of health and environmental impacts from scientific research studies as well as examples of the effects of single-use plastics in other places around the world. By examining how other policies around the world were implemented and the evidence used, we were able to tailor that information to relate to Costa Rica and provide quality information for MarViva.

When creating recommendations from case studies, we reviewed the research and evidence that other countries found to support their policy. We also reviewed how these countries implemented the policy in terms of how they conducted their campaign and prepared the public for the change. We evaluated details of the green tax or ban and what specific plastics were regulated. Lastly, we reviewed the results from the policy including the public's response and

changes in behavior, the manufacturers' responses, and the use of the extra funds if applicable to the study.

After conducting our surveys, which are described in the section above, we summarized the survey responses after analyzing the data to understand different trends. We first looked into determining if consumers were willing to pay a green tax on single-use plastic bags and bottles and then determined the value that most consumers would be willing to pay. From our analyses, we looked at the independent variables, demographics and geography, to see if there was any relation between location and responses or if there was a relation to income, age, gender, or method of transportation to a grocery store. We also looked at the tradeoffs between the level of green tax and potential outcomes in terms of impacts on the funding from FONASEMAR, reducing plastic bag use, and employment within the country. With this, we were able to recommend to MarViva the maximum green tax that people would be willing to pay.

Chapter 4: Findings

4.1 Impacts of Single-Use Plastics

One of the greatest threats to the health of Costa Rica's marine ecosystems is plastic pollution. Approximately 8 million tons of plastic are disposed in the ocean every year worldwide. This plastic has detrimental effects on the marine organisms that live in the ocean. It is estimated that 690 species of organisms have encountered debris in the ocean and 92% of this debris is plastic (UNEP, n.d.). Plastic is often mistaken for food and ingested by marine organisms which causes serious health problems that are potentially fatal for marine life. A study led by researchers at the Commonwealth Scientific and Industrial Research Organisation and Imperial College London investigated the effects plastic waste has on seabirds. From 1960 to 2010, the amount of seabirds found to have plastic in their stomachs increased from less than 5% of seabirds to 80% of seabirds, and this number is predicted to continue rising to 99% of seabirds by 2050 (CSIRO, 2015).

Since plastic is non-biodegradable, it will only break down to a certain extent through photodegradation into very small pieces of plastic, also known as microplastics. These smaller pieces of plastic are more difficult to remove from the ocean than plastic that has not broken down at all. Fish consume these plastic microfibers floating in the ocean which then move up the food chain through trophic transfer. The negative impacts to an organism as a result of this can include negative reproductive effects, an increased frequency of genetic mutations, and even the possibility of cancer (Katsuhiko et al., 2011). Not only is the environment in Costa Rica being affected negatively by plastics, but human health is also at risk.

Plastic pollution negatively affects humans by contaminating potable water. Bisphenol A (BPA) is used in many plastic products and is harmful to human health. As polymer chains that make up BPA break down, they can leach into water or the ground of landfills which can then be carried into bodies of water when it rains. The chemical compound found in plastics that makes them harder to break and more flexible, also known as phthalates, can also negatively affect human health (Centers for Disease Control and Prevention, 2017). Phthalates are an additive to many plastic products, which can impact testicular development in humans. Similarly, nonylphenol is also an additive that has the potential to impact the endocrine system, which affects metabolism

(UNEP, 2016). The toxins from plastic particles can also bioaccumulate inside the systems of organisms after being ingested. In addition to the BPA and phthalates previously mentioned, plastics also contain nonylphenol and styrene monomers among other chemicals. The combination of these chemicals have the ability to attract particles once in the ocean including metal fragments. Once ingested, the pollutants disperse throughout the organisms' digestive and endocrine systems, as well as spreading carcinogens and mutagens throughout the environment. BPA can also affect the brain and prostate glands in fetuses and newborns. This exposure to the harmful chemicals found in plastics can cause health issues like increased rates of heart disease and diabetes (The Nelson Institute for Environmental Studies, University of Wisconsin-Madison, n.d.). The combination of chemicals found in plastics can have negative impacts for both marine organisms and humans.

Bivalve organisms such as molluscs were used to study the ingestion effects of plastic pollution on an organism. Molluscs are filter-feeders, meaning that they consume small particles and help to purify water. As a small organism that feeds on fragments, increasing amounts of microplastics are ingested as greater levels of plastic enters the ocean. The bivalves are at risk due to their small size and status as a common food source to a variety of predators. They become more toxic to predators through biomagnification, which is the process of the concentration of a substance in organisms' tissues raising at increasing stages of the food chain (Bayas et al., 2017). The harmful health effects to bivalves include damage to digestive cavities, body tissue, and circulatory systems. Microplastic particles can move to the circulatory system within 3 days, but they can remain in the organism for 48 days. Bivalves that are killed or impaired from plastic ingestion lead to less purified ecosystems in addition to causing increased negative health effects to their predators (Bayas et al. 2017).

The seafood that many humans consume then has the possibility to pass on the carcinogens and pollutants, establishing a need for humans to take caution and think about where their food comes from. A study in the United States found debris in 25% of individual fish, 33% of shellfish, and 67% of all species (Baxa et al., 2015). These statistics prove that when humans consume seafood, there is a possibility of those same toxins entering the human digestive system and spreading throughout their bodies. Scientists are still researching the definitive effects to the human body since this is a relatively new issue due to the ever-increasing amounts of plastics in

marine ecosystems. It can be difficult to gauge the effects of plastic ingestion on human health due a variety of factors including the extent of accumulation of microplastics in the organisms' digestive cavities, the translocation of microplastics throughout the body, and the shape of the particles. When microplastics translocate in an organism, the pollutants carried migrate from the gut to the circulatory system and can cause systemic damage within the body (EFSA, 2016). In 2016, Mark Brown of the University of California at Santa Barbara began a three-year study to determine the concrete effects of plastic particles in an organism as well as focusing on a test method for the impact on human tissues from microplastic particles (Seltenrich, 2015). Another scientist, Heather Leslie from the University of Maine, discovered that nano-size particles, which are between 1nm and 100nm, can enter the placenta and blood-brain barrier of an organism in addition to causing negative impacts to the gastrointestinal tract and lungs (Seltenrich, 2015). Nanoplastics are more difficult to study due to their decreased size compared to normal analytical techniques used when observing microplastics; their smaller size makes them more dangerous because they have an increased chemical reactivity. Nanoplastics may also impact all organs, and the dangers from nanoplastics include damages to gut epithelium, the immune system, inflammation, encapsulation, and cell damage (UNEP, 2016). While scientists continue their research on these topics, there is a definite need for caution when humans consume seafood. In the meantime, there is reason for concern for the marine ecosystems alone, especially since some of the organisms that work to filter and clean the ocean are being impacted by the many issues that arise from plastic pollution. As the percentage of plastic consumed by fish increases, human health has a greater possibility of being affected.

4.2 Case Studies of Single-Use Plastics

Costa Rica is not the first nation to undertake the initiative of implementing a single-use plastic policy. Studying both successful and ineffective campaigns for green taxes and bans on single-use plastics provided us with supporting information from around the world. A variety of sources and case studies offer a broad array of experiences that MarViva can draw upon in order to create a successful campaign to reduce single-use plastics in Costa Rica.

In an effort to determine what approach the MarViva Foundation should take to implement a green tax on single-use plastics, we researched and evaluated multiple case studies. We found that a green tax on single-use plastics would be the most beneficial because it allows the

government to gather funds for further sustainability initiatives while also causing a behavioral change in the consumption of plastic products.

4.2.1 Ireland: Positive Behavioral Change after a Plastic Bag Tax

In 2002, Ireland became the first country to pass a plastic bag tax to help change the behavior of consumers. Before implementation of the new regulation, Ireland produced 1.2 billion shopping bags annually (Seattle Bag Tax, 2008). An initial tax of 15 euro cents was implemented on single-use plastic bags. Since then, the tax has been raised to 22 euro cents if consumers wish to use a plastic bag with their purchase. The tax resulted in a 94% decrease in the use of plastic bags within weeks and imposed a national responsibility on Ireland's citizens (Rosenthal, 2008). Three months after the tax was implemented, the government found that stores used about 277 million fewer bags than in previous years. In addition to the implementation of a tax, they launched an advertising campaign that drastically changed consumer attitude toward plastic bags throughout the country. Plastic bags became a taboo accessory and resulted in people finding alternatives to plastic bags. The *Bag for Life* campaign in June of 2008 encouraged the use of reusable bags and recycling programs which resulted in an increase of 1200% in reusable bag sales (Finn, 2008).

The initial costs of implementing this new regulation was approximately 1.9 million euros which was spent on administration and publicity costs for the new plastic tax (MARLISCO, 2017). The tax quickly made up these costs by generating over 10 million euros in funds within the first year. These funds went directly to the Environment Ministry to fuel clean-up projects and enforcing campaigns to minimize plastic bag usage (Rosenthal, 2008). Since Ireland imported 79% of plastic bags, there were no major manufacturers in the country opposing the new regulation and it eliminated one of the country’s biggest imports (Seattle Bag Tax, 2008). By 2007, plastic waste found in Ireland represented less than 1% of the nation’s waste (MARLISCO, 2017). The successes of Ireland's plastic bag tax serve as an example for other countries around the world.

4.2.2 South Africa: Concern about a Regressive Green Tax on Single-Use Plastic Bags

Before 2003, eight billion plastic bags were used each year in South Africa. The government realized plastic waste presented a problem for the environment, marine life, and farm life. Plastic bags were originally free and non-recyclable until legislators understood the true impact and environmental dangers of excessive plastic use.

The Department of Environmental Affairs and Tourism found that the amount of plastic waste was growing exponentially and that there were no leading organizations to combat this issue. The government and public organizations, along with labor and business representatives, worked to develop regulations for plastic bag usage. The first agreement enacted regulations on the thickness of plastic bags as well as the type and amount of ink used to print images on the bags. Additionally, it made the cost of the bags transparent to the public while also imposing a tax. The minimum thickness of plastic bags was raised to 24 μm, or micron thickness, in hopes of encouraging consumers to reuse their more durable plastic bags (Dikgang, 2012). This increase in thickness of the plastic bags resulted in an increase in the cost of the bags. As a result, the store owners realized that they did not want to continue to absorb the cost of bags in food prices and decided to charge for bags. This fixed price was set at 46-rand cents per bag. An additional 3-rand cents levy was imposed, and then was increased to 4 rand cents. Citizens became concerned as to where the tax revenue was going which then pressured the government to be more transparent regarding the financial aspects of the regulation.

An issue that South Africans found as a result of the efforts to diminish plastic bag usage was the amount of jobs lost due to the decrease of 80% in sales of single-use plastic bags (Hasson et al., 2007). Another issue with regulating plastic bags and their strength was that the lower socioeconomic population in rural areas relied on high strength plastic bags to carry their goods long distances. The implementation of a range for bag thickness lowered the original thickness used in rural areas. The enforcement of thickness measurements greatly affected the rural population and their ability to carry items back from stores. The tax also posed an economic burden to this part of the population. Retailers started to target middle and higher income consumers to introduce reusable bags while ignoring the lower income population and ways to accommodate them.

As a result, the charge of 46-rand cents per plastic bag decreased plastic bag purchases by 70% three months after the legislation was introduced. After plastic bag manufacturers advocated for a lower price, the prices for bags began to fall and different supermarkets started to change their prices. The low-income retailers saw a decline in prices by 19% while the upper and middle income retailers saw a decline in prices by 62% and 46% respectively. Along with this, a survey conducted found that consumers were not reusing plastic bags, as the legislation intended, due to

the inconvenience of bringing plastic bags to supermarkets and reusing the other plastic bags for purposes resulting in disposal in waste dumps.

After studying the effects of the legislation from 2002 to 2008, which includes time periods before the legislation was enacted, the legislation for a plastic bag tax was determined to be regressive. Consumers were originally affected by the initial prices implemented, however, as consumers became more accustomed to paying for the tax and saw a decrease in the prices, the plastic bag usage began to rebound. This result indicated that the plastic bag tax was only semi-effective, succeeding only in reducing plastic bag usage for a short period of time.

4.2.3 Buenos Aires, Argentina: Observed Increase in Reusable Bag Use after Tax Implementation

The Environmental Protection Agency (EPA) of Ciudad Autónoma de Buenos Aires (CABA) implemented a single-use plastic bag tax in 2008 that then evolved into a ban in 2012. There were originally 1.05 billion plastic bags delivered to Buenos Aires every year that polluted the city. In 2008, a tax of 0.025 USD for medium sized bags and 0.04 USD for large bags was implemented to disrupt consumers' automated choice of accepting plastic bags (Caballero et al., 2014). The goal of this tax was to cause consumers to consciously think about their plastic bag usage.

Two studies were conducted collectively by the University of Buenos Aires, Instituto de Investigación en Luz, Ambiente y Visión, the University of Groningen, and the Open University Interamericana to observe plastic bag usage before and after the charge was implemented. They compared supermarkets where the tax had been implemented and supermarkets where that tax had not been implemented. About 460 consumers were observed at six supermarkets and were categorized into three categories: exclusive use of plastic bags, exclusive use of reusable bags or carried products, and mixed use of plastic and reusable bags. Their observations were conducted four different times throughout the implementation of the tax. The first time was when plastic bags were free of charge, the second time was the first weekend after the charge was implemented, the third time was four weeks after the charge was implemented, and the last time was nine week after the charge was implemented. The supermarkets that began charging a tax are marked in Figure 2 with a dollar sign. It was apparent that once the supermarkets began charging a tax, the use of

reusable bags started to increase. The supermarkets without the plastic tax charge also saw an increase in reusable bag use due to the changes in attitude and habits of consumers in the area.

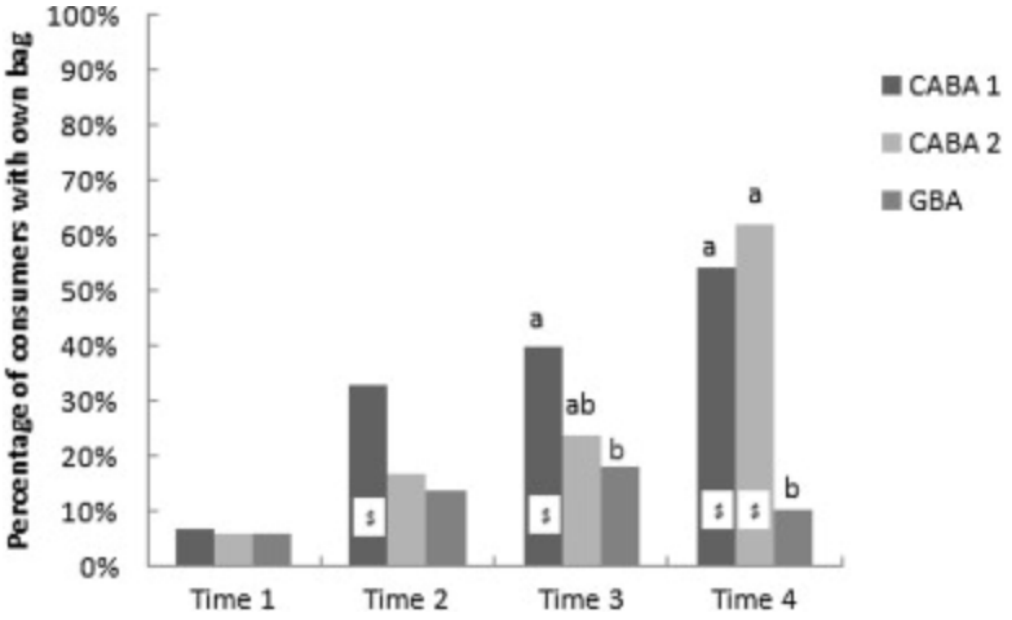

Figure 2: Reusable Bag Use in Supermarkets in Buenos Aires (Caballero et al., 2014)

The second study focused on the motivations that caused people to switch to using reusable bags after the implementation of the charge They analyzed the support for the plastic policy and the reasoning behind the lack of support along with the relation of policy support and bag use behavior. The study used a questionnaire to survey 189 consumers to determine their plastic bag use habits. About 42% stated that they agreed with the plastic bag charge, and 58% disagreed with the tax. They also found that environmental concern was the most popular reason for supporting the plastic bag tax and financial consideration was the biggest factor that caused people to not support the policy. They also concluded that the support of the policy was not related to consumers' observed behavior.

The single-use plastic bag tax in Buenos Aires successfully changed consumers' behavior to use reusable bags. It also helped to change the habits of consumers that didn't visit a supermarket with the plastic charge. In 2012, the government of Buenos Aires passed an even stricter regulation on plastic products by implementing a ban on single-use plastics. Supermarkets had to replace

single-use plastic bags with bags made from biodegradable material within 2 years of the passing of the legislation (Caballero et al., 2014).

