A thesis submitted to the Department of Environmental Sciences and Policy of Central European University in part fulfilment of the Degree of Master of Science

Evaluation of the Single-Use Plastic Ban in Reducing Municipal Plastic Waste in El Nido, Palawan, Philippines

Carissa QUINTANA

June, 2018

Budapest

Erasmus Mundus Masters Course in Environmental Sciences, Policy and Management

MESPOM

This thesis is submitted in fulfilment of the Master of Science degree awarded as a result of successful completion of the Erasmus Mundus Masters course in Environmental Sciences, Policy and Management (MESPOM) jointly operated by the University of the Aegean (Greece), Central European University (Hungary), Lund University (Sweden) and the University of Manchester (United Kingdom).

Notes on copyright and the ownership of intellectual property rights:

(3) For bibliographic and reference purposes this thesis should be referred to as:

Quintana, C. 2018. *Evaluation of the Single-Use Plastic Ban in Reducing Municipal Plastic Waste in El Nido, Palawan, Philippines.* Master of Science thesis, Central European University, Budapest.

Further information on the conditions under which disclosures and exploitation may take place is available from the Head of the Department of Environmental Sciences and Policy, Central European University.

Author's declaration

No portion of the work referred to in this thesis has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Carissa QUINTANA

CENTRAL EUROPEAN UNIVERSITY

ABSTRACT OF THESIS submitted by:
Carissa QUINTANA
for the degree of Master of Science and entitled: Evaluation of the Single-Use Plastic Ban in Reducing Municipal Plastic Waste in El Nido, Palawan, Philippines
Month and Year of submission: June, 2018.

The inescapable presence of plastics in our modern world has been causing alarm over their detrimental impact to the environment and public health. In El Nido, Palawan, a protected group of islands in the Philippines, a ban on single-use plastics is currently enforced although its effectivity remains to be seen. Evaluating its effectivity is critical to maintaining the sensitive environment. This paper evaluates the ongoing ban in El Nido through an investigation of the people's compliance as well as a waste characterization survey. Insights from interviews determine that compliance is largely lacking, except in particular barangays where enforcement and continued monitoring as well as community acceptance is strong. The waste characterization survey shows that the ban helps eliminate plastic straws and bags as waste as although bottled water is still highly used, due mainly because of unsafe groundwater issues in El Nido. A map of compliance shows that serious attention needs to be given to the lack of compliance in barangays Bebeladan, Bagong Bayan, Manlag, and Teneguiban. Overall, the ban should be part of a multi-prong approach to reducing plastic waste. Stakeholders need to collaborate on solutions that considers the economic realities of places such as El Nido. These solutions would, ideally, feature not only a ban but also capture refill and dispense distribution models for fast moving consumer goods. Banning single-use plastics have come to represent the ideals of sustainable development but efforts should not stop there, what is needed to enact significant changes are systemic and holistic solutions.

Keywords: single-use plastic ban, El Nido, compliance, waste characterization

---

Acknowledgements

I would like to thank the Municipal Environment and Natural Resource Office (MENRO) of El Nido's local government for being a tireless source of help during my 3-month fieldwork.

Likewise, I would not have been able to do my fieldwork in El Nido without the support of El Nido Resort's Environment Department. The work of their Environmental Officers give me hope that Bacuit Bay's splendour will not be lost to greed and mismanagement.

I would also like to extend my gratitude to my supervisor, Dr. Zoltan Illes, for his prompt replies and guidance throughout these past few months, as well as the faculty and staff of the MESPOM program, these past 2 years has been an incredible journey thanks to all of you.

Most importantly, I would like to thank my parents, my family, and my dearest friends. All the most beautiful experiences in my life I owe to their love and I wouldn't be where I stand now without them.

To all of you, taos pusong pasasalamat!

Table of Contents

List of Tables

List of Figures

1. INTRODUCTION

1.1 Background of the Study

Plastics have transformed our daily lives with the vast range of products it has created and the improvements to technology it has contributed (Andrady et al. 2009). These synthetic polymers are durable, non-corrosive, and moldable; physical and chemical properties that lend plastics well to numerous applications. Plastics have been in mass production since the onset of the 1950s, following its invention in 1907 by Leo Hendrik Baekeland (Gillis and Ralph 1964). The most significant use of plastics today, constituting a third of overall production, is for packaging, the majority of which are thrown away within a year or so of its creation (Hopewell et al. 2009). The term "single-use plastics" refer to these plastics. Commonly used as packaging material and intended to be used for a week at most before being cast-off or thrown away (Barnes et al. 2009). These single-use plastics have caused a worrying waste management problem in marine and land environments (Song et al. 2009). Due to plastic's excellent durability, all of the plastics ever created still survive today, fragmenting further and further as microplastics in the ocean. The bioaccumulation of microplastics within the trophic food web poses a significant threat to wildlife as well as public health since studies have shown their potential to act as endocrine disruptors in mammals as well as causing detrimental effects to the human reproductive system (Rustagi et al. 2011). Other studies have noted that plastic additives such as Bisphenol A (BPA) can pose as carcinogens (Wagner et al. 2011).

Plastics that have not had time to fragment have been found to be ingested by marine vertebrates that mistake them for food, thereby causing bodily harm in terms of posing as choking hazards, internal blockage, and eventual starvation (Macali et al. 2018). Macali (2018) further reveals the recent discovery of plastics ingested by invertebrates, a species of jellyfish, *Pelagia noctiluca* (Forsskål 1775), previously only observed to affect vertebrates, this study has made marine biologists reevaluate the extent of plastic pollution impact on marine wildlife.

Aside from the aforementioned impacts to the environment, it is speculated that the amount of plastic pollution created could be enough to create a layer on the earth's crust, thereby defining a new epoch in the geological timescale according to some scientists, which some have dubbed as the "Plastic Age" or the "Anthropocene Era" (Johnston 2016).

In order to manage this problem, some places have imposed bans and levies on single-use plastics. Last May 2018, the European Commission voted in favor of placing a ban on the ten most commonly found plastics in European oceans and coastlines (European Commission, 2018). The EU anticipates that this ban may be put in practice within the entire bloc, including the UK, by 2021.

Another one of these places where bans on single-use plastics have been imposed is El Nido, Palawan, a municipality in the Philippines.[1] El Nido, Palawan is an important location for a single-use plastic ban to be enforced because it is both a protected area as well as an economically important location in terms of fishery livelihood and tourism for the Philippines. On December 8, 2017, the municipal mayor imposed a ban on single-use plastic where violators are ordered to pay a fine of ₱1000, ₱2000 on the first and second offense respectively and a fine of ₱2,500 or less than 6 months of imprisonment for the third offense when they are caught using single-use plastics. As of October 2018, the ban has been extended to prohibiting tourists from brining plastic bottles on island hopping tours within El Nido.[2] According to informal interviews done by the Environmental Officers of El Nido Resorts[3] the ban has been met with resistance by some locals and business establishments, who simply opt to not comply since the requirements are "too difficult" and alternatives to using single-use plastics have not been easily available as replacements.[4]

[1] Office of the Sangguniang Bayan ng El Nido. *Ordinance No. 004 Series of 2013, An Ordinance Regulating the Use of Cellophane, Plastic Bags, and Styrofoam for Container of Goods and Commodities, and Promoting the Use of Ecobags and other Environment Friendly Materials as Alternatives*

[2] H Almasco (Lagen Island Resort Environmental Officer), personal communication, 14 November 2018

[3] Sustainable island resorts located in EL Nido where the author conducted an internship in exchange for their help with logistical and resource coordination

[4] H Almasco (Lagen Island Resort Environmental Officer), personal communication, 24 April 2018.

1.2 Rationale

It needs to be clarified whether the single-use plastic ban has been effective in El Nido since the ban has not been effective in other places. According to a report by UNEP (2018) on single-use plastics, information on the impacts of these measures is lacking either because the timeline of when the ban was imposed has been too short to gleam any significant impacts or there has been inadequate monitoring after enforcement. Those countries that do have data have reported negligible changes in plastic reduction after imposing bans and taxes. The problems appear to be either a lack of enforcement capability or a shortage of reasonable substitutes for consumers. Circumstances of smuggling and the surge of black markets for plastic bags or the use of denser plastic bags not covered by the specifications of the bans have been reported, arguably exacerbating the problem. Clearly, more studies need to be done on the impacts of single-use plastic bans across different places. This study could be a timely opportunity to study a policy that was first heralded by Bangladesh in 2002 (Onyanga-Omara, 2013) and voted by the European Commission to be put in place in the EU in May 2018 (European Commission, 2018).

Thus, it would be a useful endeavor to investigate whether a ban on single-use plastics has been effective in El Nido since it will serve as an opportunity to propose amendments to the policy in El Nido, thereby exerting direct change and leading a more effective fight against plastic pollution in an environmentally sensitive and economically important area in the Philippines.

1.3 Statement of the Problem

El Nido, Palawan is a protected area in the Philippines as well as a popular tourist site. As a protected area, El Nido hosts critically endangered marine wildlife and unique geological features such as limestone cliffs and lagoons. These attributes have attracted worldwide interest from tourists as well as marine science researchers and conservationists. However, the infrastructure of El Nido's town has been ill-equipped to handle the ever increasing number of tourists, business establishments, and workers residing within the town. The influx of people

has also created a waste management problem due to the indiscriminate use of single use plastic such as plastic bottles, straws, and plastic bags within the town. In response to this waste management problem, the local government of El Nido, Palawan, Philippines, has enacted a plastic ban within the municipality to reduce their usage of plastic. However, it remains to be seen whether the plastic ban is effective. In order to understand if the plastic ban within El Nido is working or not, an investigation of people's compliance to the ban as well as a waste characterization survey must occur in order to understand the impact of the ban and propose any amendments that can improve the current policy implementation.

1.4 Aims and Objectives

In light of the above justification, the aim of this study has three parts:

1) To find out information regarding compliance from businesses (hotels and resorts, restaurants, and tour administrators) as well as consumers (locals and tourists)

2) To assess the volume of municipal waste to determine if the ban has led to a decrease in single-use plastic in the municipal landfill

3) To propose amendments to the ban using information obtained regarding compliance and waste volume

In order to achieve the first aim, there is a need to determine how local businesses and customers have been complying with the ban. The practices that local businesses and citizens have had to adopt in compliance of the ban should be assessed in order to see if they have been a deterrent in the use of single-use plastic as well as a promoter of reusable alternatives. To achieve this first aim, the following objectives are defined:

1. Interview local businesses and consumers on awareness and compliance to the ban
2. Interview local government representatives to determine enforcement challenges
3. Collect a list of fines imposed since the ban was imposed

In order to achieve the second aim, it should be determined whether there has been a decrease in the volume of single-use plastic pollution after the ban was imposed.

To achieve this aim, the following objectives are defined:

1. Interview trash collectors to find out if there has been a decrease in the volume of plastic trash
2. Conduct a waste characterization survey (WACS) on the municipal waste landfill
3. Compare the results of this WACS with past WACS done by the local government pre-ban to determine if there has been a reduction in single-use plastic waste

In order to achieve the third aim, information from the first two aims must be compiled and recommendations for amending the policy must be presented to the local government therefore, the objective for this aim is to:

1. Analyze data gathered from interviews to determine where the problems in compliance are stemming from if any
2. Analyze results from the waste characterization survey to determine the effectivity of the ban in reducing single-use plastic waste load
3. Create a compliance map that aggregates and illustrates the analyzed data
4. Propose recommendations for policy amendment to the local government

1.5 Scope and Limitations

The types of single-use plastic waste to be accounted for in this study will be limited to the types of plastic targeted by the ban i.e. plastic bags used as secondary packaging[5], utensils, disposable cups and plates, straws, trash bags, banderitas or flaglets, and Styrofoam containers, This study also infers that compliance to the ban leads to single-use plastic waste reduction. It does not account for outlying factors that might lead to waste reduction, although these can be explored during the interviews.[6] The WACS was conducted on April 2019. 3 Barangays from the urbanized area and, likewise, 3 barangays from the more rural parts of El Nido were chosen

[5] Plastic bags used primarily for the purpose of convenient handling of purchased goods, Primary packaging, in this instance, refers to the container of the actual product as obtained from the producer which are, more often than not, made from plastic materials

[6] Waste reduction may occur from other factors such as a major fast food chain closing down thereby reducing the actual amount of waste produced within the municipality

to represent the entirety of El Nido. Decreases in single use plastic was inferred by looking at the amount of residual and recyclable waste from the previous WACS done since this is where most of the plastics covered by the ban fall under. Changes in other waste type were also inferred as possible effects of the ban.

Barangay representatives[7] and locals from every barangay in El Nido were interviewed on their compliance to the plastic ban as well as observed changes in generated waste. Tourists, and business establishments that catered to tourists, such as hotels and restaurants, were mostly interviewed within the town poblacion since this is where touristic activity is concentrated. Previously, a survey was the preferred method of data collection, however, the researcher ran into several problems[8] in the field so information was collected through key informant interviews. Interview data was analyzed through a framework by the National Collaborating Centre for Healthy Public Policy.

The index for the compliance map made use of performance indicators (PI) selected from the framework of AlHumid et al. (2019) as well as additional PI's relevant to El Nido. The PI's used reflected the use of qualitative data obtained from interviews, observations, and indigenous knowledge as well as some quantitative data from the WACS.

1.6 Conceptual Framework

The idea underpinning this study is that compliance to the single-use plastic ban will lead to reduced plastic waste in El Nido's municipal landfill and natural environment. Several factors affect compliance which can be generally divided into 2 categories: effect-variables and implementation-variables. Effect-variables include, first of all, the effectiveness of the ban, how well does it actually minimize plastic usage within the municipality of El Nido. Secondly, are unintended effects, which are unanticipated effects that can be traceable back to the ban. The

[7] Barangay Captains or Barangay chairmans, the highest elected official in a barangay. A barangay is the smallest level of administrative division in the Philippines

[8] Locals would neglect to answer surveys and provide misinformation or lie. Ultimately, changing to in-depth interviews gave better assurance to the quality of information being collected.

third factor under effect-variables is equity which looks into how the ban affects different social groups, religions, age groups, and other categories. Implementation-variables, on the other hand, include cost, feasibility, and acceptability. All these factors affect how well the ban is executed within the municipality. Compliance can be further validated through waste characterization studies and compliance mapping. Thus, proper compliance leads to reduced plastic waste in El Nido. The conceptual framework for this study is illustrated in figure 1.

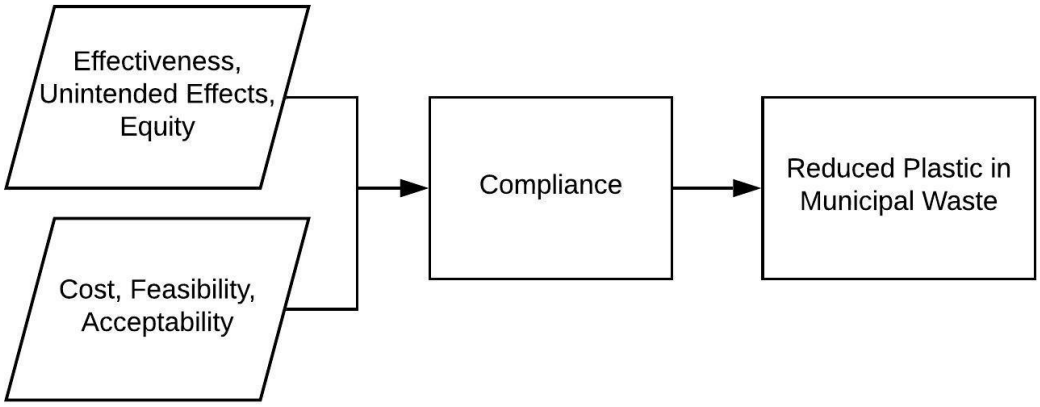


Figure 1. Conceptual framework

2. REVIEW OF RELATED LITERATURE

2.1 Plastics

Plastics are long carbon chains or polymers chemically synthesized using fossil fuels such as petroleum (Hosler et al. 1999). The unnatural length and repeating arrangement of these carbon chains render them so pliable, lightweight, and strong. Aside from these properties, plastics also have low density, low electrical conductivity, high durability, and high flexibility making them a highly sought after material for numerous applications. Today, after just 50 years since it was first synthesized, plastics have become an indispensable part of society.

2.1.1 History of Plastics

John Wesley Hyatt is credited with inventing the first known synthetic polymer by using camphor to treat cellulose to invent a material that could replace ivory (Vlachopoulos 2003).

Hyatt discovered that his invention could be formed to mimic not just ivory but also tortoise shells and animal horns, a discovery that people at the time claimed could help save such animals from being slaughtered for their valuable parts.

Then, in 1907, Leo Baekeland created Bakelite, the first true plastic as we know it today. Bakelite was intended to replace shellac, a natural insulator for electricity. The huge potential of the plastics discovered by Hyatt and Baekeland fueled research into discovering new types of plastic materials. This research proved useful during World War II and plastic production surged to 300% during this time (Nicholson 1942). Materials such as nylon and Plexiglas were useful during war time (Field 2003). After the war, plastics continued to prove useful.

2.1.2 Types of Plastic

The Society of the Plastics Industry (SPI) curated a classification system for plastics back in 1988 to make it easier for recycling companies and consumers to identify their type (Berins 1991). From then on, most plastic packaging has a number from 1 to 6 inside an image of the recycling logo indicating the type of plastic the packaging corresponds to. SPI's classification system has divided plastics into 7 main types: (1) Polyethylene Terephthalate or PET, (2) High-Density Polyethylene or HDPE, (3) Polyvinyl Chloride or V, (4) Low-Density Polyethylene or LDPE, (5) Polypropylene or PP, (6) Polystyrene or PS, and (7) miscellaneous plastics. Among these types, PET, HDPE, and PS plastics are normally recycled, although PS plastics, the material for disposable coffee cups, are difficult to recycle. Packaging film and shopping bags are made with LDPE plastics while drinking straws are made with PP plastics, both of which are seldom recycled. Miscellaneous plastics, typed under group 7, are notoriously difficult to recycle according to SPI. Common products made of type 7 are nylon products and medically safe containers.

2.2 Impacts of Plastics

During the 1960's, growing awareness of environmental issues cast some doubt onto the near positive appeal of plastics especially since plastic debris was discovered floating on the

ocean during the same time period (Barnes 2009). Plastics' inability to decompose made environmentalists increasingly concerned but despite the growing ambivalence, plastics are inescapably part of modern society due to their unquestioned usefulness.

2.2.1 Beneficial Impacts of Plastics

Plastics have impacted society in numerous ways, both good and bad (Gregory 2009). The lightweight and low density of plastics has cheapened the cost to transport goods all over the world by cutting down fuel costs (Tierney 1996). In the automotive industry, replacements of plastics for metal parts have improved fuel efficiency. Plastics have also been used to keep medical products as well as food sterile and hygienic (Raniwala 2004). Healthcare devices such as heart valves, syringes, and prosthetics have been made possible with plastics. The use of polystyrene plastics to insulate heat has helped reduce heating costs, a source of greenhouse gas emissions (Winistorfer 2007). Wind turbines and solar panels also have numerous plastic parts, adding credence to the notion that, despite their detrimental environmental effects in one aspect, plastics have a place in the assent of renewable energy as components to viable energy generators (Fünger 2003; Martínez 2007).

2.2.2 Environmental Impacts of Plastics

It was in the 1970s when researchers started noticing plastic pellets in the North Atlantic, about 60 years after Leo Baekeland developed Bakelite (Ryan 2015). In 1997, oceanographer Charles J. Moore discovered what was eventually dubbed as the "Great Pacific Garbage Patch" (Eriksen et al. 2014). Since then, awareness of plastic pollution, that is, plastics amassed over the earth's surface that has had detrimental effects on the natural biota as well as public health, has steadily increased.[9]

The inexpensive cost of production for plastic has made it widely used in all sorts of applications (Hopewell et al. 2009). In combination with its chemical properties of durability

[9] In 2018, the Earth Day Network, a nonprofit organization that coordinates the annually observed Earth Day, declared year 2018's Earth Day to be focused on ending plastic pollution by 2020.

and resistance to degradation, plastics have demonstrated an extreme inertness to the process of decomposition (Derraik 2002). Plastic debris located in remote locations such as the north and south pole or in deep sea will take considerably longer than the estimated hundreds or thousands of years it will take for plastics normally exposed to sunlight and weathering processes (Eriksen et al. 2014). Hammer et al. (2012) divides plastic pollution according to the size of debris: micro-, meso-, and macro plastics. Microplastics are caused by the disintegration of plastics into smaller and smaller pieces due to the earth's weathering processes. Several studies have noted the detrimental effects of microplastics to the ocean, wildlife, and humans via ingestion (Wagner and Oehlmann 2011). Microplastics tend to bioaccumulate along the trophic food web while larger plastic debris pose as choking hazards for wildlife such as turtles and birds (Ziccardi et al. 2016).