4.2.4 China: A Change in Behavior after the Implementation of a Plastic Bag Ban

China faced the challenge of plastic bag waste throughout the country and its waterways. In the 1980s, plastic bags were marketed as a cheap and easy way to transport items and caused the sales of plastic bags to flourish. China would spend about 24 billion Chinese Yuan (3.6 billion USD) on plastic bags each year. Eventually, plastic bags accounted for 5% of landfills, which pushed the Chinese government to implement and enforce plastic regulations (Block, 2017). For the 2008 Olympics, China advocated for a "green" Olympic games. The *Administrative Bylaw for Non-free Use of Plastic Shopping Bags in Retailer Situations* was created by the Ministry of Commerce, National Development and Reform Commission, and State Administration for Industry and Commerce to ban the use of plastic bags in supermarkets and add a price to plastic bags in smaller stores. The State Administration of Industry and Commerce also proposed the threat of fines on shops that distributed free bags (Block, 2017). One of the negative outcomes was that Suiping Huaqiang Plastic, a plastic bag manufacturer located in China, experienced the effects of the plastic bag policy immediately after its implementation and subsequently went out of business, causing the loss of approximately 20,000 jobs (Bodeen, 2008).

Throughout this implementation of the policy to decrease the usage of plastic bags, several steps were taken to ensure the regulations would be effective in China. A survey was conducted before and after the policy was implemented. The pre-policy survey was conducted one month before the legislation was enforced, but with enough time for the public to become aware of the new policies. The purpose of this was to be able to compare results and show the progress that the regulation had achieved. Four months after the regulation was put into place, another survey was conducted to discover the effectiveness of the policy. Throughout the study, there was no economic change to alter the behavior of consumers. At the end of the study, there was a 64% decrease in the amount of plastic bags used and the average weight of items per plastic bag increased by 50% (Block, 2017).

In this study, advocates of the regulation discovered that there are several factors that contribute to a person's behavior toward the environment. Consumers were motivated to use plastic bags because they were the cheapest option. By implementing advanced disposal fees, such

as imposing a fee on plastic bags in combination with giving information about the negative effects of plastic bags on the environment, China found that there was a change in behavior regarding plastic bag use. The change in behavior that was found after executing the policy was directly related to the positive attitudes and behaviors toward the regulation.

4.2.5 Delhi, India: Importance of a Quality Implementation Process of a Plastic Ban

The National Green Tribunal (NGT) in Delhi, India banned the use of all forms of single-use plastics after incidents of mass burnings of plastic at dumps. These mass burnings caused severe air pollution in the area that was estimated to be 36 times more toxic than the air in London (Johnston, 2017).

In 2009, a blanket ban on the use of all plastic bags was imposed, but was found to be ineffective as 94% of people still used plastic bags (Gupta, 2011). A revision of the legislation in April 2009 created a mandatory pricing of all plastic bags, discounts when using reusable bags, taxes at the manufacturing level, and the launch of an awareness campaign. The new legislation addressed different problems relating to the lack of information, incentives, and cheap alternatives. The minimum thickness of plastic bags was increased to allow plastic bags to be reused due to their improved strength. There was a cash-back incentive implemented to encourage people to stop using plastic bags which resulted in a 5.5% reduction in usage. Cloth bags also helped to reduce plastic bag usage by 4.5% (Gupta, 2011). Altogether, the three main efforts to improve the success of the program included consumer education on the ban, financial incentives for using plastic bags, and an increase in the availability of alternatives to plastic bags. The combination of these three efforts decreased the number of people who used plastic bags from 80.8% to 57.1%, and increased the number of people who used reusable bags from 4.6% to 17.7% (Gupta, 2011).

City officials in Delhi, India concluded that a blanket ban is not necessarily the best solution to decrease the usage of plastic bags. Raising awareness and support of the regulation and slowly introducing the changes to allow for behaviors to adapt was essential when revising the legislation. Additionally, they found that environmental awareness among citizens, especially in developing countries such as India where sustainability is not a major concern among the general population, is crucial to the success of environmental legislation such as plastic bans (Gupta, 2011).

4.2.6 Germany: Business and Government Support Leads to Successful Plastic Bag Tax

Germany's plastic bag tax stemmed from the 1991 Packaging Ordinance and the Green Dot system. The Green Dot system is a European network that focuses on the recycling of packaging materials for consumer goods. It uses a well-known and globally protected recycling symbol on certain products to increase awareness for their initiatives. The German single-use plastic bag tax incorporated public, business, and government support. Initially, large supermarkets began taxing their customers about five to ten euro cents per plastic bag used, but the German government pushed toward a larger scale regulation. The Packaging Ordinance was set forth to increase the environmental responsibility of manufacturers and distributors from the initial production until the recycling phase (Packaging Ordinance, 2014). In addition to the voluntary efforts of the supermarkets, the German government imposed a tax on plastic bags, which was raised up to 20 euro cents per bag. Germany achieved success for both economic and ecological aspects of plastic recycling (Jochem et al., 2000). The tax policy in Germany was determined to be effective because the involvement of businesses and the government allowed for a positive shift in the nation's sustainability efforts.

4.2.7 France: A Phase-Out of Single-Use Plastics

In September of 2015, France decided it was time to enact a ban for the usage of single-use plastics. Approximately five billion single-use plastic bags were being handed out to customers yearly, along with 12 billion fruit and vegetable plastic bags (Local, 2016). France decided to put an end to this waste by implementing a ban for all bags with a thickness less than 50 microns, which represents virtually all single-use plastic bags handed out at checkout counters as well as plastic bags used for fruits and vegetables (Energies, 2017). Companies had until January 1st, 2017 to comply with the new legislation. These companies were then only able to give out paper bags, thicker reusable plastic bags, or no bags at all at checkout. Since the implementation of the ban, rising prices of consumer goods was noted along with the obvious decline in single-use plastic usage. Another issue that arose with the ban was the threatened loss of jobs for people in the recycling and plastic bag industries. As this is still a new law, France is staying aware of the negative new issues that can arise from implementing such a ban.

Although it has only been a year since the ban of single-use plastics has been implemented, France recently became the first country to ban plastic cutlery, which will go into effect in 2020.

This new law is also part of the same Energy Transition for Green Growth Act that banned plastic bags in 2017. President Francois Hollande stated that "the ban is part of a larger push intended to make France an exemplary nation in terms of reducing greenhouse gas emissions, diversifying its energy model and increasing the deployment of renewable energy sources" (McAuley, 2016). Manufacturers and retailers have until 2020 to adjust their product to be made from biodegradable materials. One specific company, Pack2GoEurope, is unhappy with this decision as it goes against France's own law of the free movement of goods. Due to how recent the single-use plastic bag ban was implemented, it is too early to determine its success rate.

4.2.8 South Australia: A Successful Behavioral Change Campaign for the Promotion of a Plastic Bag Ban

Before the implementation of a ban on single-use plastic bags, South Australians used 3.94 billion plastic bags every year and 2.96 billion of those bags came from supermarkets (Government of South Australia, n.d.). A study done by Roy Morgan Research found that 93% of Australians were concerned with the impact plastic bags had on the environment. As a result, South Australia started to implement the gradual elimination of lightweight plastic bags.

In 2005, the Environment Protection and Heritage Council scheduled the phase out of plastic bags and offered alternatives in shops by the end of 2008. The ban applied to lightweight checkout style bags, but did not include heavier department store bags, barrier bags for fruits and vegetables, compostable bags, and paper bags (Government of South Australia, n.d.). A fine was levied on stores that did not comply with the plastic bag ban.

When implementing the plastic bag ban, there was an emphasis on establishing a strong educational message. South Australia chose to use the 7 Doors Model to encourage the change in behavior regarding plastic bag use (Government of South Australia, n.d.). They implemented the ban by forming a set timeframe for the change to be introduced that was well known to the public. Along with this, they created a range of different initiatives and campaigns reaching several different types of people to encourage more behavioral changes. This included widespread support campaigns with information that was constant throughout the region. There was also an established way of finding information about the plastic bag ban through an easily accessible website along with a variety of outreach messages such as newsletters to companies and television

advertisements that were focused on relaying important information. These tactics helped change the attitudes of the community to be prepared and enthusiastic about the change.

As a result, there was a significant change in the behavior of South Australians. Keep Australia Beautiful, a non-profit environmental conservation organization, found that there was a 45% decrease in the use of plastic bags (Aspin, 2012). The Ehrenberg-Bass Institute for Marketing Science found that 8 out of 10 customers were in support of the ban. An exit survey also found that 65% of shoppers brought bags, 24% purchased bags in the store, and 11% bought so few items they did not require a bag, as shown in Figure 3 below (Aspin, 2012). With the use of an educational campaign which changed the consumer behavior regarding plastic bag usage, the South Australian plastic bag ban was found to be effective.

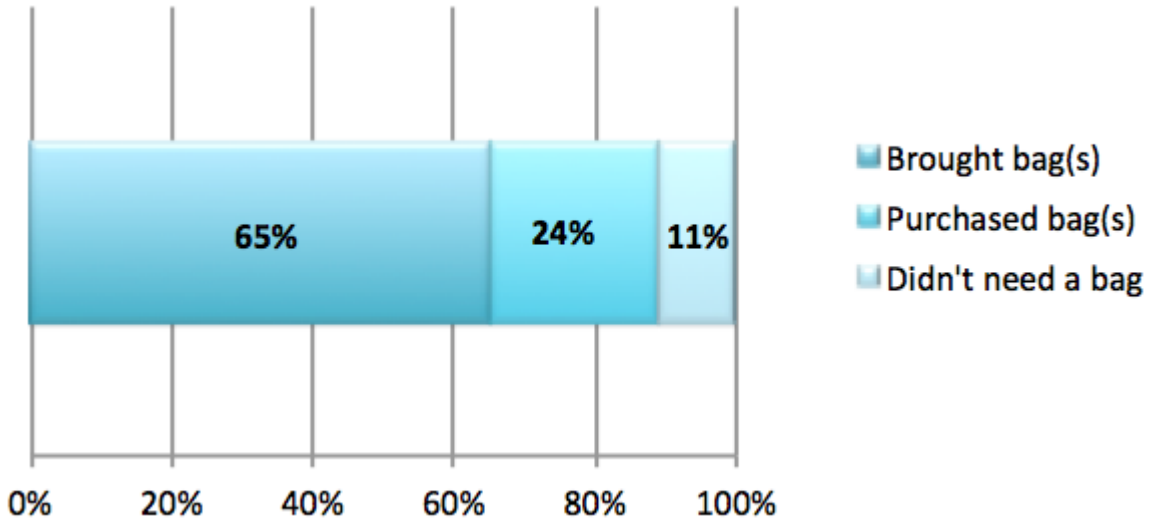

Figure 3: Consumer Bag Usage in Stores in South Australia (Aspin, 2012)

4.2.9 Israel: A Positive Response to a Plastic Bag Tax

As of January 2017, Israel's plastic bag consumption from supermarkets was reported to be 2.7 billion bags annually. According to the United Nations Environment Programme, the total annual weight of plastic bags from supermarkets was 15,000 tons, and for those bags, supermarkets paid about 80,000,000 Israeli New Shekels or around 22,000,000 USD a year (UNEP, 2018). The Israeli government passed a national tax on single-use plastic bags which cost consumers 0.10 Israeli New Shekels or about 0.03 USD per bag. The national action plan combined with the legislation contributed to sustainable consumption and production behavior amongst Israeli people

in regard to single-use plastic supermarket bags in the country. After less than a year of the legislation being enacted, plastic bag consumption had reduced by 80% (UNEP, 2018). The green tax in Israel is still relatively new, so there is limited information on the results, but the country's short-term impacts manifest progress toward the reduction of single-use plastics.

4.2.10 Portugal: Change in Behavior due to Tax and Available Alternatives

Portugal hoped to create a change in consumer behavior by implementing a plastic carrier shopping bag tax in February 2015. A survey was conducted before the legislation was enacted along with a follow up survey four months after the legislation to measure the success and impacts of the policy. The study took place at shops, grocery stores, and supermarkets in Almada and Castelo Branco, instead of nationally. Almada is a city located on the western side of the country, and Castelo Branco is a more landlocked area toward the eastern border with Spain. The study's hypothesis stated that the proximity to the coast would influence the effectiveness of a plastic bag tax due to the visibility of the marine litter problem. The tax on plastic bags was an indirect environmental tax to benefit marine ecosystems while providing funds to the government. The policy also provided individual goals to consumers encouraging them to not use more than 90 bags per year by the end of 2019 and 40 bags per year by the end of 2025. The combination of legislation along with personal goals and public input contributed to the overall success of the initiative.

The study was conducted through face-to-face surveys with one survey being conducted before the tax was implemented while another occurred four months after the implementation. Both surveys included key variables such as receptiveness to a policy, type of transportation to shopping, and the number of times that the shopping bags are reused. The second survey found that the majority of consumers perceived the legislation to contribute revenue to the government rather than providing environmental benefits. However, after the four months, plastic bag consumption was reduced by 74% and reusable bags increased by 61% (Balaia et al., 2017). Figure 4 below examines the alternatives to disposable plastic bags before and after the implementation of the plastic bag tax, or PBT. After the policy, disposable plastic bags and reusable plastic bags decreased, while the use of more sustainable alternatives increased. Environmental options include textile bags, paper bags, and trolleys. The study concluded that the change in behavior occurred because of the tax and availability of alternatives as shown in Figure 4 provided by the supermarkets in Portugal. The initial hypothesis about the proximity to water was found to not

impact the behavior of consumers. While some responses portrayed that consumers believed they were helping government funds more than the environment, the reduction of single-use plastic bags in circulation aids environmental progress around the world. The short-term results were positive, but an additional study would need to occur in order to determine the long-term success of the legislation.

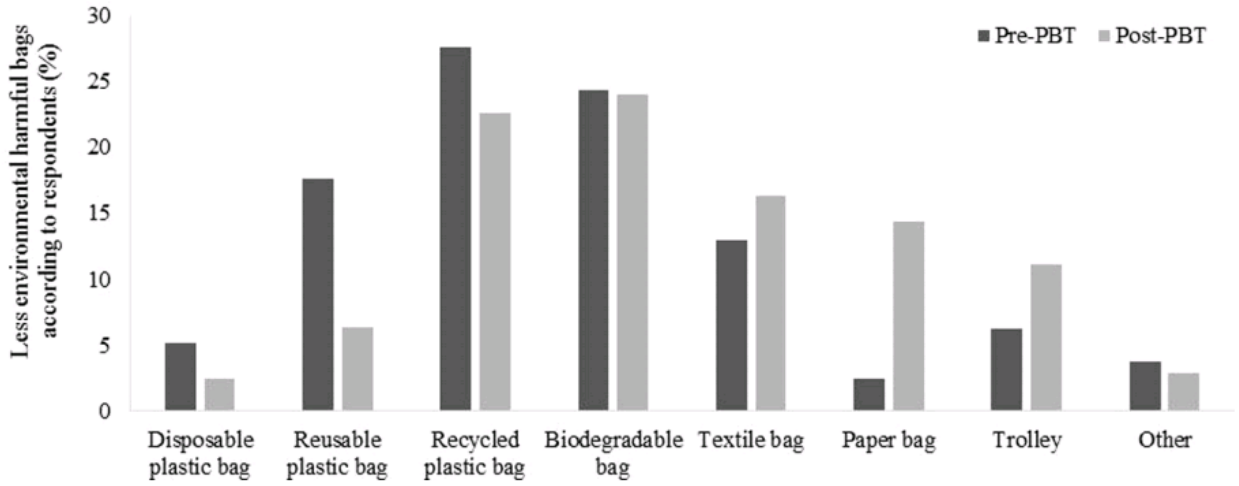

Figure 4: Alternatives to Disposable Plastic Bags Used in Portugal (Balaia et al., 2017)

4.2.11 Belgium: National Packing Charge and Environmental Charge

In 1993, Belgium implemented a packaging charge on all beverage containers with the goal of encouraging consumers to change their plastic consumption behavior. The charge was implemented to help promote the reuse of packaging products through a deposit refund system as well as to change the price of products to encourage recycling. The tax was initially 15 francs (EUR 0.37) on all types of beverage containers. This tax was soon reformed, exempting all beverage containers from the value added tax (VAT) but also introducing a higher rate of the tax with the goal of reducing the price of reusable packaging while maintaining the price for other containers (Card, n.d.). By 2014, the charge was EUR 9.86/hectolitre for non-reusable containers and EUR 1.81/hectolitre for reusable containers (Card, n.d.).

Following the Packaging Charge on beverage containers was a more specific Environmental Charge on single-use carrier bags, single-use plastic, aluminium foil, and disposable plastic cutlery in 2007 (Card, n.d.). This tax specifically intended to make consumers use less of the aforementioned products.

The main stakeholders affected from the charges implemented were the packaging industry, consumers, and environmental groups. Most of the Packaging Charge support came from Belgian green political parties as some industry and union groups were opposed to the charge. These industry and union groups claimed the charge "induced an undue burden on producers and consumers" (Card, n.d.). Support for the Environmental Charge mainly came from non-profit governmental organizations, including the non-profit Bond Beter Leefmilieu Vlaanderen (BBLV). These groups supported environmental progress before its implementation, reaching out to consumers to encourage a change and express why it was needed. The amount of single-use plastic bags being used also dropped prior to the introduction of the tax (Card, n.d.).

For both charges implemented, the charge was placed on the industry putting the packaging on the market which was then passed down to consumers. Many consumers opposed the packaging tax and it was less successful in promoting re-use. Revenue from the charge was EUR 203.8M in 2004 but then rose to EUR 318.0M in 2012 (Card, n.d.). This rise in revenue was most apparent in 2005 from the charge being raised by almost 50%. Due to the fact that the charge wasn't consistent and not specific to one type of packaging product, it is hard to analyze its success rate. The rise in revenue could have been from the charge being raised or from consumers going back to their old habits of not reusing their packaging containers but rather just paying the tax.

The Environmental Charge had a more successful outcome as consumers were more willing to change their habits. Revenue from the charge dropped from EUR 1.2M in 2008 to EUR 0.46M in 2009, approximately 60%. The tax rate also remained consistent throughout its implementation. As well as having less single-use plastic bags being used, the sale of reusable bags rose from EUR 7.6M in 2003 to EUR 76.6M in 2010 (Card, n.d.). Although the revenue from the Environmental Charge initially dropped, it ended up remaining relatively consistent throughout its implementation. This could be due to the other targeted products revenue (single-use plastic, aluminium foils, and disposable cutlery) remaining relatively consistent or increasing slightly (Card, n.d.). In 2014, the Environmental Charge was withdrawn as Belgium decided to work toward a broader packaging tax.

The overall lessons learned from the two charges implemented were helpful in informing other nations on how to go about implementing their own charges. Belgium learned that it is important to "engage consumers and industry at an early stage, and to set explicit goals or targets

for the policy instrument" and that "taxes are the most influential when there are campaigns and voluntary agreements supporting the charge" (Card, n.d).

4.2.12 Summary of Campaign Strategies Used in the Case Study Locations

Not only was it important to focus on what type of legislation to implement, but it was also important to focus on the campaign strategy used to inform citizens about the change. If citizens did not understand the need for a plastic bag policy, then their attitude toward the change was found to be pessimistic and there was a lack of change in behaviors. The most successful legislation implemented came from the case study locations that considered the consumers response to a policy change. By raising awareness of the issue, more citizens are likely to support the legislation and change their habits. Additionally, slowly introducing a policy change proved to be the most successful method because it allowed manufacturers, businesses, and consumers to adjust to the new legislation. For example, in China, a survey was handed out to consumers to inform citizens about the new policy change before it was implemented. Four months after the legislation was implemented, China conducted another survey to see if there was a shift in the behavior of consumers. There was a 64% decrease in the amount of plastic bags used and the average weight of items per plastic bag increased by 50% (Block, 2017). It was noted that informing the consumers about the negative effects of single-use plastics was directly related to the positive attitudes and shifts in the behavior of citizens.

Another example of how important it is to inform consumers of the benefits of a green tax is in Ireland. Ireland had a strong campaign known as the *Bag for Life* campaign which encouraged the use of reusable bags and recycling programs. This campaign helped raise awareness on the negative effects of single-use plastics and citizens felt responsible for these effects, resulting in plastic bags becoming socially unacceptable. This also occurred in South Australia where the Environment Protection and Heritage Council established an emphasis on informing citizens through multiple forms of outreach such as newsletters, television advertisements, websites and more. The government also allotted a set timeframe for the policy change to go into effect, which allowed manufacturers, retailers, and citizens to adjust to the new legislation.

A strong campaign allows for citizens to understand how they can contribute to improving the environment. Without a strong campaign, citizens can become complacent and revert back to single-use plastics as they start to become accustomed to the green tax. This was seen in South

Africa where a green tax was imposed on single-use plastics, but citizens were not educated on why the green tax was needed in the first place.

4.2.13 Summary of Factors Affecting the Success of Legislation in Other Countries

There were many other factors that contributed to the success of new legislation. An important aspect to note was how consumers traveled to and from their local stores. If consumers walk to their local stores, it is more likely for them to support a stronger material bag option and buy reusable bags. For those who drive or use public transportation, the shift from single-use plastics to reusable alternatives may be less important because they don't carry their items for an extended period of time.

It was also important to note how different socioeconomic classes would respond to a green tax on single-use plastics. It might be easier for citizens who have a higher socioeconomic status to pay for a single-use plastic bag every time at checkout as opposed to those of a lower socioeconomic status. The green tax on single-use plastic bags could also impose an economic burden on those of lower socioeconomic status.

A third factor noted was whether single-use plastic bags are manufactured in the country or imported. By placing a green tax on single-use plastics, it should result in fewer citizens purchasing the single-use plastic bags. This further results in fewer bags manufactured, which in turn results in fewer people needed to manufacture them. The loss of jobs is an important aspect to note when placing a green tax on single-use plastic bags. South African single-use plastic bag sales dropped by 80%, which caused the loss of some jobs in the area due to the decrease in demand for plastic bags (Hasson et al., 2007).

Lastly, the case studies demonstrated that people are more likely to use reusable bags if they are readily available at the supermarket. It is easy for customers to forget their reusable bag at home so providing an alternative in stores would allow customers to purchase a reusable bag as opposed to a single-use one.

4.3 Consumer Survey Responses and Analysis

Through surveying individuals, we were able to gain valuable insight into consumers' single-use plastic habits and willingness to pay for a green tax. We surveyed 198 individuals from various locations around Costa Rica and found that a majority of consumers used less than 5 plastic bags per week, as seen in Figure 5. Over 80% of the consumers that used plastic bags stated that they reused some or all of them.

When investigating the single-use plastic bottle usage by Costa Ricans, we discovered that 53% of consumers always use reusable bottles and 23% sometimes use reusable bottles. The majority of consumers, 47%, use less than 3 single-use plastic bottles per week. The main reason a majority of individuals do not use reusable bags or bottles is because they forget to bring them.

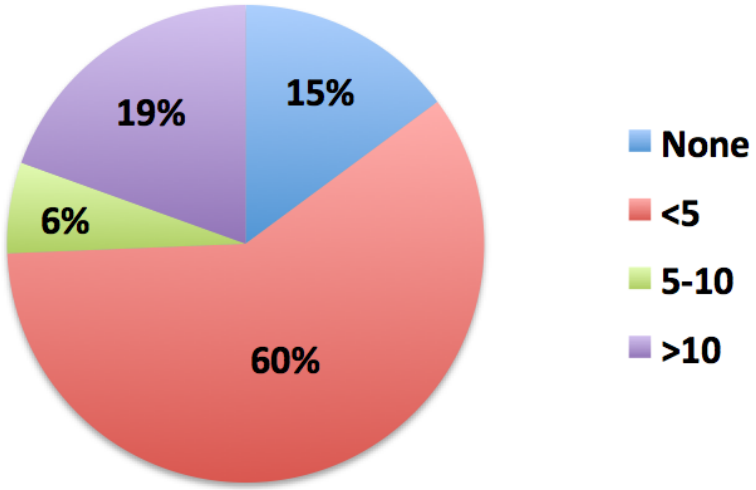

Figure 5: Single-Use Plastic Bags Used per Week in Costa Rica

We used the hypothetical CV method questions to provide MarViva and legislators with an estimate of consumers' willingness to pay a green tax on single-use plastics. About 57% of consumers said they would pay for a green tax on plastic bags, 31% said they would not, and 12% said they were unsure. About 40% of consumers would be willing to pay 60 colones per plastic bag, whereas 34% of consumers already use reusable bags, as seen in Figure 6. The other 26% of consumers were split between 150, 200, and 250 colones per plastic bag.

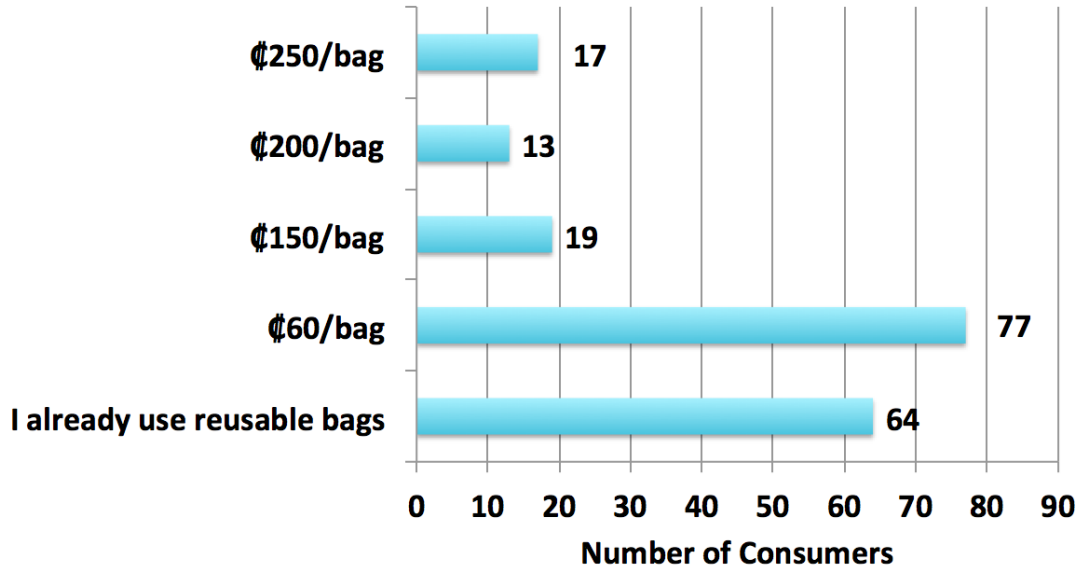

Figure 6: Consumers' Willingness to Pay for a Green Tax on Single-Use Plastic Bags

About 55% of consumers were willing to pay a green tax on single-use plastic bottles, 33% were not willing, and 12% were unsure. When asked at which price point they would switch to using reusable bottles, 27% stated they already used reusable bottles, 25% said they would pay 60 colones per bottle, 18% said they would pay 220 colones per bottle, 20% said they would pay 100 colones per bottle, 5% said they would pay 140 colones, and 5% said they would pay 180 colones, as seen in Figure 7.

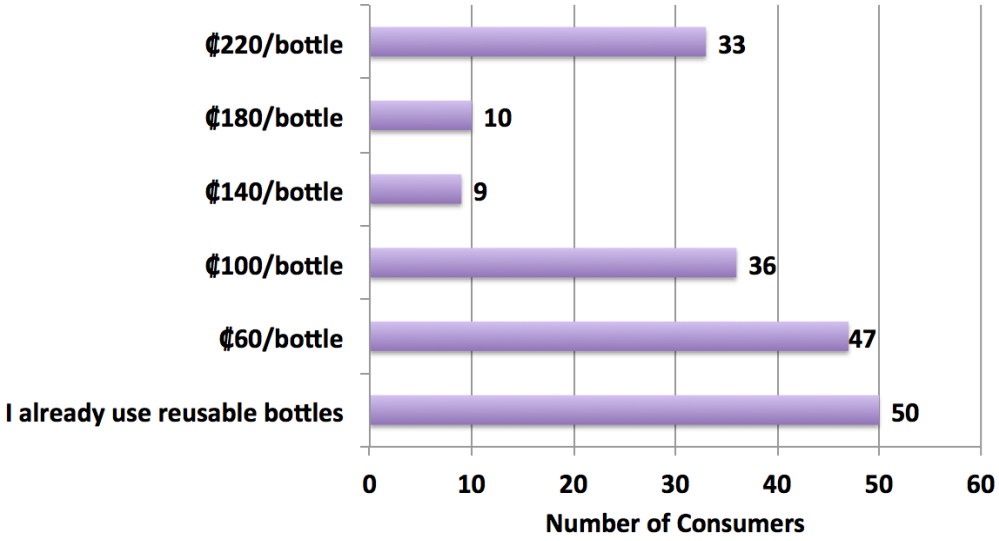

Figure 7: Consumers' Willingness to Pay for a Green Tax on Single-Use Plastic Bottles

When analyzing the data, it is apparent in Figure 6 and Figure 7 that the middle range values have lower responses and that consumers were more likely to choose the extremes. It can be inferred that consumers may have interpreted the question in two ways: how much the consumer would be willing to pay to continue using the plastic bags and how much would cause a consumer to switch to reusable bags or bottles. It is also important to note that 26 consumers that responded saying they would not pay a green tax on single-use plastic bags also said they always used reusable bags and 19 consumers that responded saying they would not pay a green tax on single-use bottles also said they always used reusable bottles. We can deduce that consumers did not feel the need to say they would be willing to pay for single-use plastic bags and bottles because they were already using reusable products.

By comparing the responses of consumers' willingness to pay and the price they were willing to pay, we discovered that the distribution of responses to each possible answer was less consistent for people who were not willing to pay a green tax, as seen in Figures 8 and 9. About 48% of people who were not willing to pay a green tax on single-use plastic bags said that 60 colones would be the price point that would cause them to switch to reusable bags, whereas 8% said they would pay a higher price and 44% stated they already use reusable bags. As for consumers that stated they were willing to pay a green tax, 35% chose the lowest price option of 60 colones, 32% would pay a higher amount, and 33% already use reusable bags.

For bottles, 40% of consumers that were not willing to pay a green tax chose the lowest price option. About 27% of consumers responses were distributed throughout the other price options and 33% said they already use reusable bottles. Those who said they were willing to pay a green tax responded with a larger distribution. About 19% of consumers said they would pay 60 colones, 24% said they would pay 100 colones, 22% said they would pay 220 colones, 25% said they already used plastic bottles, and the last 10% was distributed between 140 and 180 colones per bottle. We can infer that the majority of people that chose the lowest possible price because they were not willing to pay for the green tax and those that were more willing to pay a green tax chose a high price point.

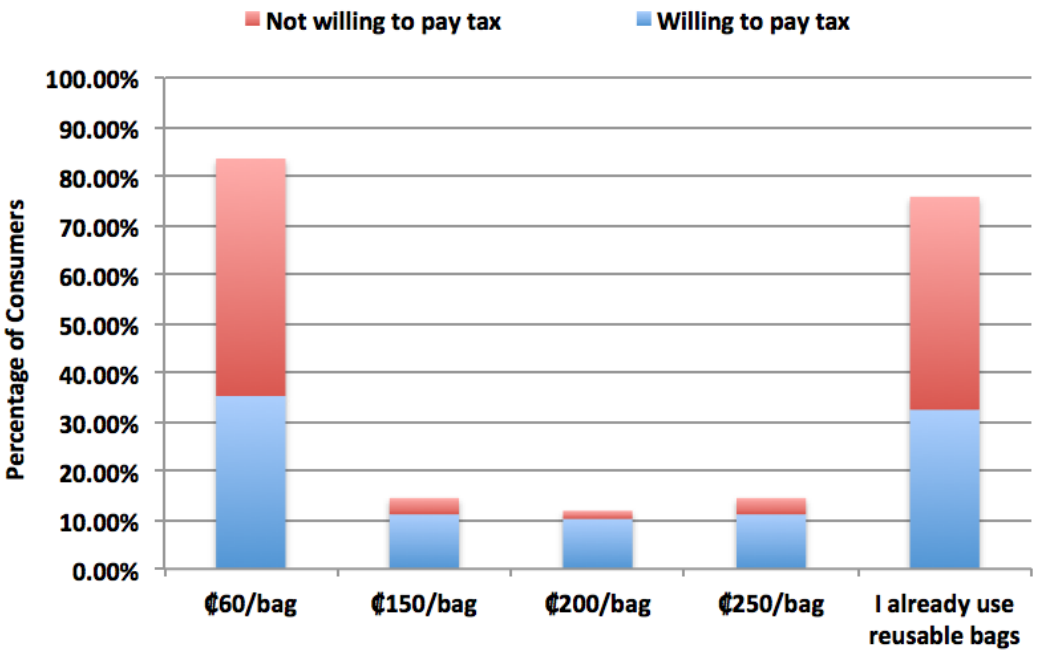

Figure 8: Distribution of Price Point Responses Based on Willingness to Pay for a Green Tax on Single-Use Plastic Bags

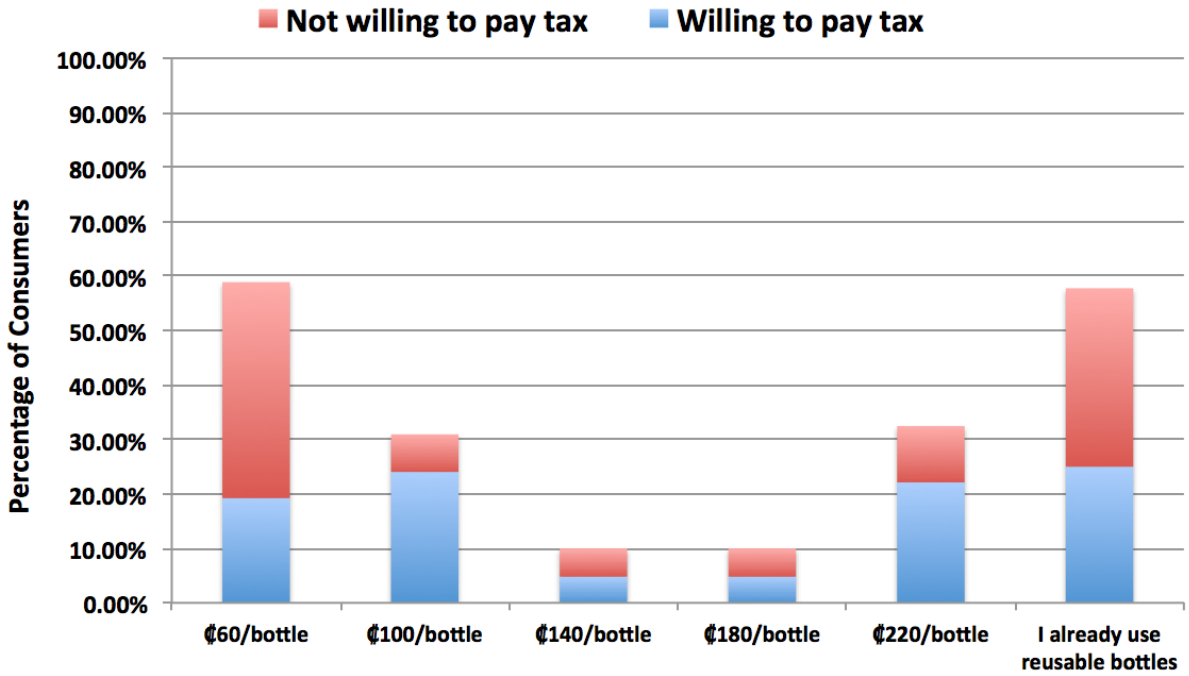

Figure 9: Distribution of Price Point Responses Based on Willingness to Pay for a Green Tax on Single-Use Plastic Bottles

A majority of respondents' incomes ranged from below 400,000 colones per month to 800,000 colones per month. Their willingness to pay for a plastic bag and bottle green tax stayed

generally consistent with the overall, average willingness to pay. As incomes began to increase, the willingness to pay also increased above the overall average of around 75% of consumers for both a bag and bottle green tax. When selecting a price point that would cause consumers to switch to reusable bags, a majority of the lower income respondents chose the lowest price of 60 colones. As incomes increase, more people stated that they use reusable bags and were more willing to choose the higher price point.