2.2.3 Public Health Impacts of Plastics

Since bioaccumulation occurs when microplastics enter the food web, these small plastic fragments are a threat to public health when people consume animals that have ingested microplastics. Studies have found microplastics in bivalves and fish being cultured for human consumption (Rochman et al. 2016). A recent pilot study by Liebmann from the Environment Agency of Austria and Schwabl from the Medical University of Vienna has found microplastics in stool samples of eight participants across Europe and Asia.[10] Aside from plastic fragmentation causing harm, plastic additives and leachates such as Bisphenol A (BPA) and di-(2-ethylhexyl) phthalate (DEHP) have been the subject of numerous studies owing to their endocrine-disrupting behavior (Rustagi et al. 2011;Wagner et al. 2011;Koch et al. 2009;Mato et al. 2001). BPA particles from food containers, baby milk bottles, and water bottles, among other ubiquitous examples, have been investigated to leach into food and drink, a progression enhanced over time by constant washing or the storage of highly acidic foods and beverages

[10] Although it needs to be replicated in a larger scale, the implications of the study are profound, with the researchers extrapolating that half of the world's human population could potentially have microplastics in their digestive system.

(von Goetz et al. 2013). DEHP, on the other hand, are extensively used in medical devices. In the 1960s, studies showed that DEHP leachate from medical devices were found in body fluids which consequently traveled into human tissue (Latini et al. 2010). Placing consideration beyond the indispensable services made possible with the use of plastics, their accompanying health risks cannot be ignored and future societies must find a way to deal with this plastic problem.

2.3 Plastic Waste Management Strategies

Several solutions have been put in place in an attempt to curb the plastic problem. The principle of Circular Economy has been used to inspire the use of plastic waste as input materials for bricks. Policy instruments such as bans and levies are currently being enforced in various countries around the world with varying levels of effectivity. Economic incentives such as the exchange of commodities such as rice for recyclable plastics is being considered in some regions of the Philippines (Abrina 2018). Alternative materials are also being developed as possible replacements of plastics. These measures represent the myriad of solutions being considered, although, not without their share of constraints and disadvantages. The key is to use a multi-pronged approach appropriate to the context of the problem.

2.3.1 Recycling Plastic

One of the ways plastic waste pollution is being managed is through recycling. Recycling refers to the process of creating new products by processing used products that would have just been thrown away (Arvanitoyannis et al. 2001). Items made out of recycled plastic cannot be recycled once more (Bergman 2018). Plastics are first sorted into its different types, according to the classification scheme by SPI (Association of Cities and Regions for Recycling 2004). Then a washing procedure removes adhesives and labels to improve the look of the end product. Washed plastics are passed through a shredding machine to turn them into plastic pellets which are, then, extruded according to their classification.

The benefit of plastic recycling comes from the need to manage the huge volume of

plastic waste created every day. Diverting waste plastic for recycling also clears up landfill space since the accumulation of plastic waste has been a prevalent problem in landfills (Chinda t al. 2012). Recycling also lessens the need to extract petroleum to create virgin plastic materials (Ligthart et al. 2007).

China has been a major player in the recycling industry, importing 60% of the world's recyclable materials during its peak in 2017. In 2018, however, China imposed its National Sword Policy, setting cleanliness standards for imported waste products so high that exporting countries such as most Western countries and Japan have treated it as a ban (Higgs 2019). This has transmitted most of the flow of waste products to Southeast Asia, overwhelming countries like Thailand who do not have the proper infrastructure to deal with the massive influx of waste. The crippling of the recycling industry by China has created criticism at the recycling industry as the solution to global waste, declaring the industry as an unstainable business.

2.3.2 Alternative Products to Plastic

Several startups have experimented with innovative products to minimize society's dependence on plastics. Mushroom packaging, developed by the startup Ecovative, is one such product. As the name suggests, the product is made from mycelium fed with agricultural waste. With the right conditions, the mycelium turns the waste into material akin to Styrofoam thereby functioning as a viable alternative. Other products that perform like other plastic materials are currently being developed. Although a lifecycle assessment has yet to be done to verify Ecovative's claims that their product is better for the environment, it represents one of many innovative solutions being tried by companies and researchers.

2.3.3 Banning Single Use Plastics

Plastics are incredibly versatile materials that have proven to be economically valuable and convenient to use. The overreliance on their usage has caused plastic pollution that encompasses economic losses owing to their lost value as well as costs in clean up, tourism, and fishing (Garrod et al. 1998). The most commonly littered plastic items are cigarette butts,

plastic bottles and bottle caps, bags, coffee lids, straws, and drinking stirrers (Derraik et al. 2002).

Due to the plastic waste management problem experienced worldwide combined with increasing awareness of plastic's detrimental effects, many places around the world have started taking active measures to control their use of plastic. One such active measure is single use plastic bans. Bangladesh was the very first country in the world to impose a ban on single use plastics back in 2002 (Xanthos et al. 2017). Kenya's plastic bag ban has the world's harshest penalty of $38,000 as of August 2017. In January 2018, Canada banned the use of microbeads in cosmetics after research showed that Lake Ontario contained 1 million microbeads per square kilometer. In the German city of Hamburg, plastic coffee pods have been banned. Corporations have also started banning plastic drinking straws amongst their supplies. Companies such as Starbucks, Walt Disney, Marriott Hotels, American Airlines, SeaWorld Entertainment, and Ikea have committed to phasing out straws and other single use products (Dauvergne et al. 2018).

In the Philippines, there is talk within the national government to aim for a nationwide ban on single use plastics following evidence by the United Nations stating that the Philippines belongs to one of the five countries that creates half of the entire world's plastic waste. The other four countries are China, Thailand, Indonesia, and Vietnam. A contributor of the Philippines' status as a major ocean polluter is its sachet economy (Ang et al. 2007). Poverty limits most Filipino citizens to buying household items in small quantities, which manufacturers have accommodated by packaging their products in sachets, everything from soy sauce, vinegar, laundry detergent, and shampoo are more readily available in single-use sachets than in bulk quantities.

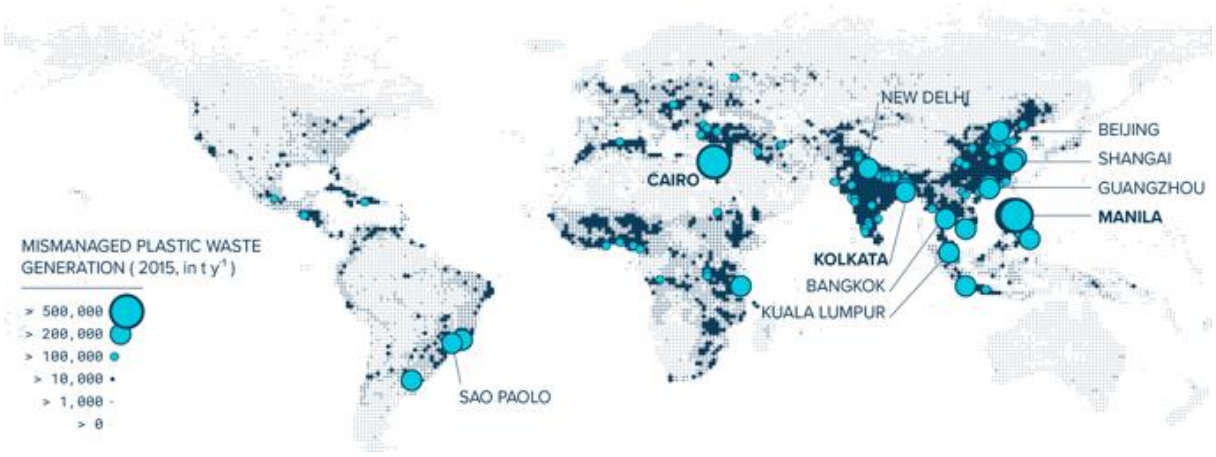


Figure 2. Global mismanaged plastic waste (MPW) generation in 2015 (Image and caption taken from Lebreton et al. 2019)

Completely banning plastic straws has been met with criticism by the disabled community. People with disabilities (PWD) who need straws to be able to drink properly are concerned that the bans will make it difficult for them to drink their beverages in public places (Ho 2018). Some proponents have also criticized the trend of single use plastic bans by corporations as nothing more than greenwashing (Shelton 2018). Starbucks is cited as a specific example, as Starbucks aims to replace plastic straws with recyclable polypropylene plastic lids that do not need straws. A move, argued by Shelton (2018), that will not make much of an impact in terms of reducing plastic waste since only 9% of recyclable plastic is actually recycled.

The biggest resistance to banning single use plastics are the lack of viable alternatives (Ang et al. 2007). In Kenya, where the penalty for being caught in violation of the plastic ban is the world's highest, a black market for plastic bags has sprouted (Bahri 2005)

2.4 Context of the Philippines

2.4.1 Sachet Economy of the Philippines

Sachet economy is the practice of buying consumable products such as shampoo, detergent, and milk powder in single use plastic packaging referred to as sachets (Ang et al. 2007). It is prevalent in poorer communities where the average income is too little or too irregular. While

it may be cheaper to buy in bulk due to economies of scale, the average person living in these poor communities, does not have enough savings to afford larger quantities of the product, thus, buying small quantities of the product is preferred. Corporations have responded to this need by offering common household products in smaller and smaller packaging i.e. sachets. Sachets are made even more prevalent by the ubiquity of sari-sari stores around the Philippines. Sari-sari stores are small convenience stores commonly found around every street corner in the Philippines. These stores often sell sachet versions of commonly used products. These stores are abundant in rural areas where larger markets are too far away. The environmental consequences of buying sachets is notable, as the Philippines is one of the top 5 countries responsible for most of the plastic pollution in the ocean (Leung 2018).

2.4.2 El Nido, Palawan

El Nido is a municipality in the province of Palawan (Philippine Statistics Authority 2015). It can be found about 420km southwest of the Philippine capital, Manila, and 238km northeast of the Palawan provincial capital, Puerto Prinsesa (Figure 3). The Ministry of Natural Resources (MNR) Administrative Order No 518 was issued in 1984 that proclaimed Bacuit Bay, situated within El Nido, as a Marine Turtle Sanctuary. In 1991, the entirety of El Nido, not just Bacuit Bay, was declared a marine reserve due to its unique geographical features and endemic species. Then, in 1998, by directive of the Department of Natural Resources and Environment (DENR) Administrative Order No. 14 Series of 1992, El Nido as a marine reserve was combined with nearby municipality of Taytay to form the El Nido-Taytay Managed Resource Protected Area. This declaration intended to reconcile the protected area status of El Nido with the livelihood needs of the local fishermen.

The DENR Mines and Geosciences Bureau (MGB), the government agency responsible for the country's mineral resources claims that the location of El Nido's landfill is a natural pathway for rainwater. This could mean that a strong rainfall event can carry waste from the landfill into runoff and rivers. These bodies of water can then, in turn, transport the waste to

the ocean. Thus, the waste in the landfill is interconnected with the waste found in Bacuit Bay.

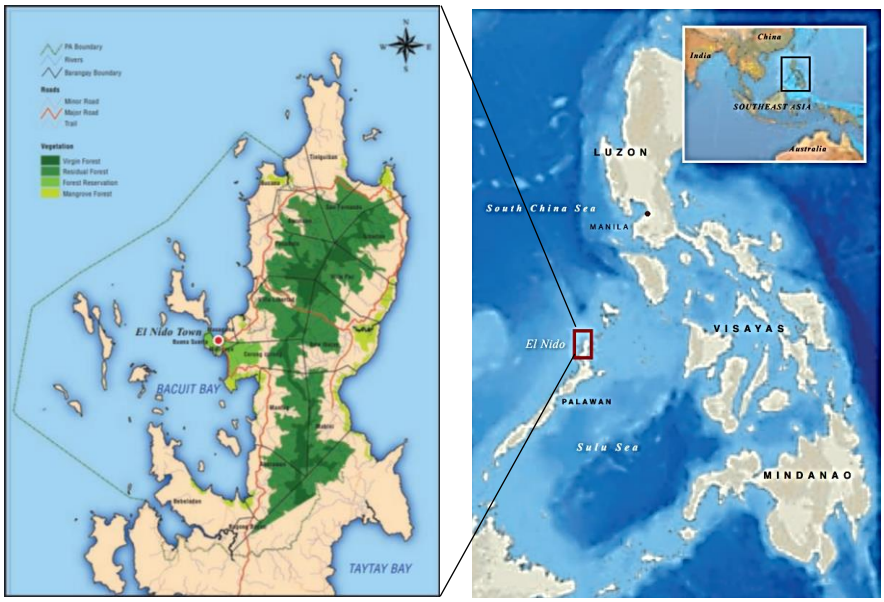


Figure 3. L: Map showing El Nido and Bacuit Bay, R: Map of the Philippines showing the location of El Nido (World Wildlife Fund [WWF] 2005)

2.5 Laws and Ordinance on Waste Management in the Philippines

2.5.1 Republic Act 9003

Republic Act (R.A.) 9003 January 26, 2001 is the Philippines' national policy on solid waste management, formally entitled as the Ecological Solid Waste Management Act of 2000. The law, containing 7 chapters and 66 subsections, was passed by Congress on December 20, 2000 and subsequently officially approved by the Office of the President by January 26, 2001. This law creates the essential institutional instruments such as incentives and penalties as well as stipulation of funds for the appropriate segregation, assemblage, transport, storage, recovery or disposal of waste in accordance to best environmental practices and public health security. Recovery includes provisions on recycling, compost, materials recovery, aside from initial reduction of waste volume before finally stipulating proper disposal techniques. RA 9003 established the National Solid Waste Management Commission (NSWMC) to handle the enforcement of this law in cooperation with the establishment of a Solid Waste Management Board (SWMB) at the local governance level. The SWMB is instructed to formulate 10-year ecological solid waste management plans appropriate to their local context and conditions.

2.5.2 Ordinance No. 041 Series of 2015

Following RA 9003's mandate of leaving waste management implementation at the local level, El Nido's local government enacted this ordinance formally entitled as "an ordinance for the implementation of solid waste segregation at source and providing penalties for violations thereof." The ordinance was created on October 19, 2015. According to the ordinance, waste is segregated into five types: compostable, non-biodegradable, reusable or recyclable, hazardous and special waste, and lastly, bulky waste and white goods. Bulky waste refers to waste that cannot fit reasonably sized containers owing to their sheer size or unwieldiness. White goods refer to household and commercial appliances at the end of their lifespan whose parts can be dismantled for other purposes.

Aside from reiterating the segregation types, the ordinance also asks generators to prioritize first and foremost source reduction, followed by reusing, recycling, composting, and lastly, disposal. In order to facilitate proper waste management within the municipality, the local government's management scheme includes the policy of no segregation, no collection and proper waste storage. This puts pressure on generators to properly segregate and store their waste otherwise it will not be collected. Multiple types of storage bins are allowed under the scheme although the ordinance prefers bins appropriate to the size of waste that generators usually create so leakage and spillage will be minimized. On the part of waste collectors, a set schedule and collection point will be determined for every barangay wherein generators can bring their waste when timely. Compostable, reusable, and recyclable waste will be managed by the barangay while non-biodegradable waste will be disposed at the municipal landfill.

2.5.3 Ordinance No. 004 Series of 2014

In the effort to minimize non-biodegradable waste being sent to the municipal landfills as well as to protect the beaches and islands of El Nido from improperly disposed waste, the local government enacted the ordinance "regulating the use of cellophane, plastic bags and Styrofoam for container of goods and commodities, and promoting the use of ecobags and other

environment friendly materials as an alternative." The ordinance covers those types of plastic that end up as residual waste. Cellophane, plastic bags, and Styrofoam are prohibited from being used as a secondary container wherein the material had an original container such as softdrinks in bottles subsequently transferred to a cellophane bag for more convenient handling. Mostly they are prohibited as one time use items for purposes such as food containers, party items like disposable cutlery and party decorations.

Business establishments, aside from consumers, are prohibited from selling the banned plastic items as well as repackaging materials such as rice and coal. Plastics which can be reused are exempt from the ban. Alternative materials to be used in lieu of plastic bags are cloth bags, buri bags, or mesh bags. In order to promote the alternatives to plastic bags, business establishments are encouraged to train all staff of the ban, endeavor to promote the use of ecobags in all possible situations, and are encouraged to give discounts to customers who bring their own containers for shopping and buying food.

The local government will distribute eco bags to business establishments, provide training on how to make eco bags, award commendations to compliant business establishments and households and provide a 10% discount to their garbage fee. Penalties for violating the ban is 1000 pesos for the first offense, 2000 pesos for the second offense, and 2,500 pesos for the third offense and/or a 6 month imprisonment or a 1 year suspension of license to operate in the case of commercial establishments. In September 2018, an amendment to the ban was enacted which prohibited the use of plastic bottled water in island hopping tours by tourists, boatmen, and tour guides.

2.6 Evaluation Frameworks

2.6.1 Policy Effectiveness

The National Collaborating Centre for Healthy Public Policy, a think tank based in Quebec, Canada, proposed a framework for analyzing public policies as seen in Table 1. The framework is a structured way to analytically process the robustness of a particular public policy.

According to Milio (2001), good public policy lifts up society by improving the conditions that people live under.

Table 1. Dimensions for Analyzing Policies

Effects	Effectiveness	What effects does the policy have on the targeted problem?	Durability
	Unintended effects	What are the unintended effects of this policy?	
	Equity	What are the effects of this policy on different groups?	
Implementation	Cost	What is the financial cost of this policy?	
	Feasibility	Is this policy technically feasible?	
	Acceptability	Do the relevant stakeholders view this policy as technically feasible?	

The conceptual framework of the 6 dimensions shown in table 1 is illustrated in figure 4. All the factors under effects, that is, effectiveness, unintended effects, and equity all play a part in how a policy is perceived, and more importantly, how much it is accepted by the general public, policymakers, and other stakeholders. Cost also affects acceptability. If a particular policy places too much of a financial burden on certain actors then they are more likely to reject it. Feasibility affects cost by changing the practicability of a policy. If there is a more efficient, and therefore more cost-effective way to run a policy then that policy is more feasible. Lastly, acceptability and feasibility reinforces each other. The more viable a policy, the more acceptable it is. Cost, acceptability, and feasibility are factors relating to implementing a policy, and each factor influences the effects of a policy.

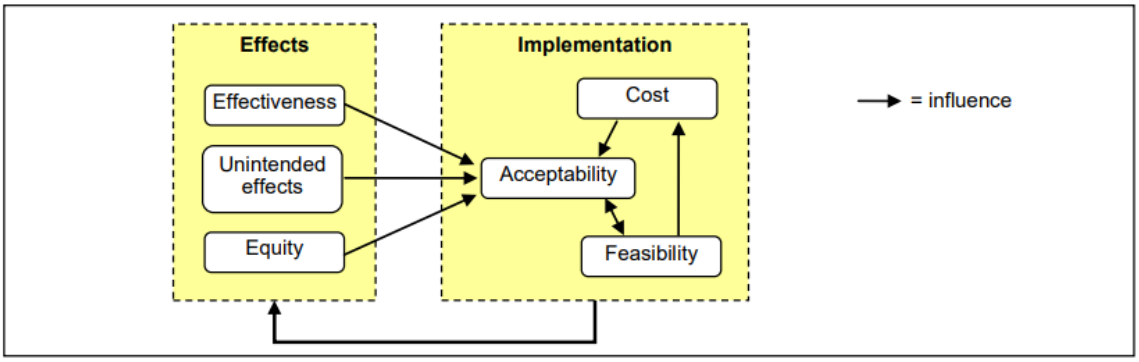


Figure 4. Relationship of the 6 policy dimensions

2.6.2 Index for Waste Management

An index is a useful construct intended to summate various variables into a single measure. It is useful as a way to compile and communicate various data points into a single aggregate. In waste management, literature about performance assessments have been scarce but Coelho et al. (2012), made an attempt to assess various uses of multicriteria decision-making (MCDM) within the practice of waste management. The appraisal revealed that most literature is dedicated to landfill location complications (Donevska et al. 2012; Ud et al. 2009), environmental and social impacts of waste management technologies (Coelho et al. 2012), and proper selection of waste treatment facilities (Cherubini et al. 2009).

The use of performance indicators (PI's) was demonstrated by Mendes et al. (2013) in evaluating waste management systems of areas with very seasonal tourism. In most studies, evaluation of a constitutent of the waste management system was measured using PI's acquired from municipal data sets for comparison with regional or global counterparts (Abbondanza et al. 2019; Zaman et al. 2014; Mendes et al. 2013; Huang et al. 2011). The limitations in these studies lie in their inability to adjust to observational inaccuracies or incomplete data. Moreover, PI's of these past literature that relied heavily on quantitative data could not account for qualitative data, indigenous knowledge, or data sets with narrow time frames. In this regard, the index developed by Alhumid et al. (2019) circumvents these limitations therefore making it appropriate to apply in the context of El Nido's waste management system.