In order to understand consumers responses, we provided questions that would give us a better understanding of consumers' knowledge of plastic contamination in Costa Rica. We observed how their willingness to pay relates to their belief that plastic is harming the environment. About 57% of consumers said they supported a green tax on single-use plastic bags and 55% said they supported a green tax on single-use plastic bottles. Consumers who believed that plastic was not harming the environment were less willing to pay a green tax on single-use plastic bags or bottles.

About 36% of those who said that plastic was not harming the environment also said they were not willing to pay for a single-use plastic bag green tax and 55% who said that plastic was not harming the environment said they were not willing to pay for a green tax on single-use plastic bottles. From this, we can conclude that awareness of environmental issues relates to consumers' willingness to pay for a green tax.

Out of 198 respondents, 94 identified themselves as female, 96 identified themselves as male and 8 respondents did not identify a gender on their survey. Out of the 94 females, 29 said they were not willing to pay a green tax on plastic bags, 13 said they were unsure if they were willing to pay, 51 said they were willing to pay a green tax on plastic bags and 1 omitted the question. In regard to willingness to pay a green tax on plastic bottles, 28 females were not willing to pay, 15 were unsure, 50 were willing to pay, and 1 omitted the question. Based on this data, we were able to determine that the majority of females are willing to pay a green tax on both plastic bags and plastic bottles, with 54% indicating that they were willing to pay the green tax on bags and 53% indicating that they were willing to pay the green tax on bottles.

Of the 96 males that responded to the survey, 32 respondents indicated that they were not willing to pay a green tax on plastic bags, 10 were unsure if they were willing to pay, 54 were willing to pay a green tax on plastic bags, and 0 respondents omitted the question. In regard to plastic bottles, 31 males were not willing to pay a green tax, 9 were unsure, 56 were willing to pay

a green tax, and 0 respondents omitted the question. Similar to females, the majority of male respondents indicated that they were willing to pay a green tax on both plastic bottles and plastic bags with 56.3% of males indicating that they were willing to pay a green tax on plastic bags and 58.3% of males indicating that they were willing to pay a green tax on plastic bottles.

Both males and females were equally willing to pay a green tax on both plastic products, with a little more than 50% of both sex indicating that they were willing to pay. More females than males were unsure if they were willing to pay a green tax with 13% of females indicating that they were unsure about the green tax on plastic bags and 16% of females indicating that they were unsure about the green tax on plastic bottles. Males, comparatively, only had 10% of respondents indicate that they were unsure about plastic bag green taxes and 9% of respondents indicate that they were unsure about plastic bottle green taxes. Additionally, more males than females indicated that they were unwilling to pay a green tax with 33% of males indicating "no" for willingness to pay for plastic bags and 32% indicating "no" for willingness to pay for plastic bottles compared to 30% of females indicating "no" for willingness to pay for plastic bags and 29% of females indicating "no" for willingness to pay for plastic bottles.

In regard to age, we placed our survey respondents in eight different age groups: under 18 years of age, 18 to 25 years of age, 26 to 35 years of age, 36 to 45 years of age, 46 to 55 years of age, 56 to 65 years of age, 66 to 75 years of age, and 76 years of age and older. In the youngest age group, under 18 years of age, there were 20 respondents. Of these 20 respondents, 65% indicated that they would be willing to pay a green tax on plastic bags, 10% indicated that they were unsure and 25% indicated that they were not willing to pay a green tax on plastic bags. As for plastic bottles, 65% respondents indicated that they were willing to pay a green tax, 5% indicated that they were unsure if they were willing to pay, and 30% indicated that they were not willing to pay.

For the second age group, 18 to 25 year olds, there were 44 respondents. In regard to the green tax on plastic bags, 45% of respondents indicated that they would be willing to pay, 18% indicated that they were unsure, 34% indicated that they were not willing to pay, and 2% omitted the question. In regard to the green tax on plastic bottles, only 41% of respondents indicated that they would be willing to pay, 18% were unsure, 36% were not willing to pay and 5% omitted the question.

The next age group, 26 to 35 year olds, had 55 respondents, making this age group the largest group of respondents. Of these 55 respondents, 51% of respondents were willing to pay a green on plastic bags, 11% were unsure, 33% were not willing to pay, and 5% omitted the question. Additionally, only 45% of respondents in this age group indicated that they were willing to pay a green tax on plastic bottles while 1% was unsure, 36% was not willing to pay and 5% omitted the question.

The age group of 36 to 45 year olds had a total of 30 respondents. When asked about their willingness to pay a green tax on plastic bags, 70% indicated that they were willing to pay, 10% were unsure, 20% were not willing to pay and 0% omitted the question. When asked about their willingness to pay a green tax on plastic bottles, 67% indicated that they were willing to pay, 10% were unsure, 23% were not willing to pay and 0% omitted the question.

For the next age group, 46 to 55 year olds, there were 24 respondents. Out of these 24 respondents, 63% of them indicated that they would be willing to pay a green tax on plastic bags, 8% indicated that they were unsure, 29% indicated that they were not willing to pay a green tax on plastic bags and 0% omitted the question. Additionally, 63% of respondents indicated that they were willing to pay a green tax on plastic bottles, 17% indicated that they were unsure, 25% indicated that they were not willing to pay a green tax on plastic bottles, and 0% omitted the question.

The final substantial group of respondents in terms of age was the age group ranging from 56 years of age to 65 years of age, of which there were only 13 respondents. Of these 13 respondents, 69% indicated that they were willing to pay a green tax on plastic bags, 15% indicated that they were unsure, 15% indicated that they were not willing to pay a green tax on plastic bags, and 0% omitted the question. As for plastic bottles, 77% indicated that they would be willing to pay the green tax, 7% indicated that they were unsure, 15% indicated that they would not be willing to pay the green tax, and 0% omitted the question.

Finally, the last two age groups were the 66 years old to 75 years old age group and the 76 years old and older age group. Both of these age groups had only 2 respondents each and 100% of the respondents in these two age groups indicated that they were not willing to pay a green tax on either plastic bottles or plastic bags. It is important to note, however, that 2 respondents is not a substantially large enough group to be a good representative of all of the members of these two age groups across all of Costa Rica.

Based on the data described above, we came to the conclusion that the age groups of under 18 year olds, 26 to 35 year olds, 36 to 45 year olds, 46 to 55 year olds, and 55 to 56 year olds were all willing to pay a green tax on both plastic bags and plastic bottles as these were the age groups that had a majority of respondents indicating that they would be willing to pay these green taxes. The only 3 age groups that did not have a majority of respondents indicate that they were willing to pay these green taxes were the 18 to 25 year olds, the 66 to 75 year olds, and 76 and older age group. As mentioned before, the two latter age groups were not large enough to be a good representation of all of Costa Rica. However, the fact that there was not a majority of 18 to 25 year olds who wanted to pay a green tax could be due to the fact that this age group is usually in a financial place in life where they have just started living on their own. This fact may have contributed to the higher percentage of respondents not wanting to pay for green taxes or being unsure if they would want to pay green taxes.

When looking at consumers' primary form of transportation to and from the supermarket, it was interesting to compare this to their willingness to pay for a green tax on single-use plastics. It was found that there was not a huge shift in response based on transportation method. Overall, most consumers were willing to pay for a green tax on single-use plastics regardless of their transportation method, as seen in Figure 10. The number of consumers who were unwilling to pay was highest for those who took public transportation. The highest percentage of consumers who were willing to pay was those who walked to and from the supermarket. This may be because they'd actually prefer to use stronger, sturdier bags to carry their groceries when walking so they wouldn't be paying for single-use plastic bags often.

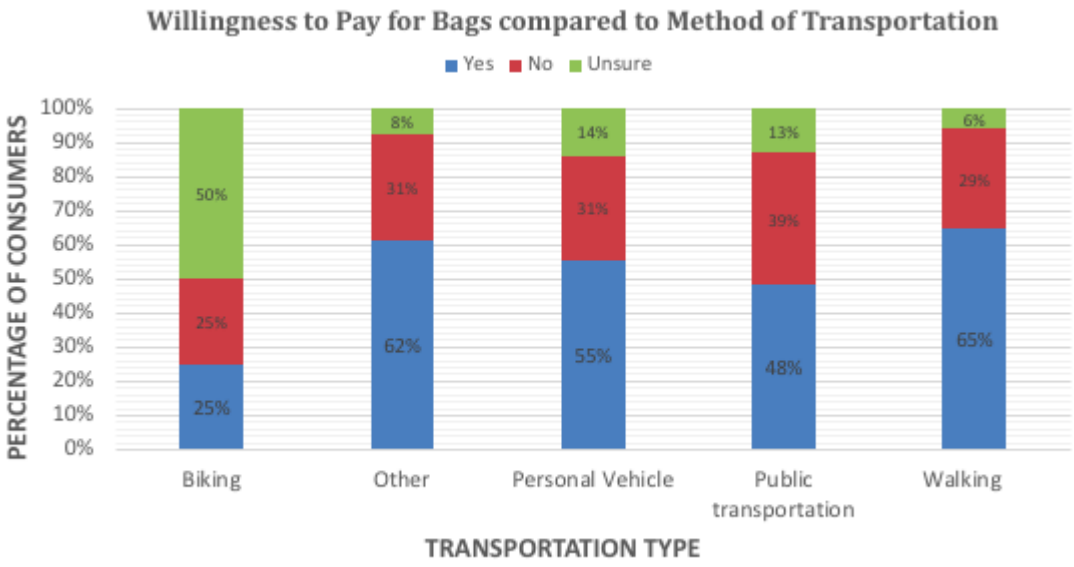

Figure 10: Willingness to Pay Compared to Method of Transportation to a Supermarket

By surveying the 7 different locations around Costa Rica, we were able to collect data from consumers with different socioeconomic backgrounds. Yoses, Nicoya, Guadalupe, and Herradura's respondents generally had an average monthly income range of 400,000-800,000 colones. Yoses and Guadalupe also included some outlier respondents of a higher income. Santo Domingo, Escazu, and Playa del Coco all had a generally even distribution of income indicating that these areas may have a higher socioeconomic status. It is also important to take into account the respondents that said their income was less than 400,000 may have been students that are not currently receiving a steady income.

The responses for price point based on consumers' income in general is fairly consistent as seen in Figure 11. For every income range, 60 colones was the most popular option chosen, except for 1,200,000-1,600,000 colones per month and 2,00,000-2,400,000 colones per month, which had a majority of people already using reusable bags. The higher price options were chosen by people with lower incomes as well as middle incomes. A majority of people with higher incomes chose that they already use reusable bags or the 60 colones option per bag. This indicates that income does not necessarily dictate whether or not a respondent chooses a lower or higher green tax.

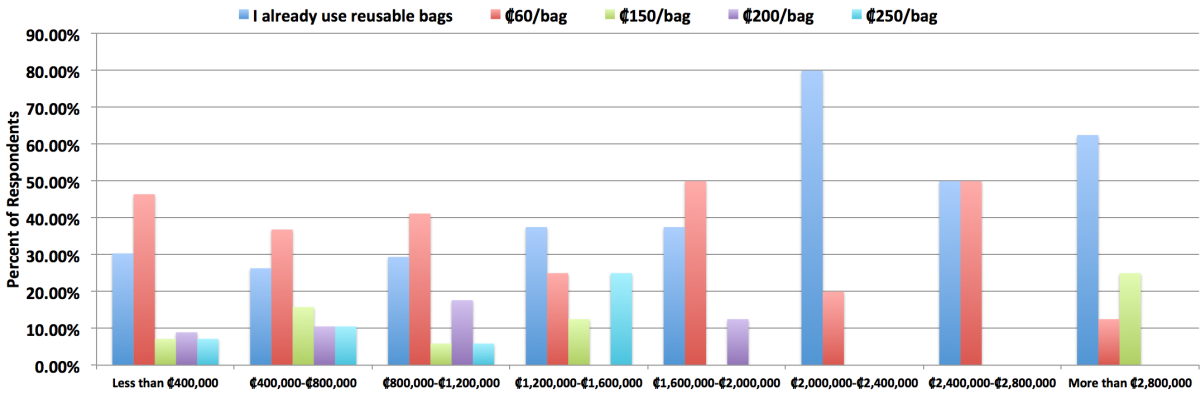

Figure 11: Percent of Consumers' Tax Price Point Preference on Single-Use Plastic Bags Based on Income

The responses for the price point at which a consumer would switch to using reusable bottles was generally consistent throughout each income range option as seen in Figure 12. People with a higher income use reusable bottles more often that people with lower incomes. The distribution of selected price points was even throughout each income range. The number of consumers with lower incomes selected the extreme options of 60 colones per bottle and 220 colones per bottle, while also having some respondents choose the middle range options. The range in selected options for price point indicates that income does not have a drastic impact on people's choice in price point for a green tax.

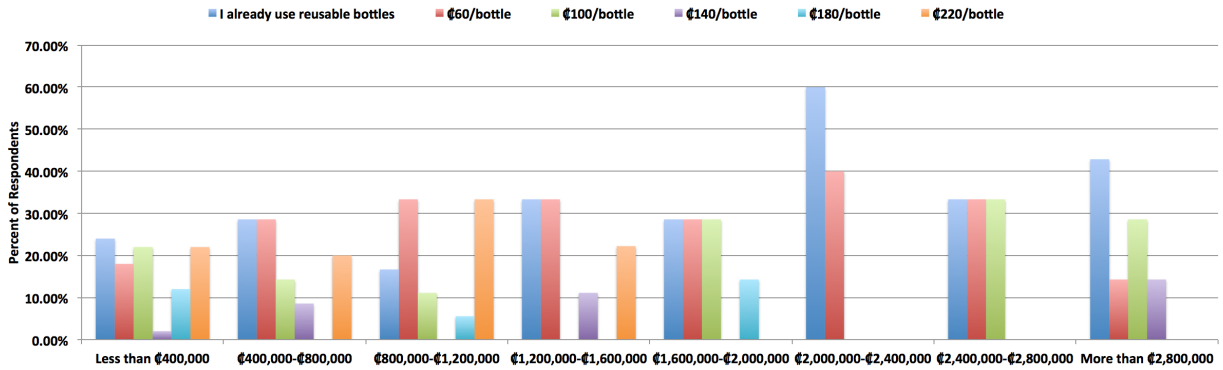

Figure 12: Percent of Consumers' Tax Price Point Preference on Single-Use Plastic Bottles Based on Income

Consumers' willingness to pay a green tax on single-use plastic bags was consistent throughout each location as seen in Figure 13. A majority of consumers in each location said that

they would be willing to pay a green tax. The percentage of people who responded saying they were not willing to pay was most apparent in the areas outside of San José. It can be assumed that consumers that live in San José have better access to public transportation and are closer to a grocery store compared to consumers in more rural areas of the country. This could result in a higher willingness to pay rate because it is more convenient to access their grocery stores so the way they carry their groceries is less important.