3. METHODOLOGY

3.1 Study Area

3.1.1 18 Barangays of El Nido

The municipality of El Nido contains 18 barangays. According to the local government code of the Philippines, a barangay is the minimum political unit spanning a geographical area, akin to a district or a suburb. The Poblacion, or central business district, of El Nido spans 4 barangays: Buena Suerte, Corong-corong, Maligaya, and Masagana. Some census include Villa Libertad as part of the poblacion. The poblacion is where the local government plus other offices such as the Protected Area Office (PAO) that has jurisdiction over the protected area status of El Nido. The poblacion is also where most of the hotels and business activities catering to tourists are concentrated. The town pier located at the end of the poblacion is also where most island hopping tour boats originate from. Other tours originate from the El Nido Resorts group.[11]

The other barangays are Bagong Bayan, Barotuan, Bebeladan, Mabini, New Ibajay, Pasadeña, San Fernando, Sibaltan, Teneguiban, Manlag, Villa Libertad, Villa Paz, Bucana, and Aberawan (see Figure 5). Bacuit Bay is located to the left of El Nido. Island hopping tours are concentrated in the smattering of islands and limestone cliffs on the southern part of Bacuit Bay. The nearby municipality of Taytay is located to the south of El Nido, adjacent to barangays Bagong Bayan, Aberawan, and Mabini. The right side of El Nido is Sulu Sea then the island of Luzon where Manila, the Philippine capital, is located. To the north of El Nido is the municipality of Coron, another popular tourist area where the Calamian archipelago is found.

[11] The 3 island resorts are called Pangulasian, Miniloc, and Lagen. There is a 4th resort called Apulit under the same company but is located in the municipality of Taytay

Figure 5. Map of the 18 barangays in El Nido (Created by author using base maps from the National Mapping and Resource Information Authority (NAMRIA) of the Philippines). Refer to Figure 3 for the location of El Nido within the Philippines.

3.2 Research Design

The general flow of this study consists of conducting interviews to key stakeholder groups in El Nido as well as a waste characterization survey of waste coming from the 18 barangays of El Nido to infer if decreases in banned plastics has been occurring since the ban was put in place. Observational notes and analysis of scholarly secondary sources accompanied the data gathered in the field. After critically probing patterns extracted from the data, clarifications and recommendations could be presented that can improve the policy in theory and in practice.

3.3 Waste Characterization Survey (WACS)

The WACS was done in accordance to the method prescribed by the Philippine Environmental Governance Project in their 2011 published manual on waste analysis and characterization. Preparation for the waste characterization survey included defining the sample area, sample selection, procurement of materials, and preparation of waste segregation site. A team from the Municipal Environment and Natural Resource Office (MENRO) was assembled to conduct the segregation and data processing. Results of the WCS will then be compared to the WCS done by the local government before the ban was put in place in order to see if there has been a reduction in single-use plastic waste as well as compare any changes in waste types after the ban was imposed on the municipality.

Data collection took place on April 2019. 3 participants from commercial establishments, institutions, and households were asked to separate their waste into 4 categories: biodegradable waste for leftover food and yard waste; residual waste for unrecyclable waste such as sachets, food packaging, and plastics; recyclable waste for glass bottles, aluminum cans and other recyclable items; and finally, special waste for any waste that does not fit neatly into the other categories, usually these are uncommon types of waste such as broken furniture or appliances.

A total of 9 samples were collected per barangay, 3 for each participant type. Per capita generation of waste was calculated by dividing the total waste collected for the 3 sampling days by the total number of residents (in a household) or total number of staff (in an institution) or

by the total number of staff plus average daily customers or guests (for a store, restaurant or hotel) (see Equation 1).

$$Per\ Capita\ Generation = \frac{Total\ Generated\ Waste\ per\ Sampling\ Day}{People\ per\ Establishment}$$

Equation 1. Per Capita generation of waste. People per establishment may refer to total number of residents in a household or total number of staff plus average daily customers for commercial establishments

Projections for the average amount of waste produced by each person in a barangay were calculated by multiplying the per capita generation to the total population of El Nido (see Equation 2). The total population was taken from the Philippine Statistics Authority (2019), the official government institution that collects censuses on population. Finally, yearly projections were approximated by multiplying the projected daily waste produced by each person to the number of days in a year, 365. A sample table of the data can be found in appendix 8.1.

$$Projection\ (Daily) = \frac{Per\ Capita\ Generation}{Total\ Population\ of\ El\ Nido}$$

Equation 2. Projected daily generation of waste. Figure is multiplied by 365 to get the yearly projection.

3.4 Interviews

A semi structured interview with key informants was employed for landfill operators, the local government, school representatives, and other key stakeholders. Likewise, interviews on the level of compliance to the single use plastic ban was conducted for business establishments and people. The business establishments were categorized into three main groups: tour operators, hotels and resorts, and restaurants and markets. Since the main industry of El Nido, aside from fisheries, is tourism, these 3 establishments are biggest players within the tourism industry.

People were, likewise, categorized into 3 main types: local tourists, foreign tourists, and locals.[12] Local and foreign tourists are the main consumers within the municipality. There were

[12] Locals were defined as Filipino citizens, whether born in the Philippines or naturalized, who claim El Nido to be there current permanent address

a total of 131 interviewees (see appendix 8.3 for the outline and 8.2 for the consent form).

3.4.1 Data Analysis

Evidence-based decision making calls for an analysis of what strategies and courses are effective based on how policies advance societal conditions (Milton et al. 2001). Nutley, Walter, and Davies (2007) refer to this evidence-based analysis as a method to determine "what works" and considers not only the performance of the policy in question in fulfilling its intention but also any concerns arising from implementation. Appropriate execution of a public policy increases its chances of success. Hence the necessity for analysis to focus on both effects and implementation.

The analysis of the plastic ban in El Nido was consequently guided by the framework for analysis created by the National Collaborating Centre for Healthy Public Policy was based on the criteria of both effects and implementation. Finally, performance of the policy over the long term, defined as durability, is affected by all the factors that fall under effects and implementation.

3.5 Compliance Mapping

The index developed by Alhumid et al. (2019) was used for this map since it can best account for qualitative data obtained from interviews, observations, and indigenous knowledge as well as quantitative data with short time frames, unlike other similar indexes reviewed for the study. Contextually appropriate PI's were selected from the pool of PI's in Alhumid's study (see Table 2). Additionally, other relevant PI's were added to the matrix to ensure robustness of data as well as ensure it reflected the conditions of El Nido given the limitations in data collection.

A scoring system based on low (0-3 points), medium (4-7 points), and high (8-10 points) was used. Scores were based on observations, interviews, comparisons with literature, and results of the WACS. All barangays of El Nido were assessed on the PI's found in table 2. A summation of total points resulted in their overall compliance score. A map of compliance using

ArcGIS was created to illustrate inter-barangay similarities and differences in waste management. The map helped convey which barangays needed improvements in general waste management and compliance to the plastic ban to the relevant authority.

Table 2. Performance Indicators for Compliance Mapping. (Adapted from AlHumid et al. 2019)

Performance Indicator (PI)	Performance Indicators (PI)
Effects of ban	Presence of MRF
Implementation of ban	List of fines
Community involvement	WACS results
Public acceptance	Odor impact
Enforcement	Visual impact
Community awareness	--

4. RESULTS AND DISCUSSION

4.1 Policy Evaluation: Effects

The effects of the plastic ban in El Nido was subdivided into three components: effectiveness, unintended effects, and equity. First and foremost, effectiveness, refers to the capacity of the ban to attain its primary objective: reduce single use plastic waste. Unintended effects refer to any type of effect unanticipated by the stakeholders. Lastly, equity refers to effects on people of varying social classes wherein one group may be disproportionately affected, whether positively or negatively, more than others by the ban.

4.1.1 Effectiveness

The first component to assess the success of the plastic ban in El Nido is its effectiveness in realizing its objective of reducing single use plastic waste within the municipality. In addition to this primary goal, the inclusion of negative effects, and the lack of any effects whatsoever was also considered in this analysis.

Almost all of the interviewees noted an observed decrease in plastic waste since the ban was enacted. Many tour guides, whose job is to escort a dozen or more tourists to the many

islands within Bacuit Bay, also confirm that they have started to see less floating plastic waste around the bay since the ban. Although this observation was not ratified by divers who venture farther out into the open sea or sea floor as they claim there are still a sizable amount of plastic waste in the ocean.[13] A public school teacher from Barangay Mabini and a local from Pasadeña lamented how plastic bags are increasingly difficult to procure since the ban was put in place.

Interviewees consisted of establishments such as restaurants and hotels within the town as well as barangay captains and sari-sari store owners in the barangays outside the poblacion. Notably, however, the landfill manager of the municipal landfill stated that the ban has not been effective in reducing plastic water bottles. This is understandable given that the ban does not prohibit bottled water within the town, it only prohibits people from bringing these bottles whilst on a boat lest they throw them away to the open sea.

A receptionist at a hotel in Barangay Corong-corong corroborated the observation of the landfill manager as she noted that while some of the plastics covered by the ban were eliminated in their hotel, plastic bottles are still provided on a complementary basis to guests with a provision that they are not to be brought when island hopping.

The effects of a policy are often challenging to evaluate as enough time must pass before observable effects can be gleamed. A direct link from cause (i.e. the plastic ban) to effect (i.e. decrease in single use plastics) can be problematic to verify since policies are not the only thing that impacts the problem in question (Milton et al. 2011).