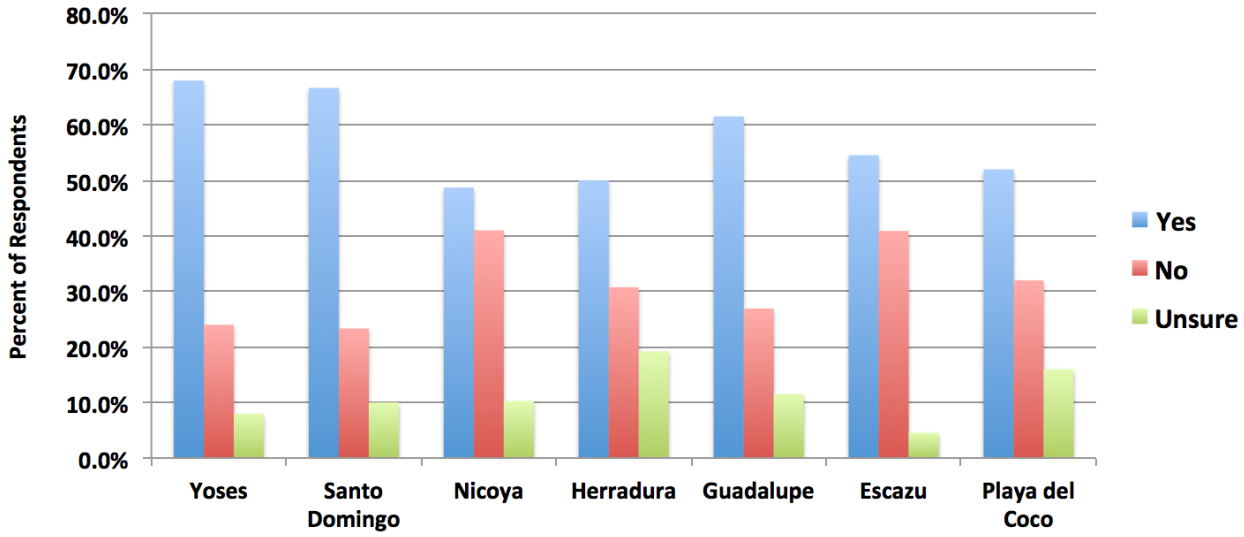

Figure 13: Survey Location Comparison of Percent of Consumers Willing to Pay a Green Tax on Single-Use Plastic Bags

The willingness to pay for a green tax on single-use plastic bottles varied from each location as shown in Figure 14. The places located in San José had a stronger willingness to pay for a green tax than the locations outside of San José. Herradura was the only location that had a larger percentage of people that said they would not be willing to pay for a green tax on single-use plastic bottles, while also having the highest percentage of people that stated that they were unsure.

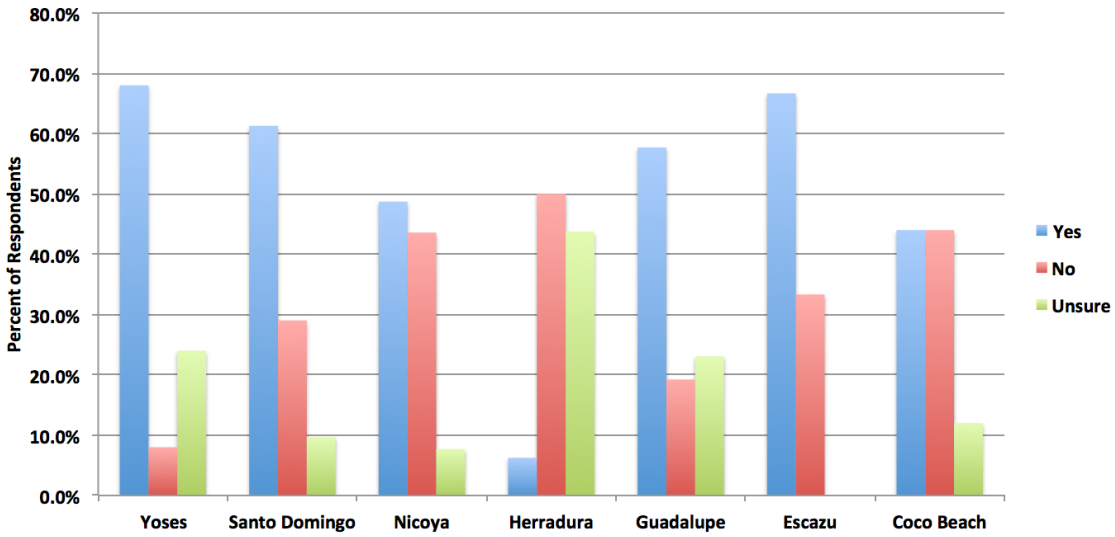

Figure 14: Survey Location Comparison of Percent of Consumers Willing to Pay a Green Tax on Single-Use Plastic Bottles

Chapter 5: Deliverables and Project Accomplishments

We presented the information collected to MarViva in a detailed, comprehensive document that allowed them to apply the findings to their campaign and effectively shape the proposed legislation. Based on the information in this comprehensive document, we formed a concise document to present strong arguments to legislators in support of a green tax on single-use plastics in order to quickly and efficiently provide them with important information. This document can be found in Appendix B.

This deliverable contained important health and environmental facts regarding the negative impacts of single-use plastics, case studies regarding the implementation of plastic policies, and trends found from consumer surveys. We also included a summary of our background research and methodology in order to provide context within the document and give MarViva information about how we reached our conclusions. We provided MarViva with a more concise document to use when approaching legislators with the issue. This document is a clear and impactful list explaining the benefits of a green tax on single-use plastics. Evidence of health and environmental issues was presented as well as information about prior case studies on single-use plastic legislation. We included information on how consumers would react to a green tax on single-use plastic bags and water bottles in the deliverable to demonstrate a more convincing argument to legislators that is specific to Costa Ricans.

Additionally, we took the key facts that we presented in the concise document and created a PowerPoint presentation containing the same facts, as shown in Appendix C. We did this in order to provide an additional tool to MarViva, which could be used when making presentations to legislators on the importance of a plastic policy. After speaking with MarViva, we came to the conclusion that different legislators had different lengths of time available to speak to MarViva representatives. For this reason, we created multiple tools and documents for MarViva to use when making presentations to different legislators with varying time constraints. The three deliverables contained the same basic information but presented this information in varying degrees of length and detail. MarViva could then decide which tool was appropriate to use in specific situations in the future.

Chapter 6: Recommendations

After analyzing the data collected, we determined an effective approach for new legislation regarding single-use plastics. We recommend that a green tax of 100 colones on single-use plastic bags and bottles would be the most beneficial approach because the policy allows the government to gather funds for current and future sustainability initiatives. Informing manufacturers, retailers, and citizens about where the green tax money is going while also allowing time for a shift in legislation are both key aspects in successful policy changes. Consumers must be educated about the harmful effects of single-use plastics in order to make a change in their own consumption habits. It is important to have continuous education about single-use plastics even after the policy change is implemented in order to have consumers realize the impact of their individual efforts. The following recommendations aim to advance MarViva's campaign and legislation.

6.1 Public Awareness Campaigns

Through our research of past case studies of plastic policies, we concluded that the most successful plastic policies contained a public awareness campaign. This public awareness aspect focused on educating the public on the new policy. For example, when Ireland implemented its levy on plastic shopping bags, a poster and leaflet campaign was started in order to educate the public on the new green tax that would be applied to plastic shopping bags at point of sale and what alternatives were available to them instead of plastic bags. This educational campaign began in December of 2001 when the levy was first passed which gave ample time for the public to become familiar with the levy before it was implemented in March of 2002 (Killian, 2003). South Australia's plastic policy was also successful partly due to the contributions of a public awareness campaign. The plastic ban was introduced through the Seven Doors Model in 2005, which provided education to the public and encouraged behavioral changes amongst them in regard to plastic bag usage. This educational campaign led to the public being prepared for the ban when it was eventually fully implemented in 2008.

Due to the success of these two policies, we recommend that MarViva implements a similar public awareness campaign in preparation for their plastic green tax. MarViva has already begun educating citizens of Costa Rica about the impacts of single-use plastics through their Chao

Plástico campaign. Additionally, a campaign tailored directly toward educating the public on their proposed green tax would be even more beneficial in getting Costa Ricans prepared and willing to pay a green tax on plastic bags. It is important that this public awareness campaign begins before the actual implementation of the green tax in order to give the public an adequate amount of time to adjust to a green tax before it is actually placed on single-use plastic products. This public awareness campaign could be carried out by the same government organization that would be formed through MarViva's bill, FONASEMAR.

6.2 Retailer Education

While it is important to educate consumers on the green tax before it is implemented, it is also important to educate the retailers who will be enforcing the green tax about their responsibilities. Similar to how the Irish government educated the public on their levy before implementation, they also provided a document to all retailers that outlined requirements of the new policy and consequences of inaction. Again, this document was distributed after the levy was passed in December of 2001, but before the levy was implemented in March of 2002, allowing retailers to have the tools, resources, and time to adequately prepare for the new green tax (Killian, 2003). We recommend that MarViva creates a similar document for retailers in Costa Rica that outlines requirements in regard to the plastic green tax that MarViva is proposing.

Additionally, we recommend that MarViva provide a section within this document that outlines acceptable alternatives to plastic bags that stores can provide for their customers. Both the plastic ban that was implemented in Delhi, India and the plastic tax that was implemented in Portugal were successful because alternatives to plastic bags became readily available at stores. If MarViva encourages Costa Rican retailers to provide reusable canvas bags or cardboard boxes at check-out, this could significantly contribute to the success of their green tax.

6.3 Public Response

Based on our survey results, 57% of respondents were willing to pay a green tax on plastic bags and 55% of respondents were willing to pay a green tax on plastic bottles. About 12% of respondents were unsure if they were willing to pay a green tax on plastic bags and 12% of respondents were unsure if they were willing to pay a green tax on plastic bottles. The remainder of respondents, 31% for plastic bags and 33% for plastic bottles, were not willing to pay a green tax. The majority of respondents identified that they would be in favor of a green tax which indicates that the majority of Costa Ricans would have a positive response to MarViva's proposed green tax.

Additionally, our survey results showed that San José residents were more willing to pay a green tax on plastic bottles and bags than residents of areas outside of San José. Based on this data, we recommend that MarViva expends more resources preparing rural areas for the implementation of the green tax in comparison to the city areas like San José as those rural areas are more hesitant of a green tax. MarViva could do this by strengthening their public awareness efforts of the green tax in these areas and also working to educate the retailers in these areas in order to ensure that proper alternatives to plastic bags and bottles are available in stores.

6.4 Pricing of the Green Tax

Based on our survey results, we suggest that MarViva places their green tax somewhere around 100 colones per plastic bag or plastic bottle. The majority of respondents who did not already use reusable shopping bags or water bottles said that 60 colones was the price point that they were willing to pay for a green tax on both shopping bags and water bottles. After the two lowest price points, the highest price point option was the one of the most popular choices indicated by survey respondents. For this reason, we suggest that MarViva chooses 100 colones as their price point for their green taxes as it satisfies the desire of the majority of respondents to have a low green tax while also raising the price point above 60 colones to satisfy the desire of the second largest group to have a higher green tax. Additionally, a green tax that is slightly above the desired price point indicated by residents will further encourage them to change their plastic use habits.

Using our data on the average number of bags and bottles used per week by our survey respondents and census data on the population of Costa Rica, we calculated a rough estimate of

the number of plastic bottles and bags used in Costa Rica per week and per year. We had to make numerous assumptions about our data in order to get our estimated numbers.

Firstly, since our survey questions asked respondents to choose a range of plastic bags and plastic bottles that they use per week as opposed to a specific number, we had to convert each range into an averaged number in order to carry out our calculations. On our survey, respondents could say that they used less than 5 bags per week, 5 to 10 bags per week, more than 10 bags per week, or 0 bags per week. For the purpose of our calculations, we counted less than 5 bags per week to be 3 bags per week, 5 to 10 bags per week to be 7 bags per week, and more than 10 bags per week to be 12 bags per week. For plastic bottles, survey respondents could indicate that they used less than 3 bottles per week, 3 to 5 bottes per week, 6 to 8 bottles per week, more than 8 bottles per week, or 0 bottles per week. We counted less than 3 bottles per week to be 2, 3 to 5 bottles per week to be 4 bottles per week, 6 to 8 bottles per week to be 7 bottles per week, and greater than 8 bottles per week to be 10 bottles per week.

Using these numbers as replacements for our ranges, we then determined which percentage of respondents had indicated each response for the number of plastic bottles and bags they use per week. For example, 47% of respondents indicated that they used less than 3 bottles per week so for the sake of our calculations, we assumed that 47% of Costa Ricans used 2 bottles per week. We then used the population of Costa Rica, which was 4,749,490 people as determined by census in June 30, 2017, and the percentage of each respondent to estimate the number of bags used by each group of respondents each week (Inec, 2017). The 47% of respondents who answered that they used less than 3 bottles per week was multiplied by the total population of Costa Rica in order to make the assumption that 2,325,320 Costa Rican residents use 2 bottles per week. We then multiplied the number of residents who used that number of bottles per week by the number of bottles per week in order to get an estimate of the number of bottles the specified group uses per week. We carried these calculations and assumptions out for both bottles and bags and then added up the total number of bottles used per week and the total number of bags used per week.

We then multiplied both of these numbers by 52 (number of weeks in a year) to get an estimate of the number of bottles and bags used per year. Finally, we multiplied both of these numbers by 100 colones to get an estimate of the amount of funds that could be raised by the green tax proposed by MarViva under the assumption that all Costa Ricans continue to use bags and

bottles at their current rate as opposed to switching to reusable alternatives once the green tax is implemented.

Using these calculations and assumptions, we determined that the rough estimate of the number of bags used by Costa Ricans per year is 1,157,712,452 and the amount of money that could be raised by the green tax is 115,771,245,200 colones which is roughly 203 million USD. In terms of a rough estimate of bottles used in Costa Rica, we determined that Costa Ricans use 671,472,672 plastic bottles per year and the amount of money that could be raised by the green tax is 67,147,267,200 colones which is roughly 117 million USD.

Due to the fact that we made numerous assumptions while carrying out these calculations, there are obviously many areas in which our estimates could be inaccurate. For one, our calculations only took into account the plastic bag and bottle usage of Costa Ricans and did not take into account the plastic bag and bottle usage of tourists within the country. Our numbers would be significantly higher if tourist use had been taken into account due to the fact that ecotourism is a large industry in Costa Rica. Additionally, our assumptions that greater than 8 bottles per week was only 10 bottles per week and greater than 10 bags per week was only 12 bags per week also introduced a lot of error into our data. For example, some of the survey respondents that we spoke to indicated verbally to us that they owned businesses and used hundreds of bags and bottles per week within their businesses. Again, these assumptions likely lowered our final numbers below their actual values. Another significant area of error in our data was the fact that we extrapolated data on the plastic bag usage of 198 Costa Ricans to make assumptions about all nearly 5 million residents of Costa Rica. We also assumed that every resident of Costa Rica was using shopping bags and plastic bottles which is inaccurate due to the population number we used including Costa Ricans of all ages, including infants and small children who likely do not use these products. Finally, our calculations of the amount of money raised are based on the assumption that nobody will switch to alternatives to plastic bags and bottles but will instead pay the green tax on their products. It is unlikely that every Costa Rican will continue to use plastic products at their current rates after the implementation of a green tax, so the amount of money that could be raised by the green tax is variable. A more likely assumption is that the implementation of the green tax will result in a 50% decrease in the number of plastic products used. Given this assumption, the green tax would raise roughly 57,885,622,600 colones per year which is roughly 101 million USD

through plastic bags and roughly 33,573,633,600 colones per year for single-use plastic bottles, which is roughly 58 million USD.

6.5 Continuation of Research

In future years, our project could be continued through an additional follow-up study that measures the success of the green tax if it is implemented. This work could focus on gauging the feedback that consumers have on the green tax, how they feel it could be changed or improved, and if they feel the green tax has positively impacted Costa Rica and its ecosystems. The survey could include questions regarding consumers' behavior before and after the implementation of the green tax to see if there was a behavioral change. The follow-up study could be conducted through an additional round of consumer surveys. Since our surveys were anonymous, the same people who took our surveys will not be able to be surveyed again to get their specific feedback. However, if surveys were conducted at the same locations in which the original surveys were conducted, a similar sample of Costa Ricans could be surveyed and the opinions of the sample group from before and after the implementation of the green tax could be compared. Based on consumers responses on the follow-up study, the green tax could be altered to be the most effective.

Additionally, more in depth calculation could be carried out in order to estimate the amount of money that could be raised through the green tax. We used our survey data on the average number of bags and bottles used per week by our respondents to carry out our calculations. These calculations could also be carried out using data collected by Auto Mercado on the number of plastic bags that they give out to their customers. Cashiers at Auto Mercado record which customers use plastic bags as opposed to alternatives to plastic bags and how many bags they give out to each customer. This data could be used to carry out more accurate calculations.

Chapter 7: Conclusions

Thorough research allowed us to present a clear and memorable message to legislators about the dangers of plastic pollution for the health of citizens and marine ecosystems. The data collected will be impactful to the extent that the information will act as a "call to action" for the individuals who would decide on a plastic policy, such as legislators in Costa Rica. The review of case studies about implementation strategies for single-use plastic regulations provided proof that a green tax in Costa Rica has the potential to be successful with the proper preparation time, public awareness campaigns, and the provision of alternatives to plastic products. The data collected through surveying consumers will give legislators the confidence to support the policy because there is now evidence that a majority of their constituents would support the policy as well.