Furthermore, there is a scant number of published literature investigating the link between policies and their targeted effects (Liu et al. 2008). Which is why examining intermediate effects can be beneficial. Intermediate effects allows the chain of effects to be analyzed from cause to target-problem in order to make sense of the intermediation reasoning. Swinburn and colleagues (2005) assert that analyzing the logic chain can be used to determine

[13] It would be prudent to note here that the municipality of El Nido might not be the sole contributor of plastic waste in Bacuit Bay. Trash could be carried by ocean currents from the nearby municipality of Taytay, for example, which does not have a plastic ban.

if the policy is truly targeting the problem if there is no data yet that links the cause and effect directly. The logic flowchart of the ban could be illustrated as follows:

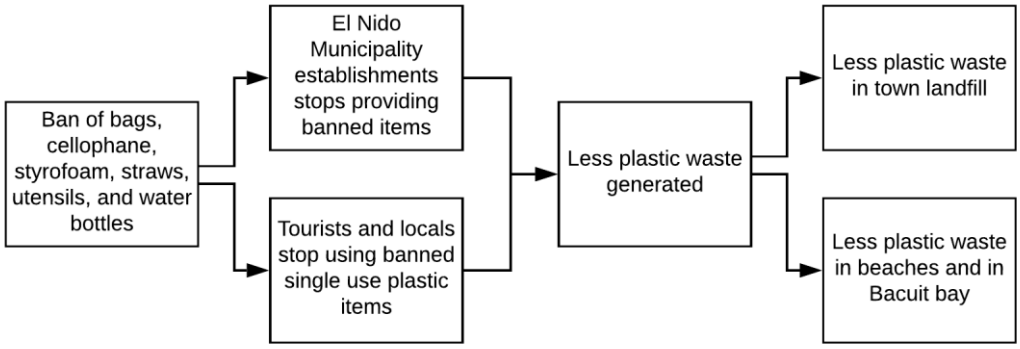


Figure 6. Intervention flow chart of the ban showing intermediate effects

The intervention logic assumed by the ban states that less plastic waste will be found within Bacuit Bay and along El Nido's beaches following compliance to the ban by establishments, tourists, and locals. However, stakeholders have to account for plastic waste coming from outside El Nido's jurisdiction. Some barangays are geographically closer to the municipality of Taytay which predisposes residents to buy goods there rather than in the town. The municipality of Taytay, unlike El Nido, does not have a single use plastic ban in place. Additionally, ocean currents can transport plastics very far from its place of origin (Gillespie et al. 2012). This is compounded by the issue of plastic's durability which is prolonged when plastics drift into remote locations that do not experience frequent weathering conditions such as sunlight or wind.

The implementation logic requires the combined effort of business owners no longer providing customers plastic items included in the ban and consumers to make the necessary lifestyle adjustments such as bringing their own bags to the market. The government tried to make this adjustment easier by selling market vendors cloth bags coined as "ecobags" which are used in place of plastic shopping bags and meant to be reused by the consumer. This combined effort should reduce the amount of plastic waste generated by the municipality of El Nido. Nearly all tourists interviewed commend the effort of El Nido to reduce its plastic usage

but did not necessarily stop patronizing restaurants that still serve drinks with plastic straws nor refrain from purchasing bottled water. Carrigan (2001) refers to this as a failure for ethical choices to translate into actual consumer behavior, the myth of the ethical consumer.

Arguably, the success of the intervention logic relies more heavily on the power of the local government to enforce the ban. However, the local government does not have enough personnel to patrol every area El Nido. Indeed, one restaurant owner was frustrated at the local government's lack of manpower in patrolling the municipality lamenting at how she did not have any authority to hand out fines to the violators she sees in the public market. People who want to see the ban enforced better have become watchdogs for the local government by reporting violators.

The enforcement of the ban outside of the poblacion relies on the cooperation of the barangay captains in each barangay, however, many barangay captains have not made any real initiatives to enforce the ban. Some, such as the barangay captain in Villa Libertad, have asked locals to inform him of sari-sari store violators, although according to him, none have come forward.

There is also some accountability on the part of locals and tourists to adjust their normal behavior when buying goods. Market vendors say many locals have learned to bring their own shopping bag. Many restaurant or food stall owners, on the other hand, have not experienced any locals bringing their own food container when buying viands. A recurring complaint coming from the locals was the perceived unfairness of the ban in targeting small sari-sari stores or food stalls when the bulk of the plastic problem in the Philippines come from sachets and small containers provided by large corporations. Ultimately, the effects of the ban's intervention logic require deeper enforcement and more belief on the part of consumers of its importance.

4.1.2 Unintended Effects

Given the intricacy of modern society, a policy such as a ban can produce effects other

than a reduction in single use plastic usage. Rychetnik (2002) refers to these as positive or negative unintended effects which can come from any facet of societal life. Pinpointing all unintended effects can help prescribe the appropriate mitigating measures for deleterious unintended effects as well as possibly aid in raising the morale of the public due to any positive unintended effects.

One positive unintended effect has been the impact of using bamboo straws. One restaurant owner says that they receive messages from tourists informing her that they have decided to switch to bamboo straws in their restaurant businesses back in their own countries upon seeing the metal, paper, and bamboo alternatives to plastic straws in El Nido. The ban has also encouraged locals to be accountable for each other, acting as watchdogs and reporting violators to the local government. One interviewee, a tour guide who confiscated the bottled water brought by tourists awaiting for their island hopping tour boat, explained this behavior as their way of ensuring that no one is above the law.

Furthermore, the ban has also encouraged establishments and locals in El Nido's poblacion to be cleaner, with interviewees reporting that there used to be much more trash along the streets and canals before the ban. This effect might be due to the fact that there is less plastic waste overall or that the ban has strengthened the town's anti-littering policy.

As for negative unintended effects, people report to seeing ecobags being discarded instead of reused. El Nido Resorts, who ship most of their consumable items from Manila, have experienced costlier shipping fees when the company made the switch to glass bottles which are heavier to transport than plastic water bottles. Undoubtedly, these higher fees signal higher fuel usage, thereby being a tradeoff between the use of fuel and the use of plastic. People in client-facing roles such as cashiers in some grocery stores, bare the ire of tourists who do not like paper bags in lieu of plastic bags as, according to them, these rip quite easily. In this regard, cashiers in shops such as Abot Kaya in Barangay Corong-corong have reported a difficulty in pacifying beleaguered customers who expect to be provided with plastic shopping bags.

4.1.3 Equity

The ban forces locals to bring their own bag when buying products in the public market. It also discourages the practice of buying minute amounts of products which are often placed in small transparent plastic bags locally called *plastic labo*. This forces a shift in consumer habits which disproportionately targets lower income households who predominantly have this habit. This preference for purchasing minute quantities of products instead of bulk amounts often comes from the buyer's inability to save enough money to afford bulk purchases. Rutherford (2009) emphasizes this inability to save money as a major hindrance to lifting people out of poverty.

Before the tourist boom, El Nido was primarily a fishing town whose residents subsisted on the fluctuating and irregular income from the *catch of the day*. The tourist boom has created other livelihoods in El Nido, however, this has been concentrated within the poblacion, most of El Nido's other barangays still rely on fishing and farming (Census of Population 2015). Thus, locals do not have enough money saved to buy larger versions of the products they commonly buy. The increase in tourism can also exacerbate the economic divide between rich and poor as the rural areas of El Nido are drained of its resources to feed the urban areas where tourism thrives (Lipton 1977).[14]

Additionally, as a tourist town, most people are only temporary residents. As transient guests of the town, most people prefer purchasing products in sachets rather than in bulk which creates more plastic waste. Indeed, as a response to this preference, the sari-sari store, an ubiquitous sight in many small Philippine barangays, only provide products in sachets. One interviewee said that they find reusable drinking bottles too expensive to warrant a purchase as well.[15]

[14] A local said that coconut trees, which used to stretch across the islands, are now a rare sight, cut down to make way for new hotels and resorts

[15] Back in 2016, the Mayor decided to go on an educational campaign throughout the schools in El Nido. Part of the campaign involved encouraging students to bring their own tumblers to school instead of buying bottled water. The Mayor handed out discounted tumblers for sale to the students.

The ban places a high inconvenience and burden to poorer households and small establishments, those living in rural parts of El Nido, who cannot invest in replacing their products for plastic-free versions. The local government should take note of whom might be disproportionately affected by the ban in order to correct these inequalities (Milton et al. 2011; Swinburn et al. 2005).

4.2 Policy Evaluation: Implementation

Evaluating the ban also includes evaluating its implementation to determine if the ban can work as a long term solution or if there are any amendments needing correction. Costs, feasibility, and acceptability all fall under implementation factors relating to the policy.

4.2.1 Costs

Costs can be those acquired by the government in executing the policy or may refer to gains acquired by the government in the form of fines and penalties which can be used for other purposes. Costs for other actors, such as consumers who have to adjust their lifestyles in order to comply with the policy lest they be imposed with recurring fines are considered as well (Salamon 2002; Pineault and Daveluy 1986). The ban's fines should be realistically high enough to discourage people from using single use plastic yet not too high so as to be ridiculous and unenforceable.[16]

Restaurant establishments, as one interviewee mentioned, may experience a slight dip in profits if they refuse to let customers take out items in the menu that cannot be placed in cardboard containers such as soup dishes. Furthermore, there may be higher environmental costs associated to the use of reusable alternatives to single use plastics *if* these items are not reused. These costs reflect the expense of the alternative materials, whether the materials are easily procurable, availability of present technology to mass produce such alternatives, as well as shipping and transportation costs (Lewis et al. 2010).

[16] Barangay Pasadeña has adapted the ban and increased the fine to 10,000 Php (approx.. 170 Eur) compared to the original fine of 2,500 Php for the 3rd offense (about 42 Eur)

The cost of providing alternatives to single use plastics are gains of the producers of said alternatives. Some paper straw manufacturers have invested in building another factory to keep up with the growing demand for paper straws over the backlash for plastic straws (Anzilotti 2018).

Ultimately, the ubiquity of single use plastics is the cost of convenience over the cost of inconvenience. The unique physical and chemical properties of plastic has lent itself to a myriad of useful applications. The convenience cost of the continued usage of single use plastics, however, carry a possible health cost related to human exposure to BPA and DEHP, endocrine disrupting plastic additives (North 2013).

According to Geyer (2017), since the discovery of plastic polymers and its rise to mass production there have been 8300 million metric tons (Mt) ever produced with 79% of this amount in landfills or in the natural environment. The difficulty in envisioning the long term impacts of the plastic pollution dilemma is a deferred cost for humanity.

Thus, the ban represents a course of action that, whilst imperfect, represents one of the solutions to the plastic problem. The cost of inaction, a business-as-usual scenario, may create a future where plastics are more numerous than fish in the sea by 2050 (Ellen MacArthur Foundation 2017).

4.2.2 Feasibility

The local government unit in charge of implementing the ban is the Municipal Environment and Natural Resources Office (MENRO). The MENRO is composed of 13 staff led by Raffy G. Cabate. Only MENRO as well as barangay captains and their *tanods*[17] have the authority to impose fines to anyone caught in violation of the ban. Some barangay captains, however, are unwilling to hand out fines for fear of citizens retaliating by refusing to vote for them during the next elections as is the case for one official in barangay Corong-corong. The lack of manpower, combined with the reluctance of some barangay captains to cooperate,

[17] Barangay police officers

means that the local government is finding it difficult to oversee the farther barangays of the municipality. Some barangay captains and local government officials, additionally, supply plastic bags to stores around different barangays as well or are otherwise owners of restaurants which do not comply with the ban, compounding the problem with a conflict of interest on their part.

Aside from the lack of manpower, there is the problem of a lack of viable alternatives to plastics. Bags and plates made from leaves were once ubiquitous materials but, now, plastic items are preferred and more readily available. Some customers refuse to be inconvenienced with bringing their own bags, water tumblers, and reusable cutlery while others cite their lack of financial means to even afford reusable items such as tumblers. Advocates cite the latter reason to be insufficient going so far as calling these reasons as excuses for a lack of initiative.

Many interviewees, however, noted that Mayor Nieves Rosento, current acting Mayor who approved the ban, is known to be strict. Filipinos value strong personalities in their leaders (Vineles 2016).[18] However most institutions in the Philippines are still weak (Teehankee 2016; Hutchcroft 2003). While the ban is consistent with the Solid Waste Management Act of the Philippines, or RA 9003, the weakness of institutions to enforce the act has been apparent since its inception. A concrete example of this is the frustration of many locals in El Nido on the irregularity of trash pickup by the local landfill management, combined with the inability of said management to return *sakos*[19] as agreed upon so that locals can reuse them for their trash bins, since trash bags are included in the ban.

Thus, feasibility to enforce the ban seems to have compounding problems of lack of manpower, weak enforcement, and weak institutions. To strengthen the ban there needs to stronger public acceptance on the importance of the ban and not just see it as an inconvenience. A paradigm shift in the reliance on plastics must occur (He 2012; Hoffman 2010).

[18] The enduring popularity of strongman President Duterte, despite controversy, being a clear example
[19] Large reusable sacks often used to contain rice traditionally made with burlap or hemp

4.2.3 Acceptability

Acceptability refers to how stakeholders and affected actors agree with the policy in addressing the problem, if they even see that the problem is worth addressing. The plastic ban affects everyone in the municipality, that is, establishments such as restaurants, tour operators, and hotels, as well as individuals such as tourists and locals. Per the interviews of all stakeholders involved, everyone found it difficult in the beginning to adjust to the ban. Although this can be viewed as a normal part of adjustment. Some stakeholders still see the ban as a great inconvenience. A grocery store clerk in Barangay Corong-corong exclaimed that they bear the ire of customers who have grown accustomed to having their groceries placed in a plastic bag. The store switched to paper bags which, as the clerk says, rips easily thus annoying many customers who do not bring their own shopping bags. Other stakeholders are more sympathetic and understand the importance of decreasing plastic waste.

The issue of bottled water is also a public health issue since El Nido does not have safe drinking water from the tap. El Nido does not have a proper sewage system so the reservoir has been contaminated. Tests for E.coli have shown up positive (Fabro 2018). Thus, locals prefer to buy purified water from refilling stations in which they have 5 gallon refillable containers. Transient individuals such as tourists prefer buying the smaller bottled water. This issue has made it difficult to completely ban the sale of bottled water within the municipality. Thus the workaround of only prohibiting bottled water on island hopping tours which has met mixed acceptance among locals and tour guides, who are tasked to oversee this. In fact, some tour guides often instruct tourists to hide the bottled water in their bags instead of outright confiscating them, which other guides have been observed to do.

The policy's acceptance can evolve during implementation as observed by most interviewees who found it difficult to follow the ban in the beginning, often forgetting to bring their own shopping bags in the market, but now claim it is easier to follow. The ban's acceptance also coincides with the 6-month rehabilitation of El Nido which calls for an overall

restoration of the town's water quality, coastal easement, and carrying capacity (Fabro 2018).[20] The ban also needs to be clearer on which circumstances are *plastic labo* allowed to be used. [21] Interviewees noted contradicting beliefs on the accepted use of *plastic labo,* a sign that the local government needs to release clearer information. Furthermore, some sari-sari store owners use *plastic labo* which are stamped as biodegradable, along with a seal of approval by the Department of Science and Technology (DOST). However, according to MENRO, these are fake seals from DOST and the plastics are not really made with biodegradable materials.

Acceptability of the ban relies more on the ease of finding alternatives, a problem that still needs more solutions in order to increase community acceptance within El Nido.

4.3 Implications for Long Term Impact

The durability of the ban or its capacity to remain in effect long after its enforcement requires that it be effective in minimizing plastic trash, mitigate the unintended effects of higher fuel consumption and disposal of ecobags, and easing the burden on local people, establishments as well as tourists complying with the ban. Alongside these factors, the ban must also ensure to invest collected fines toward stronger enforcement in order to discourage offenders and increasing the acceptance of the ban from local stakeholders. According to most interviewees, the ban's effectivity rests mostly on the need for stronger enforcement. The local government, barangay captains and *tanods,* should increase vigilance to deter the use of banned plastics in the long term. The local government should also address El Nido's groundwater issues which will greatly lessen bottled water usage within the municipality. Additionally, the local government needs to collaborate with supportive locals, commercial establishments, and tour operators to come up with multi-pronged solutions to minimizing plastic usage that considers the challenges for every stakeholder.

[20] Originally, El Nido was due for total closure and redevelopment, such as in the case of Boracay, however a 6-month rehabilitation was proposed as a workaround given the efforts of stakeholders in rehabilitating El Nido, efforts that were not observed in Boracay.

[21] MENRO released a follow-up memorandum detailing the accepted and unaccepted uses of plastic labo, a thin transparent plastic bag.

In order to gain larger community acceptance, the positive impacts of the ban could be reported to the community at large. According to Xanthos et al. (2017), doing so could provide incentive and context for communities inconvenienced by the ban. Combining this strategy with consistency in enforcement and monitoring on the side of the local government could help enact significant reductions in municipal single-use plastic waste.

4.4 Alternatives to the Policy

Bans are said to be an anti-people or anti-poverty kind of policy (Gubrium 2013; Blank 2003). Even worst, some critique the ban on single-use plastics as ineffective. Effective change must come from the generating source: multinational corporations as well as a change in lifestyle choices of consumers (Xanthos et al. 2017). What is needed, as these critics argue, are systemic level solutions that considers the impacts of all solutions and alternatives. One that considers the impacts not just to the environment but also to food shelf life preservation, the disabled community that need access to straws, and the economic realities of low income households that rely on products that come in sachets for their basic needs.

In some places in the Philippines, for example in Sipalay and Bayawan Negros Occidental, the non-government organization, Sea Waste Education to Eradicate Plastic (SWEEP) have partnered with local sari-sari store owners for bottom-up and grassroots approaches to minimizing single use plastic dependence. SWEEP joined with these sari-sari stores to redesign the commonly available products in their sari-sari store to eliminate the use of sachets and other single use plastic items by engaging in refillable models of the products.[22] The concept, however, is difficult to recreate at a larger scale given the extended manufacturer accountability of transnational companies that produce Fast Moving Consumer Goods (FMCG) as well as government regulations on health and safety. There needs to be a discussion with these corporations and the relevant authorities governing public health in order to increase the

[22] SWEEP claims the concept is not so much a redesign rather a return to roots. Historically, before the invention of sachets, sari-sari stores relied on a refill distribution model to sell fast moving consumer goods.

viability of refilling stations as defensible product distribution models.

Aside from grassroots led approaches, some social enterprises have chosen to focus on the existing plastic waste in the natural environment. One such enterprise, Green Antz, aims to produce unconventional building materials that incorporate shredded waste plastic and an organic binder to incorporate everything together into their product, the *ecobrick*. The enterprise seeks to address the problem of plastic waste by including local communities in the solution through the participation of schoolchildren in preparing plastics and providing income prospects for locals through Green Antz Hubs in their communities. According to Rommel Benig, Green Antz cofounder, the *ecobrick* is stronger and more insulating than traditional bricks, and uses less cement. Their product represents a solution that addresses the present quantity of plastic waste in the natural environment.

4.5 Waste Characterization Survey

The purpose of the waste characterization survey (WACS) was to see the changes in waste types before and after the ban. It also served to validate any insights gained from the interviews. Results are shown in table 2 below. The first comparison was between the types of waste produced by commercial establishments such as hotels and restaurants. Immediately noticeable was the increase of biodegradable waste to 39% from 27% after the ban was imposed. Perhaps this was attributable to hotels and restaurants making use of alternative materials to plastics such as banana leaves for plates or bamboo straws and bamboo cutlery instead of plastic straws and utensils. Commercial establishments tend to be concentrated in the poblacion where space is limited. Most establishments, especially restaurants, do not make composts out of their food waste, as mandated by the law, so a fair number give their food waste to farmers, gardeners, and piggeries. The rest dispose of the waste improperly by mixing them up with their residual waste. According to Mcbean et al. (2005), improper disposal intensifies both public health threats and aesthetic pollution.

Recyclable waste, on the other hand, decreased after the ban. During the interviews, some

restaurants claimed to find new uses for recyclable items such as cleaning out empty glass jars and using them to hold condiments and spices. This could be one of the reasons why recyclable items decreased, people are finding new uses for them or selling them to junk collectors instead of disposing them in their garbage. However, according to interviews, many barangays find it difficult to find a market for recyclable waste, thus, proper waste management can only be effective through an understanding of waste generation composition and the local market for recyclable waste (Armijo de Vega et al. 2008).

The changes in waste types for institutions such as schools, hospitals, and government buildings have shown a remarkable difference before and after the ban. Firstly, biodegradable waste is only 1% after the ban compared to 25% before. Barring mismanagement in data collection in the field, the reduction in biodegradable waste may be attributed to the practice of burning trash still employed in provinces such as El Nido. Burning trash has been outlawed per the Philippine Clean Air Act of 1999 due to the carcinogenic fumes from burning plastic waste, unfortunately, many rural parts of the Philippines still employ the practice (Mcbean et al. 2005). While there are no open spaces to practice this within the poblacion, many institutions and households burn their trash, especially leaves, both to minimize their waste and to provide a smoke deterrent for mosquitoes and other insects.