While the facts that we collected provided a strong support for the implementation of a plastic policy in Costa Rica, MarViva still faces the possibility of some obstacles in their efforts to pass their green tax on single-use plastics. The next president of Costa Rica was in the process of being elected at the conclusion of our project. This left MarViva with the possibility of lacking the support from the newly elected president of environmentally progressive policies such as the green tax on single-use plastics proposed by MarViva. MarViva can work past these obstacles by gaining public support of other legislators and their constituents to ensure the success of the policy.

The implications of our project were extensive and far reaching. Our work with MarViva was a critical step toward protecting the marine environments in Costa Rica. The protection of these marine ecosystems could positively impact the health of Costa Ricans, the success of fishing industries and other institutions that depend on marine ecosystems, the success of ecotourism, and the well-being of marine wildlife in Costa Rica.

Additionally, the implementation of a green tax on plastic bottles and plastic bags in Costa Rica has the potential to raise a significant amount of funds for the protection of marine ecosystems. We conducted rough calculations of the amount of money that could be raised by the green tax and under the assumption that the green tax would decrease plastic bag and bottle use by 50%, determined that the green tax could raise roughly 57,885,622,600 colones per year through plastic bags, which is roughly 101 million USD, and roughly 33,573,633,600 colones per year for single-use plastic bottles, which is roughly 58 million USD. Due to the fact that there is currently no data on the number of bags and bottles used yearly in Costa Rica, we used data on the average

number of plastic bags and bottles used weekly by our survey respondents to carry out these calculations. Regardless of the fact that our calculations were based on many assumptions, the amount of money that could be raised by the implementation of a green tax on single-use plastics in Costa Rica is significant and could be used to greatly improve the state of marine ecosystems.

Overall, our project was able to accomplish numerous things. We were able accomplish some of MarViva's main goals which is important for further initiatives. We surveyed 198 Costa Rican residents on their plastic usage and views on the implementation of a plastic policy, and then reported this information back to MarViva. We created three main deliverables that MarViva can use in their future conversations with legislators. Most importantly, we established that most Costa Ricans would like to see a change in plastic usage in their country and support MarViva's work to create legislation to enact this change.

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Appendix A: Survey Questions

Section 1: MarViva Single-Use Plastic Survey

The information being collected is for research purposes only and there are no personal risks to your participation. There are no right or wrong answers, so please be honest and tell us what is true for you. Everything that you say will be confidential, and there is no identifier on this survey that will link your responses to you. You can terminate the survey whenever you want without consequences. If you would like to know more about this study, please contact MarViva at alberto.quesada@marviva.net or 506-22909600.

Section 2:

Single-use plastic bags refers to bags used at checkout that are usually disposed of after being used. Reusable bags refers to bags made out of a stronger material that can be used multiple times.

1) On average, how many single-use plastic bags do you use per week?
   a) None
   b) <5
   c) 5-10
   d) >10

2) What do you do with them once you have used them for carrying your products?
   a) I don't use plastic bags
   b) I throw them away
   c) I reuse some and throw some away
   d) I reuse all of them
   e) I recycle them
   f) Other: _____

3) Approximately, how often do you use reusable shopping bags?
   a) Always
   b) Most of the time
   c) Sometimes
   d) Occasionally, but not often
   e) Never

4) If you do not use reusable shopping bags everytime, it is because… (Select all that apply)
   a) I always use reusable bags
   b) I did not know they existed
   c) They are not available at my most visited supermarket
   d) They are too expensive
   e) I forget to bring mine
   f) I prefer plastic bags
   g) Other:_____

Single-use plastic bottles refers to pre-filled disposable bottles found at grocery stores and other small stores. Reusable water bottles refers to bottles made out of glass, plastic, or metal meant to be reused and filled multiple times.

5) Do you use reusable drinking bottles?
   a) Yes
   b) No
   c) Sometimes

6) On average, how many single-use plastic bottles per week do you buy?
   a) None
   b) < 3
   c) 3-5
   d) 6-8
   e) >8

7) Why do you prefer to buy single-use plastic bottles? (Select all that apply)
   a) I don't buy plastic bottles
   b) It is less expensive than alternatives
   c) It is more convenient than alternatives
   d) I forget a reusable bottle
   e) I don't like tap water
   f) Other: _____

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Section 3:

Reusable bags and bottles have a one time cost and are carried with you from home. Single-use plastic bags are provided for you at checkout and currently have no cost associated with them. Introducing a green tax, a tax that is used to improve the environment, on these shopping bags and single-use plastic bottles would result in a cost for each plastic bag at checkout or each single-use plastic bottle purchased.

1) Would you be willing to pay a green tax on single-use plastic shopping bags?
    a) Yes
    b) No
    c) Unsure

2) Would you be willing to pay a green tax on single-use plastic bottles?
    a) Yes
    b) No
    c) Unsure

3) If your supermarket began charging you a set amount per plastic bag at checkout, at which price point would you switch to using reusable bags brought with you from home?
    a) ₡60/bag
    b) ₡150/bag
    c) ₡200/bag
    d) ₡250/bag
    e) I already use reusable bags

4) If stores began charging you an additional tax per plastic bottle, at which tax price point would you switch to using reusable bottles that you would fill on your own?
    a) ₡60/bottle
    b) ₡100/bottle
    c) ₡140/bottle
    d) ₡180/bottle
    e) ₡220/bottle
    f) I already use reusable bottles

Section 4:

Do you think that single-use plastics are harming the environment?
    a) No
    b) I don't know
    c) Yes. Please explain:
    _____

2) If you said yes to the previous question, how do you know about these environmental issues? (Select all that apply)
    a) Own experience
    b) Friends / Family
    c) School / University
    d) Media (internet, newspaper, magazines, TV, radio)
    e) Other: _____

3) Do you believe that a green plastic tax would significantly reduce plastic waste problems?
    a) Yes
    b) No
    c) Unsure
    d) I don't think there is a plastic waste problem

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Section 5:

1) What is your gender?
    a) Male
    b) Female
    c) Other
    d) Prefer not to answer

2) What is your age group?
    a) <18
    b) 18-25
    c) 26-35
    d) 36-45
    e) 46-55
    f) 56-65
    g) 66-75
    h) >76

3) How many people are in your household (including yourself)?
    a) _____

4) How do you travel to the most visited supermarket?
    a) Public transportation
    b) Walking
    c) Personal vehicle
    d) Biking
    e) Other: _____

5) What is your average monthly income of your household before taxes?
    a) Less than ₡400,000
    b) ₡400,000-₡800,000
    c) ₡800,000-₡1,200,000
    d) ₡1,200,000-₡1,600,000
    e) ₡1,600,000-₡2,000,000
    f) ₡2,000,000-₡2,400,000
    g) ₡2,400,000-₡2,800,000
    h) More than ₡2,800,000
    i) Prefer not to answer

Sección 1: Encuesta de Plástico de Uso Único MarViva

La información que se recopila solo tiene fines de evaluación y no existen riesgos ni beneficios personales por su participación. No hay respuestas correctas o incorrectas, así que por favor sea honesto y cuéntenos su opinión. Todo lo que diga será confidencial y no hay ningún identificador en esta encuesta que vincule sus respuestas con usted. Puede finalizar la encuesta cuando lo desee sin consecuencias. Si desea obtener más información acerca de este estudio, contáctese con MarViva en alberto.quesada@marviva.net o 506-22909600.

Sección 2:

Las bolsas de plástico de un solo uso se refieren a las bolsas que se usan en el proceso de compra y que generalmente se desechan después de ser utilizadas. Las bolsas reutilizables se refieren a las bolsas hechas de un material más resistente que puede usarse varias veces.

1) En promedio, ¿cuántas bolsas de plástico de un solo uso usa por semana?
   a) Ninguna
   b) <5
   c) 5-10
   d) >10

2) Si usa bolsas de plástico, ¿qué hace con ellas una vez que las ha usado para transportar sus productos?
   a) No uso bolsas de plástico
   b) Los boto a la basura
   c) Reutilizo algunas y boto algunas
   d) Las reutilizo todas
   e) Las reciclo
   f) Otro: _____

3) Aproximadamente, ¿con qué frecuencia usa bolsas de compra reutilizables?
   a) Siempre
   b) La mayor parte del tiempo
   c) A veces
   d) Ocasionalmente, pero no a menudo
   e) Nunca

4) Si no usa bolsas de compra reutilizables siempre, es porque… (seleccione todas las que correspondan)
   a) Siempre uso bolsas reutilizables
   b) No sabía que existían
   c) No están disponibles en mi supermercado más visitado
   d) Son demasiado caras
   e) Me olvido de traer las bolsas
   f) Prefiero las bolsas de plástico de un solo uso
   g) Otro:_____

Las botellas de plástico de un solo uso se refieren a las botellas desechables precargadas que incluyen todas las bebidas embotelladas que se encuentran en las tiendas de comestibles y otras tiendas pequeñas. Las botellas reutilizables se refieren a botellas hechas de vidrio, aluminio u otro material destinadas a ser reutilizadas y rellenas varias veces.

5) ¿Utiliza botellas reutilizables?
   a) Sí
   b) No
   c) A veces

6) En promedio, ¿cuántas botellas de plástico de un solo uso compra por semana?
   a) Ninguna
   b) < 3
   c) 3-5
   d) 6-8
   e) >8

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7) ¿Por qué prefiere comprar botellas de plástico de un solo uso? (Seleccione todas las que correspondan)
   a) No compro botellas de plástico
   b) Es menos costoso que las alternativas
   c) Es más conveniente que las alternativas
   d) Me olvido de la botella reutilizable
   e) No me gusta el agua del grifo
   f) Otro:_____

Sección 3:

Las bolsas y botellas reutilizables se pagan una sola vez y las lleva con usted desde casa. Actualmente, se le proporcionan bolsas de plástico de un solo uso al momento del pago sin costos asociados. La introducción de un impuesto ecológico, un impuesto que se usa para mejorar el medioambiente, en estas bolsas de compras y botellas de plástico de un solo uso incurriría en un costo por cada bolsa de plástico al momento del pago o por cada botella de plástico de un solo uso que adquiera.

1) ¿Estaría dispuesto a pagar un impuesto ecológico sobre las bolsas plásticas de un solo uso?
   a) Sí
   b) No
   c) Inseguro

2) ¿Estaría dispuesto a pagar un impuesto ecológico sobre botellas de plástico de un solo uso?
   a) Sí
   b) No
   c) Inseguro

3) Si su supermercado comenzó a cobrarle un monto fijo por cada bolsa de plástico de un solo uso al momento del pago, ¿a qué precio cambiaría al uso de bolsas reutilizables?
   a) ₡60/bolsa
   b) ₡150/bolsa
   c) ₡200/bolsa
   d) ₡250/bolsa
   e) Ya uso bolsas reutilizables

4) Si se comienza a cobrar una cantidad determinada a las botellas de plástico de un solo uso ¿a qué precio cambiaría a la compra de botellas reutilizables o retornables (Aluminio, vidrio)?
   a) ₡60/botella
   b) ₡100/botella
   c) ₡140/botella
   d) ₡180/botella
   e) ₡220/botella
   f) Ya uso botellas reutilizables

Sección 4:

1) ¿Cree que los plásticos de un solo uso están dañando el medio ambiente?
   a) No
   b) No lo sé
   c) Sí. Explica que:

      _____

2) Si respondió que sí a la pregunta anterior, ¿cómo sabe acerca de estos problemas ambientales? (Seleccione todas las que correspondan)
   a) Experiencia propia
   b) Amigos/Familia
   c) Escuela o Universidad
   d) Medios de comunicación (internet, periódico, revistas, tele, radio)
   e) Otro: _____

3) ¿Cree que un impuesto ecológico al plástico reduciría significativamente los problemas de desechos plásticos?
   a) Sí
   b) No
   c) Inseguro
   d) No creo que haya un problema de desechos plásticos

MarViva

Sección 5:

1) ¿Cuál es su género?
    a) Hombre
    b) Mujer
    c) Otro
    d) Prefiero no responder

2) ¿Cuál es su grupo de edad?
    a) <18
    b) 18-25
    c) 26-35
    d) 36-45
    e) 46-55
    f) 56-65
    g) 66-75
    h) >76

3) ¿Cuántas personas hay en su hogar (incluido usted)?
    a) _____

4) ¿Cómo viaja a su supermercado más visitado?
    a) Transporte público
    b) Caminando
    c) Vehículo personal
    d) En bicicleta
    e) Otro: _____

5) ¿Cuál es su ingreso mensual?
    a) Menos de ₡400,000
    b) ₡400,000-₡800,000
    c) ₡800,000-₡1,200,000
    d) ₡1,200,000-₡1,600,000
    e) ₡1,600,000-₡2,000,000
    f) ₡2,000,000-₡2,400,000
    g) ₡2,400,000-₡2,800,000
    h) Mas que ₡2,800,000
    i) Prefiero no responder

MarViva

Appendix B: Summarized Fact Sheet Deliverables

Fact Sheet: Green Tax on Single-Use Plastic

Environmental Threats

- The human population has produced more plastic in the past 10 years than it has in the past century.[1]
- In Costa Rica, only 9% of the one million tons of waste collected each year is treated and the remainder is emptied into rivers.[2]
- Approximately 8 million tons of plastic are disposed of worldwide into the ocean every year.
- 690 species of organisms have encountered debris in the ocean and 92% of this debris is plastic.[3]
- From 1960 to 2010, the amount of seabirds found to have plastic in their stomachs increased from less than 5% of seabirds to 80% of seabirds, and this number is predicted to continue rising to 99% of seabirds by 2050.[4]
- 2% of all trash is recycled by municipalities.[5]

Human Health Threats

- Plastic is non-biodegradable and can only break down into very small pieces of plastic called micro plastics, which are extremely difficult to remove from the ocean. Fish consume plastic microfibers floating around in the ocean, which then move up the food chain to humans.
- Bisphenol A (BPA) is used in many plastic products and is harmful to human health. Exposure to phthalates and BPA from plastics can cause health issues like increased rates of heart disease and diabetes.[6] BPA can also affect the brain and prostate glands in fetuses and newborns.
- Nano-size particles, between 1nm and 100nm, can enter the placenta and blood-brain barrier of an organism in addition to causing negative impacts to the gastrointestinal tract and lungs.[7]
- The chemicals nonylphenol and styrene monomers that are commonly used in plastic products have the ability to attract particles in the ocean including metal fragments. The pollutants are ingested and disperse throughout organisms' digestive and endocrine systems, and spread carcinogens and mutagens throughout the environment and into humans.[8]

Successful Plastic Policy Case Studies

Ireland

- In 2002, the government of Ireland implemented a 15 euro cent (₵106) tax on single-use plastic bags which then increased to 22 euro cents (₵155), resulting in a 94% decrease within weeks.[9] By 2007, plastic waste found in Ireland represented less than 1% of the nation's waste.[10]
- The initial costs of implementing the plastic policy was approximately 1.9 million euros including administration and promotion of the new plastic tax, which was quickly made up by creating over 10 million euros in funds within the first year.[10]

China

- For the 2008 Olympics, China banned the use of plastic bags in supermarkets and added a price to plastic bags in smaller stores.[11] The State Administration of Industry and Commerce also posed the threat of fining shops that distributed free bags.[11]
- This resulted in a 64% decrease in the amount of plastic bags used and the average weight of items per plastic bag increased by 50% within 4 months.[11]

Delhi, India

- In 2009 the government of Delhi, India implemented a blanket ban on the use of all plastics which was found to be ineffective as 94% of people still used plastic bags.[12]
- A revision of the legislation in April of 2009 created a mandatory pricing of all plastic bags, discounts when using reusable bags, taxes at the manufacturing level, and the launch of an awareness campaign, resulting in a 42.9% decrease of plastic bag usage and an increase in reusable bag usage by 17.7%.[12]

South Australia

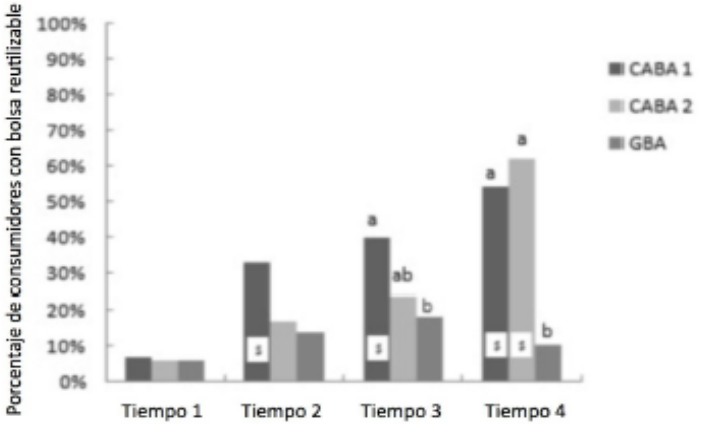
- In 2005, the Environment Protection and Heritage Council scheduled the phase out of single-use plastic bags and offered alternatives in shops by the end of 2008, and posed the threat of fining stores that did not comply.
- Keep Australia Beautiful, a non-profit environmental conservation organization that put an emphasis on educating consumers, found that there was a 45% decrease in the use of plastic bags[13], and Ehrenberg-Bass Institute for Marketing Science found that 8 out of 10 customers were in support of the ban.
- An exit survey also found that 65% of shoppers brought bags, 24% purchased bags in the store, and 11% bought so few items they did not require a bag.[13]

South Africa

- The government developed regulations on bag thickness to make bags more durable and thus able to be reused more. As a result, the cost of bags increased and store owners began charging for bags.
- Citizens were concerned about where the tax money was going.
- 80% decrease in sales of single-use plastic bags initially[14]
- Plastic bag manufacturers advocated for a lower price
- Lower price increased the use of single-use plastic bags as consumers saw a discount in plastic-bag prices

Buenos Aires, Argentina

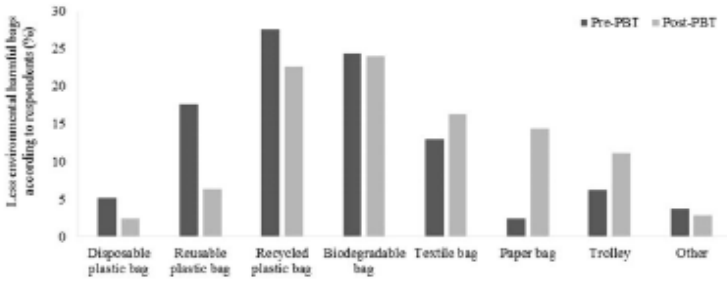
- In 2008, the Environmental Protection Agency of Ciudad Autónoma de Buenos Aires implemented single-use plastic bag tax that evolved into a ban in 2012
- Tax of 0.50 pesos on medium sized plastic bags and 7.95 pesos on large plastic bags[15]
- A study conducted during 4 different time periods (before implementation, the first weekend after charge was implemented, 4 weeks after implementation, and 9 weeks after implementation) found that there was an increase in reusable bag usage
- Studied 3 different stores, stores with white box and dollar sign have the charge implemented



Reusable Bag Use in Supermarkets in Buenos Aires (Caballero, et al., 2014)

Portugal

- National tax was implemented in 2015 that included a follow-up study four months later as well as set achievable goals to reduce bag consumption in the future.
- There was a 74% decrease in plastic bag consumption and a 61% increase in reusable bags[16]
- Alternatives such as textile bags, paper bags, and trolleys all increased in use after the implementation of the tax



Alternatives to Disposable Plastic Bags Used in Portugal (Balaia et al., 2017)

Germany

- The Green Dot system, the European network focused on recycling of packaging materials, implemented a single-use plastic bag tax
- Supermarkets taxed 5-10 euro cents per bag and was later raised to 20 euro cents[17]
- Successful in gaining support of public, business, and government

France

- In 2015, the French government enacted a single-use plastic ban on bags with a thickness less than 50 microns
- Gave companies until January 1, 2017 to comply with new legislation
- First country to ban plastic cutlery, which is going into effect in 2020
- Monitoring the negative effects that could arise from implementing the ban such as loss of jobs[18]

Israel

- In 2017, the Israeli government passed a national tax of 0.10 Israeli New Shekels on single-use plastic bags.
- Plastic bag consumption has reduced by 80% in less than a year of the legislation[19]

Belgium

- In 2007, the Belgian government charged single-use plastic bags, aluminum foil, and disposable plastic cutlery
- Revenue from the charge was EUR 203.8 million in 2004 and rose to EUR 318.0 million in 2012[20]
    - Unclear if increase in revenue was from increase of use or the increase in the price of the tax

Contributing Factors for Successful Plastic Policies

- A green tax is the most beneficial approach because it allows the government to gather funds for further sustainability initiatives. Along with this, it is important to inform consumers on where the tax money is going.
- A strong campaign strategy to raising awareness on why the tax is needed is important to create a behavioral change and educates consumers on how they can contribute to improving the environment.
- Slowly introducing the green tax allows manufacturers, businesses, and consumers to adjust to the new legislation.
- Providing alternatives at the supermarket allows customers to purchase a reusable bag as opposed to a single-use plastic bag.

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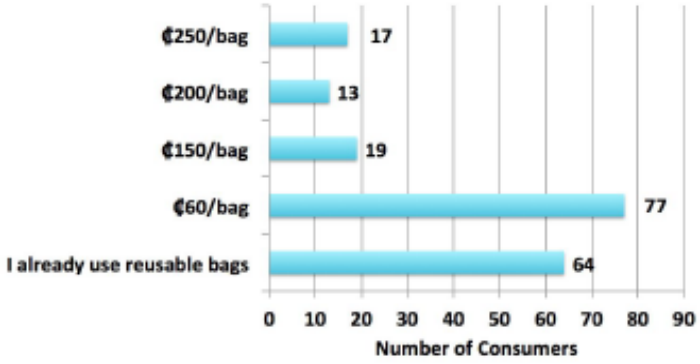
Fact Sheet: Green Tax on Single-Use Plastic Survey Data and Analysis

- 198 respondents surveyed in Yoses, Guadalupe, Escazú, Playa de Coco, Santo Domingo, and Herradura
- 50% of respondents were female, 50% of respondents were male
- 88.5% of consumers believe that disposable plastics are harming the environment
- 70% of consumers believe that a green tax will reduce plastic pollution

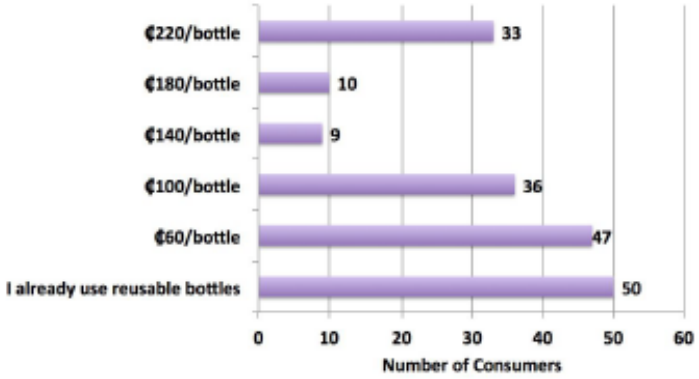
Consumers' Willingness to Pay: Data and Analysis

- About **57% of consumers said they would pay** for a green tax on plastic bags, 31% said they would not, and 12% said they were unsure. About 40% of consumers would be willing to pay 60 colones per plastic bag, whereas 34% of consumers already use reusable bags.



Consumers' Willingness to Pay for a Green Tax on Single-Use Plastic Bags

- About **55% of consumers were willing to pay** a green tax on single-use plastic bottles, 33% were not willing, and 12% were unsure. 27% stated they already used reusable bottles and 25% said they would pay 60 colones per bottle.



Consumers' Willingness to Pay for a Green Tax on Single-Use Plastic Bottles

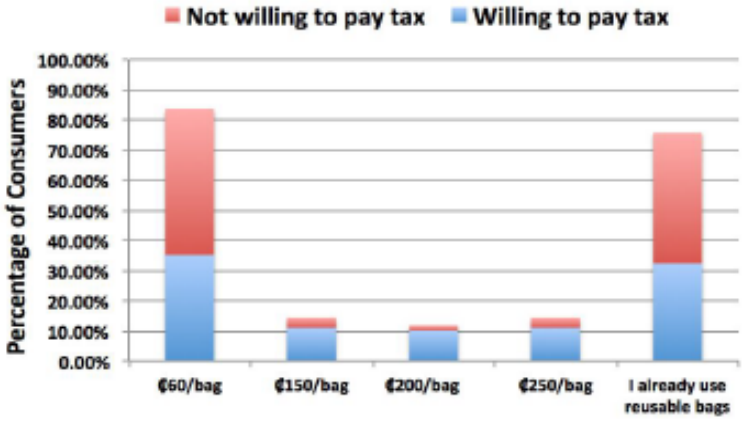
- 26 consumers (out of 61) that responded saying they would not pay a green tax on single-use plastic bags said they always used reusable bags and 19 consumers (out of 65) that responded saying they would not pay a green tax on single-use bottles also said they always used reusable bottles.

Analysis:

- Consumers were more likely to choose extreme value options and middle range values had lower responses.
- May have had different interpretations of question:
  - How much would the consumer be willing to pay to continue using single-use plastic bags/bottles?
  - How much would cause the consumer to switch to using reusable bags?
- Can conclude that consumers did not feel the need to say they would be willing to pay for single-use plastic bags and bottles because they were already using the reusable product.

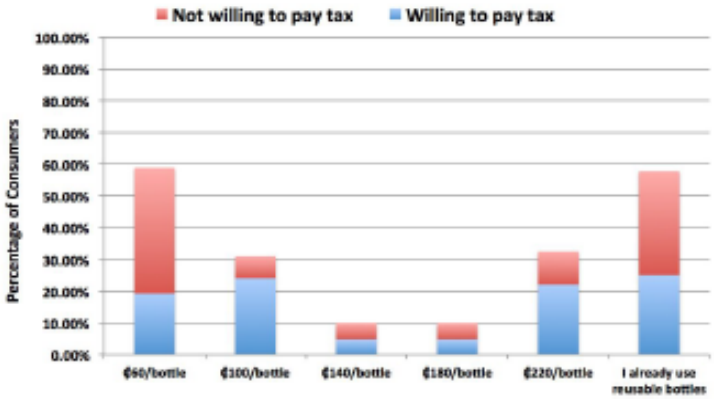
Distributions of Price Point Responses Based on Willingness to Pay:

- 48% of people who did not want to pay the tax chose the lower price point and 44% of respondents who said they already use reusable bags said they were not willing to pay the tax.



Distribution of Price Point Responses Based on Willingness to Pay for a Green Tax on Single-Use Plastic Bags

- 40% of consumers that were not willing to pay a tax on single-use plastic bottles chose 60 colones and 24% of consumers that were willing to pay a tax said 100 colones.



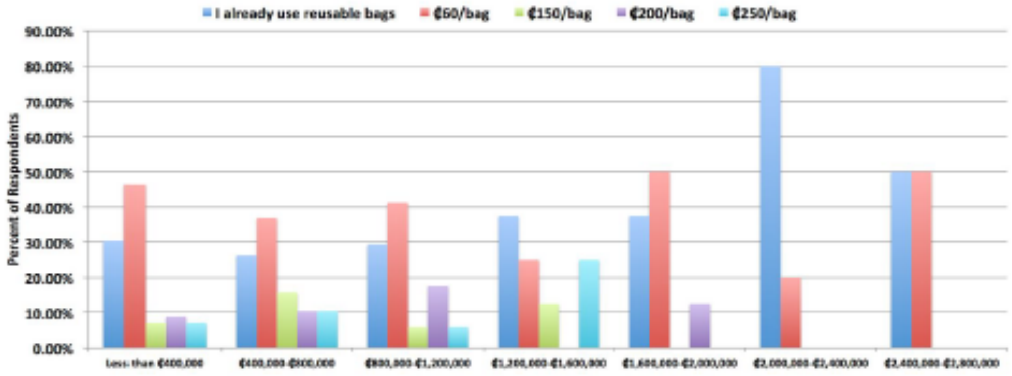
Distribution of Price Point Responses Based on Willingness to Pay for a Green Tax on Single-Use Plastic Bottles

Analysis:

- We can infer that the majority of people that chose the lowest possible price because they were not willing to pay for the tax and those that were more willing to pay for a tax chose a higher price point.

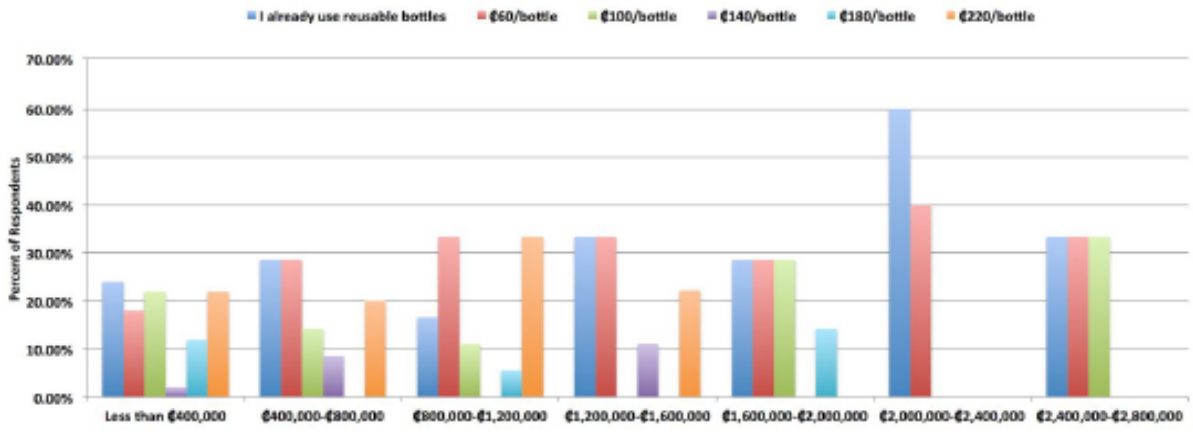
Price Point Preferences Based on Income

- As income increases, willingness to pay increases to 75% for single-use plastic bags.
- The most popular price point response was "₵60" and "I already use reusable bags."
- On average, 30% of respondents with lower incomes chose price points higher than ₵60.



Price Point Preference for Single-Use Plastic Bags Based on Location

- As income increases, willingness to pay increases to 75% for single-use plastic bottles.
- The most popular price point response was "₵60" and "I already use reusable bottles."
- On average, 47% of respondents with lower incomes chose price points higher than ₵60.



Price Point Preference for Single-Use Plastic Bags Based on Location

Analysis:

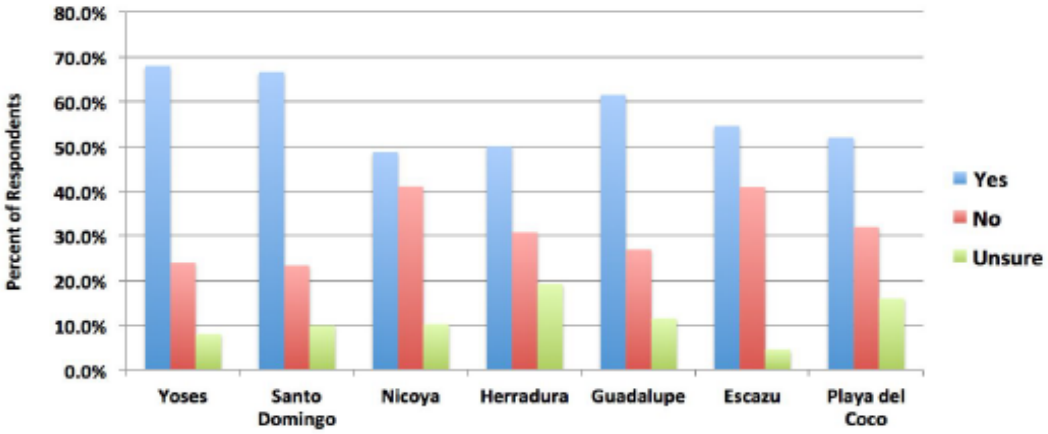
- People with lower incomes and high incomes chose low and high price points which indicates that income doesn't necessarily have an influence on what price point people choose.

Willingness to Pay for Tax Based on Location

- Consumers willingness to pay ranged from about 50% to 70% of consumers surveyed.
- The percentage of people who responded saying they were not willing to pay was most apparent in the areas outside of San José.

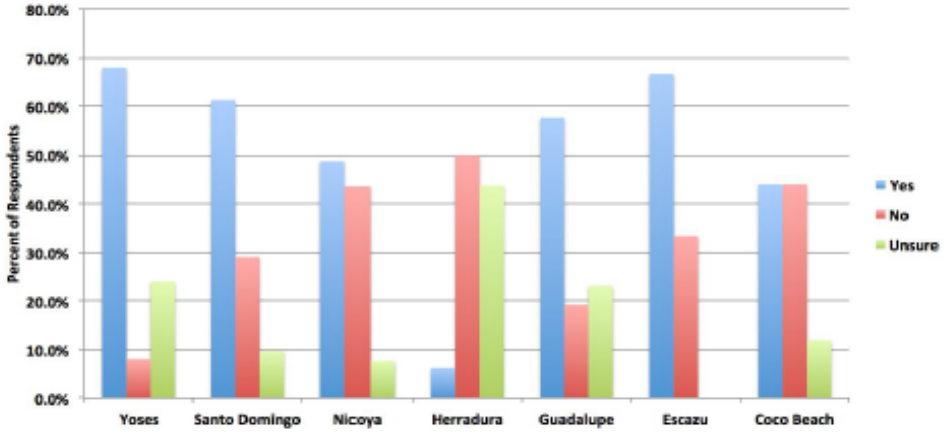
Analysis:

- From this, we can assume that consumers that live in San José have better access to public transportation and are closer to their local grocery store compared to consumers in other areas in the country.
- This could cause the higher willingness to pay rate because it is more convenient to access their grocery stores so the way they carry their groceries is less important.



Willingness to Pay for Single-Use Plastic Bags Based on Location

- Places located in San José had a stronger willingness to pay for a green tax on bottles than locations outside of San José.
- Herradura was the only location that had a larger percentage of people that said they would not be willing to pay for a green tax, while also having the highest percentage of people that stated they were unsure.



Willingness to Pay for Single-Use Plastic Bottles Based on Location

Appendix C: Presentation Deliverable

Contaminación plástica

"La población humana ha producido **más plástico** en los **últimos 10 años** que en el **siglo pasado**" [1]

8 millones **de toneladas**

de plástico se eliminan en el océano cada año[2]

Más de 690 **más de 690 especies marinas**

son dañados por desechos oceánicos

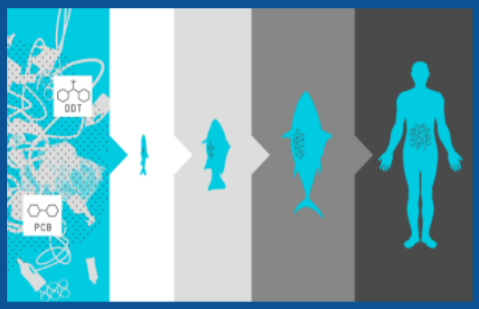
2%

de basura se recicla en Costa Rica[3]

Contaminación plástica: Amenazas ambientales

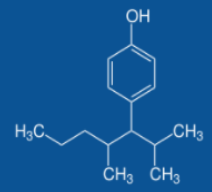
Contaminación plástica: Amenazas para la salud humana

- Microplastics entrar en la cadena alimentaria
- El estudio encontró restos en el 25% de los peces individuales muestreados, el 22% de los mariscos y el 67% de todas las especies incluidas en la muestra.4
- El bisfenol A (BPA) causa problemas de salud

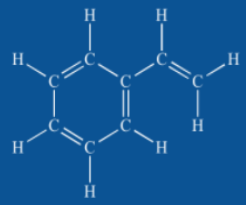


Contaminación plástica: Amenazas para la salud humana

- Las partículas de tamaño nanométrico ingresan a la placenta y también causan efectos negativos en el tracto gastrointestinal y los pulmones.[5]



Nonilfenol



Monómeros de estireno

Otras políticas de plástico de uso único

REGLAMENTACIONES PLÁSTICAS EN TODO EL MUNDO

País	Tipo de regulación	Evaluación del éxito
Irlanda	Impuesto	Resultado positivo
Sur de Australia	Prohibición	Resultado positivo
Alemania	Impuesto	Resultado positivo
Buenos Aires, Argentina	Impuesto	Resultado positivo
Israel	Prohibición	Resultado positivo
Portugal	Impuesto	Resultado positivo
Bélgica	Impuesto	Resultado positivo
China	Prohibición	Resultado positivo
Sudáfrica	Impuesto	Éxito a corto plazo
Delhi, India	Prohibición	Resultado neutral
Francia	Prohibición	Resultado neutral

Irlanda

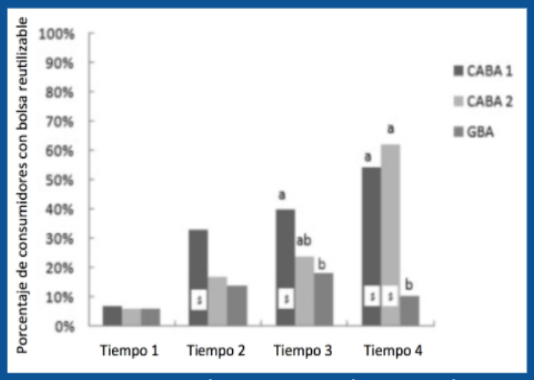
- 2002: impuesto de 22 céntimos de euro (₡ 155)
- 94% de disminución en bolsas de plástico en semanas[9]
- Costos iniciales: 1.9 millones de euros (₡ 1.3 mil millones)
- Fondos en el primer año: 10 millones de euros (₡ 7 mil millones)[10]

Sur de Australia

- 2005: eliminación gradual de las bolsas de plástico de un solo uso
- Disminución del 45% en el uso de bolsas de plástico[13]
- 8 de cada 10 clientes apoyaron la prohibición

Buenos Aires, Argentina

- 2008 Single-use plastic bag tax evolved into a ban in 2012
- 2008 Tax of 0.50 pesos (₡ 14) for medium sized bags and 7.95 (₡ 227) pesos for large bags
- About 50% increase in reusable bags[9]



Reusable Bag Use in Supermarkets in Buenos Aires (Jakovcevic, et al., 2014)

Delhi, India

- 2009: prohibición del uso de todas las bolsas de plástico
- Ineficaz ya que el 94% de las personas todavía usan bolsas de plástico debido a la falta de conocimiento[12]
- Una disminución del 23.7% en el uso de bolsas de plástico

Delhi slaps blanket ban on plastic bags

New Rules To Be Implemented Within A Year

WHY THIS BAN HAS MORE BITE

"Delhi critica la prohibición general de las bolsas de plástico"

Factores que contribuyen a una política de plástico exitosa

- Un impuesto ecológico
- Informando a los Consumidores
- Una estrategia de campaña fuerte
- Poco a poco introduciendo el impuesto ecológico
- Proporcionar alternativas

La voluntad de pago de los consumidores: Datos y análisis

ANÁLISIS DEL CONSUMIDOR BASADO EN LA UBICACIÓN

198 encuestados

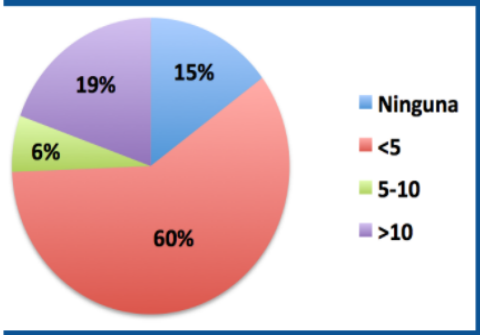
auto MERCADO

Métodos de encuesta

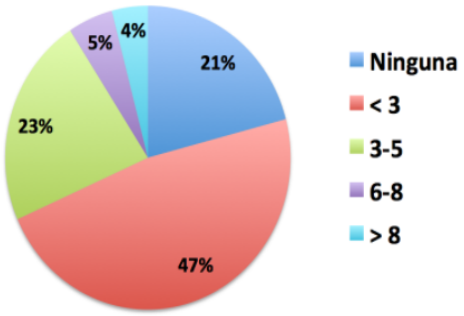
- Método de valoración contingente (CV)
- Preguntas de investigación:
  - Hábitos de consumo
  - Disposición a pagar
  - Advertencia ambiental
  - Demografía
- Eliminando el sesgo

Hábitos de consumo

Bolsas de plástico de un uso único por semana

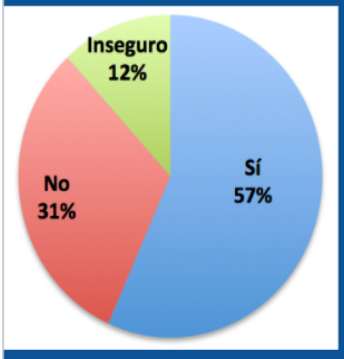


Botellas de plástico de un uso único por semana

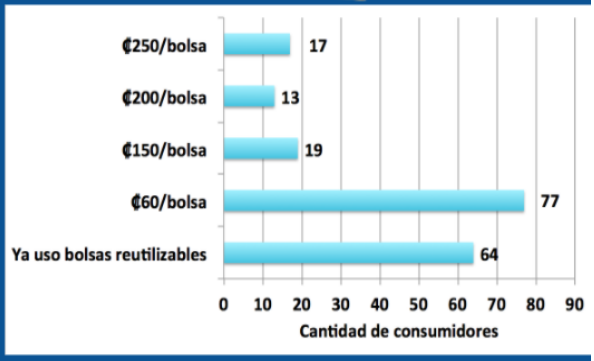


Disponibilidad para pagar: Bolsas de plástico de uso único

Disposición a pagar



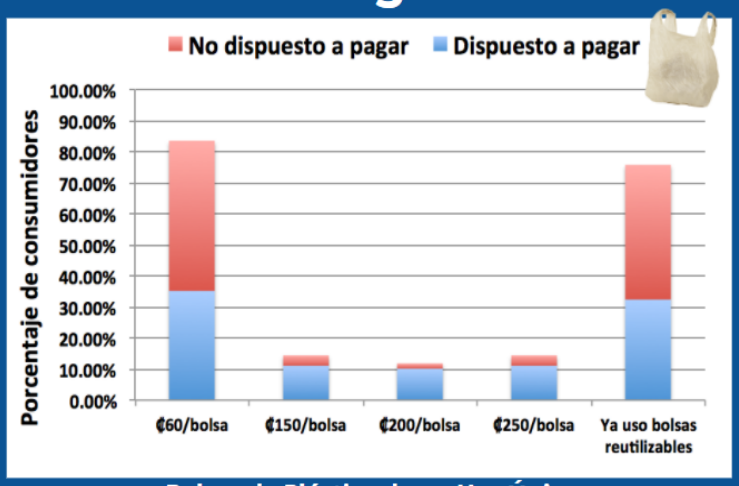
Punto de precio



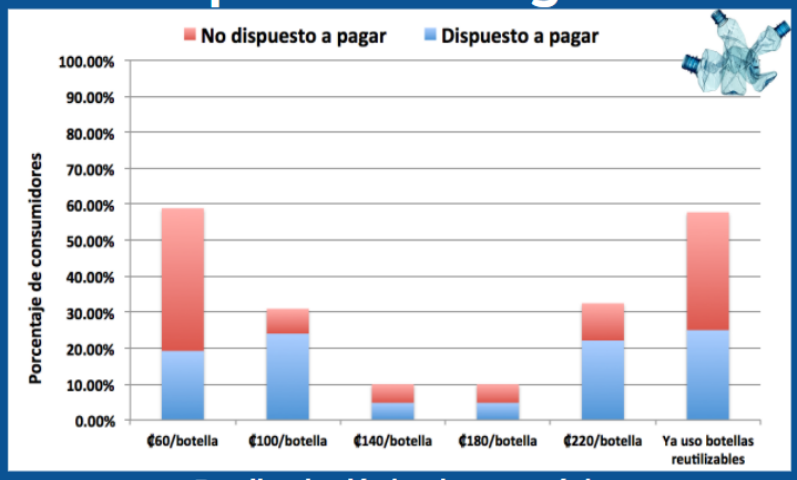
Resultados clave

- Los consumidores eligen extremos
- Diferentes interpretaciones de preguntas
- 26 consumidores que no están dispuestos a pagar, pero usan bolsas reutilizables
- 19 consumidores no dispuestos a pagar, pero usan botellas reutilizables
- No dispuesto debido al uso actual

Distribución de las respuestas del punto de precio basadas en la disposición a pagar el impuesto ecológico

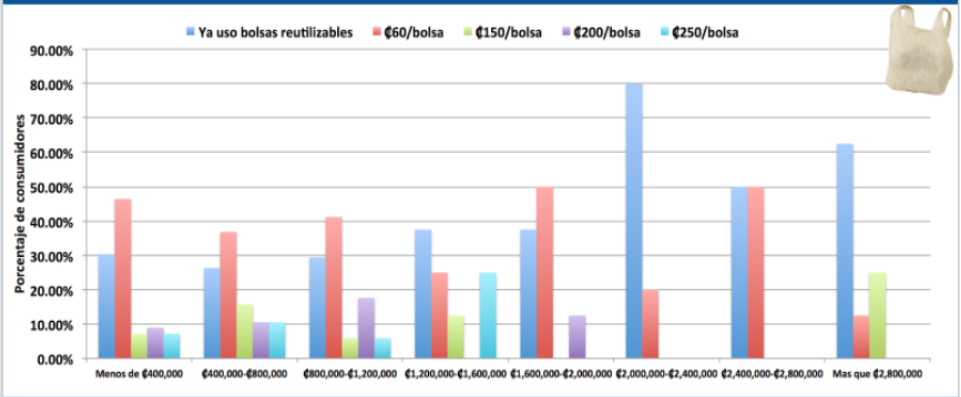


Distribución de las respuestas del punto de precio basadas en la disposición a pagar el impuesto ecológico

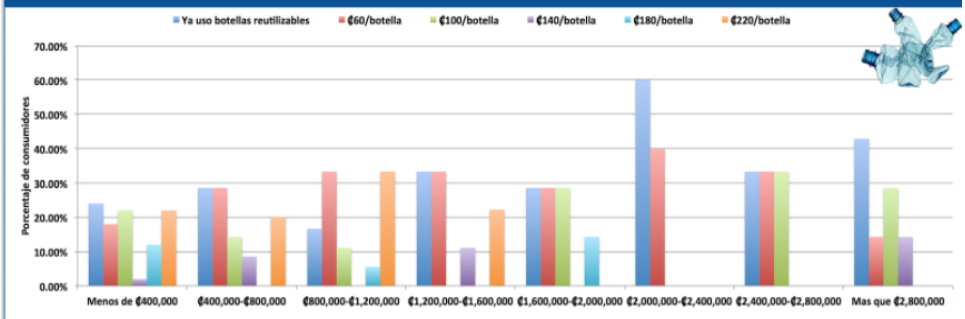


Botellas de plástico de un uso único

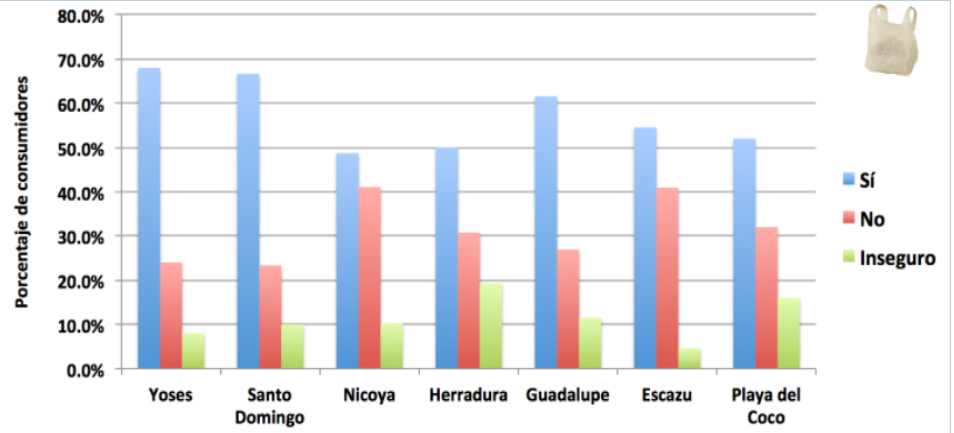
Preferencia de punto de precio en bolsas de plástico de uso único basadas en los ingresos



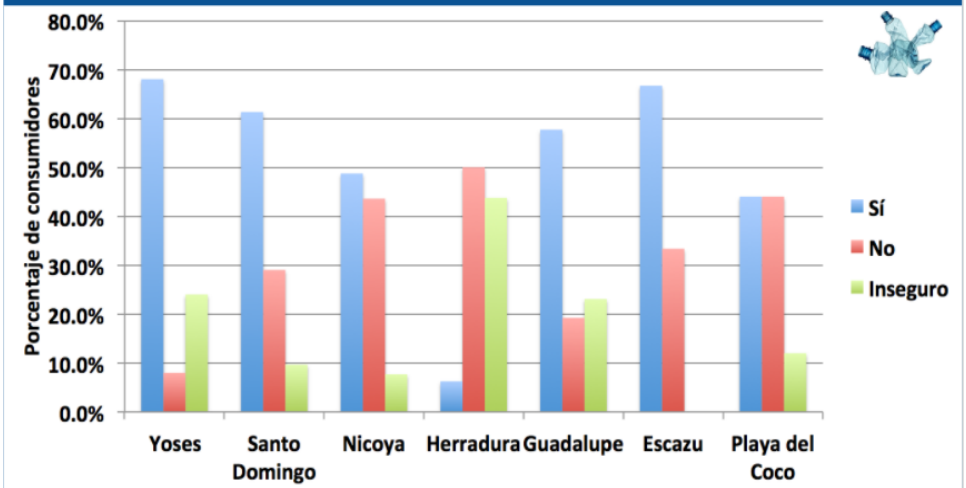
Preferencia de punto de precio en botellas de plástico de uso único basadas en los ingresos



Preferencia de punto de precio en bolsas de plástico de uso único basadas en los ingresos



Preferencia de punto de precio en botellas de plástico de uso único basadas en los ingresos



88.5% de los consumidores
creen que los plásticos desechables son perjudiciales para el medio ambiente

57% de los consumidores
están dispuestos a pagar un impuesto ecológico sobre las bolsas de plástico de un solo uso

55% de los consumidores
están dispuestos a pagar un impuesto ecológico sobre botellas de plástico de un solo uso

70% de los consumidores
creen que un impuesto ecológico sobre los plásticos de un solo uso reduciría la contaminación plástica

₡100

como precio de impuestos para bolsas y botellas de un solo uso

- **26% eligió un precio superior a ₡60 para bolsos**
- **34% ya usa bolsas reutilizables**
- **El 46% eligió un precio superior a ₡60 para botellas**
- **27% ya usa botellas reutilizables**

Posible ingreso con un 50% de disminución en el uso de plástico de un solo uso:

₡57,885,622,600 from bags*

₡33,573,633,600 from bottles*

*Very rough estimate based on our collected data

Conclusiones

- **Alta posibilidad de éxito en Costa Rica**
- **Aumento de fondos para ecosistemas marinos**
- **Impactos positivos del impuesto**
- **Evidencia convincente para los legisladores**

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