Therefore the remarkable increase of biodegradable trash may not mean that institutions have stopped producing them rather they have not been accounted for properly since they were not included in the waste samples obtained. The increase in recyclable waste is most likely due to the materials recovery facilities (MRF) located within most schools and government buildings. Institutions are required to set one up by law (RA 9003). The purpose of these MRF is to act as a collection point for the recyclable waste of every establishment and household in the barangay. Ideally, once these MRF's are at full capacity, barangay officials should find a junk collector to sell these items to or provide them to other more fully-equipped MRF's that have grinders and pulverizers that can process the waste so that it can be used for other

purposes. The MRF's may just be at full capacity during the time of sampling thereby increasing their contribution to the percentage. Additionally, the municipal MRF and landfill manager claims that while the plastics ban has helped decrease residual plastics there has been no decrease whatsoever in plastic bottles. Indeed, the landfill has a mountain of empty bottled water that reiterates his claim.

Residual waste seems to have decreased by 13% from 23% prior to the ban. Most items included in the banned plastics are classified as residual waste. This could mean that the ban has actually contributed to a decrease in plastic municipal waste. According to interiews, institutions such as schools have tried to reduce their plastic usage in canteens by encouraging students to use drinking tumblers and washable plates when buying drinks and food. Unless the issue of safer drinking water is addressed by the municipality this waste management issue will likely remain unchanged. Landfill management will likely have to address landfill space constraints in the near future through sustainable measures to account for the unsustainable bottled water waste currently plaguing El Nido (Highfill et al. 1997).

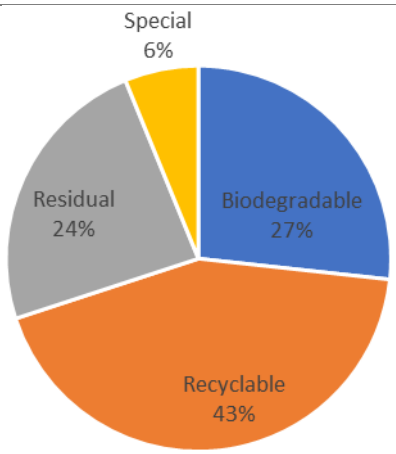
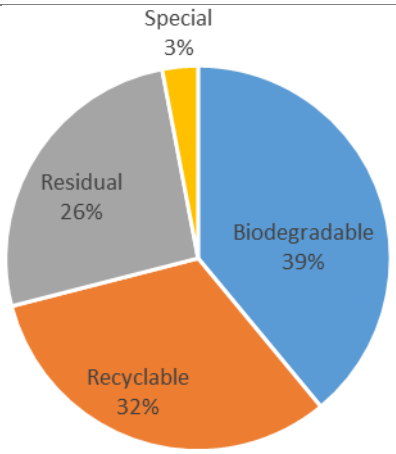
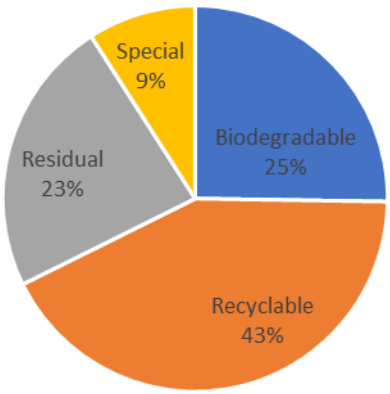
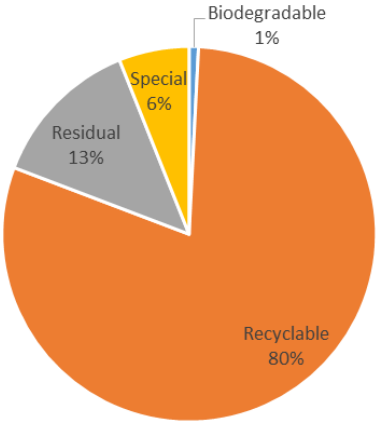
The last comparison is for residential establishments or households within El Nido. Similar to commercial establishments, their biodegradable trash has also increased. Although most households practice waste burning or even burying their waste. The practice of burying waste may contribute to the contamination of soil and groundwater as experienced by residents of El Nido (Al-khatib et al. 2010).

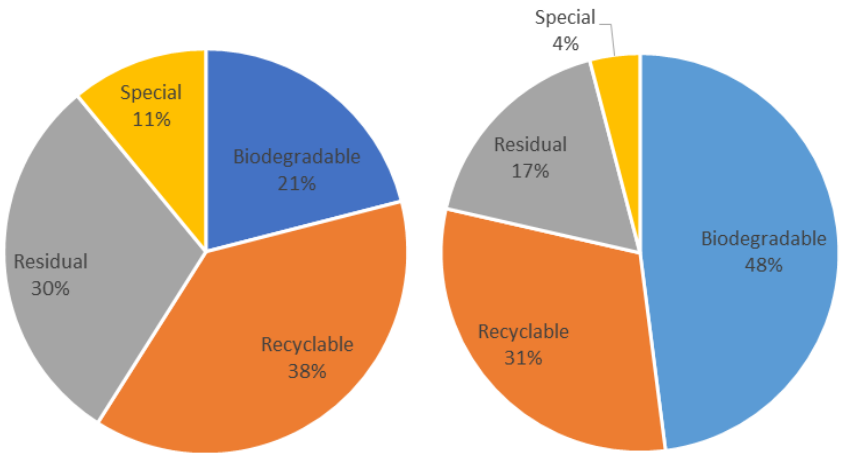
Recyclable waste seems to have decreased slightly, though as mentioned above, most of recyclable waste from households are delivered to MRF's within barangay halls or schools. Residual waste has notably decreased for households from 30% before the ban to 17% after the ban. While not all of the waste types comprising residual wastes are plastics included in the ban most residual wastes are plastics that are no longer usable. For households these are often sachets, small plastic bags, and packaging plastics. The decrease may be a good sign that the ban has had an effect on lessening residual waste produced by households.

The waste type called special waste are mostly types of waste that cannot be easily classified into the other 3 categories. More often than not these are items that are rarely thrown out such as broken appliances and broken furniture. This data does not provide any insightful information about the effect and implementation of the plastics ban in El Nido but it was good to include them in the categories to account for any unusual types of waste.

Solid waste management goes beyond proper segregation and disposal of waste. The problems in El Nido are influenced by politics, its socio-cultural contexts, environmental, and monetary factors (Abu Qdais 2007; Kum et al. 2005).

Table 2. A Comparison of Waste Characterization Survey Results for Commercial Establishments, Institutions, and Residential Establishments Before and After the Single-Use Plastics Ban was enforced in El Nido

	Before the Ban (2017)	**After the Ban (2019)**
Commercial Establishments		
Institutions		

Residential	
Establishments	

4.6 Compliance Map

Using the adapted index of AlHumid et al. (2019) for scoring waste management systems between regions a compliance map was created to illustrate the differences in compliance among barangays (see Figure 7) while Table 3 lays out the scores of each barangay. Raw scores for each performance indicator per barangay can be seen in appendix 8.4. As mentioned in the methodology, scores are based on 12 performance indicators related to the quality of waste management and degree of compliance to the plastic ban.

Barangay Bagong Bayan has the lowest score while Villa Paz has the highest with 10 and 87 respectively. According to interviews, Villa Paz and Aberawan scores high due to good leadership of the barangay captain and good partnerships with schools. Schools provide a meeting point among households and their children where waste management practices can be discussed. Lack of leadership in barangays such as Corong-corong, where the barangay captain admits to refrain from handing out fines in fear of decreased voters in the next elections. Political factors such as these cases contribute to a lack of enforcement of unpopular measures such as bans (Plata-diaz et al. 2014).

Barangay Bebeladan represents an interesting case wherein most of the community members are employed by El Nido Resorts whose waste management practices are arguably more stringent than the municipality yet the community scored poorly on the index. Perhaps

the score is a reflection of low acceptance among community members of waste management practices and the single-use plastic ban in general. Arguably, lack of awareness of proper waste management practices such as segregation and disposal should not be a problem for employees of the resort yet these practices are not translated to their own households. Barr (2007) suggests that in intention-behavior connections, personal beliefs and values, contextual influences, and psychological dynamics all play a role in predicating waste management practices.

Additionally, barangay Bebeladan as well as barangays Bagong Bayan, Aberawan, and Mabini are adjacent to the nearby municipality of Taytay. The very low score of Bebeladan and Bagong Bayan may perhaps be attributed to their tendency to purchase goods from Taytay where a single-use plastic ban has not been enacted. Thus, plastics included in the banned list are able to enter these places. Although, Mabini and Aberawan, who are also nearby to Taytay, do not seem to be having the same problem. Furthermore, multiple interviewees from every barangay have confirmed that traveling salesmen from Taytay supplies most sari-sari stores in El Nido with goods, some of which are plastics included in the ban such as utensils and cups. Thus, proximity to Taytay may not be such a strong determinant of compliance levels at least for some barangays. El Nido's proximity to Taytay and, for that matter to Coron, represent a strong opportunity for intermunicipal cooperation. According to Boyne, cooperation could create larger economies of scale which would produce more well-organized and coordinated services that would serve municipal interest for waste management (Plata-diaz et al. 2014).

Manlag has the third lowest score among barangays. Manlag's proximity to the more urbanized barangays should technically help raise its awareness and community involvement yet its low score proves otherwise. Although the higher scores of Villa Paz and Aberawan suggest that proximity to the more urbanized barangays do not determine compliance success.

The urbanized barangays of Corong-corong, Masagana, Maligaya, Buena, Suerte, and Villa Libertad have varying score levels. One could assume that these tourist-centric barangays would score higher on compliance yet the more rural barangays of Villa Paz, New Ibajay, and

Aberawan scored higher overall. One explanation may be the higher concentration of commercial establishments that can make it more difficult to enforce the ban in terms of the number of establishments to check. Although their concentration in a relatively smaller area should make monitoring easier as compared to other barangays where barangay captains and tanods have to traverse farther distances to reach all households.

Rural barangays cite the lack of timely and regular collection services as a major deterrent to proper waste management. Parizeau et al. (2006) says this problem is commonplace among low and middle income countries. It would seem that the strongest factor that influences compliance is enforcement, strong implementation, and availability of viable alternatives (Fourie 2006). While these factors appear weak in the more urban barangays, what raises their scores are the strength of community acceptance and participation. They would be able to score higher if the barangay captains are able to monitor more stringently and routinely all the households and commercial establishments within the area.

Table 3. List of Scores per Barangay

Barangay	**Score**	**Barangay**	**Score**
Bagong Bayan	10	Villa Libertad	39
Bebeladan	12	San Fernando	40
Manlag	20	Bucana	41
Teneguiban	22	Pasadeña	49
Corong-corong	26	Maligaya	50
Barotuan	27	Buena Suerte	56
Mabini	33	Aberawan	65
Sibaltan	34	New Ibajay	70
Masagana	38	Villa Paz	87

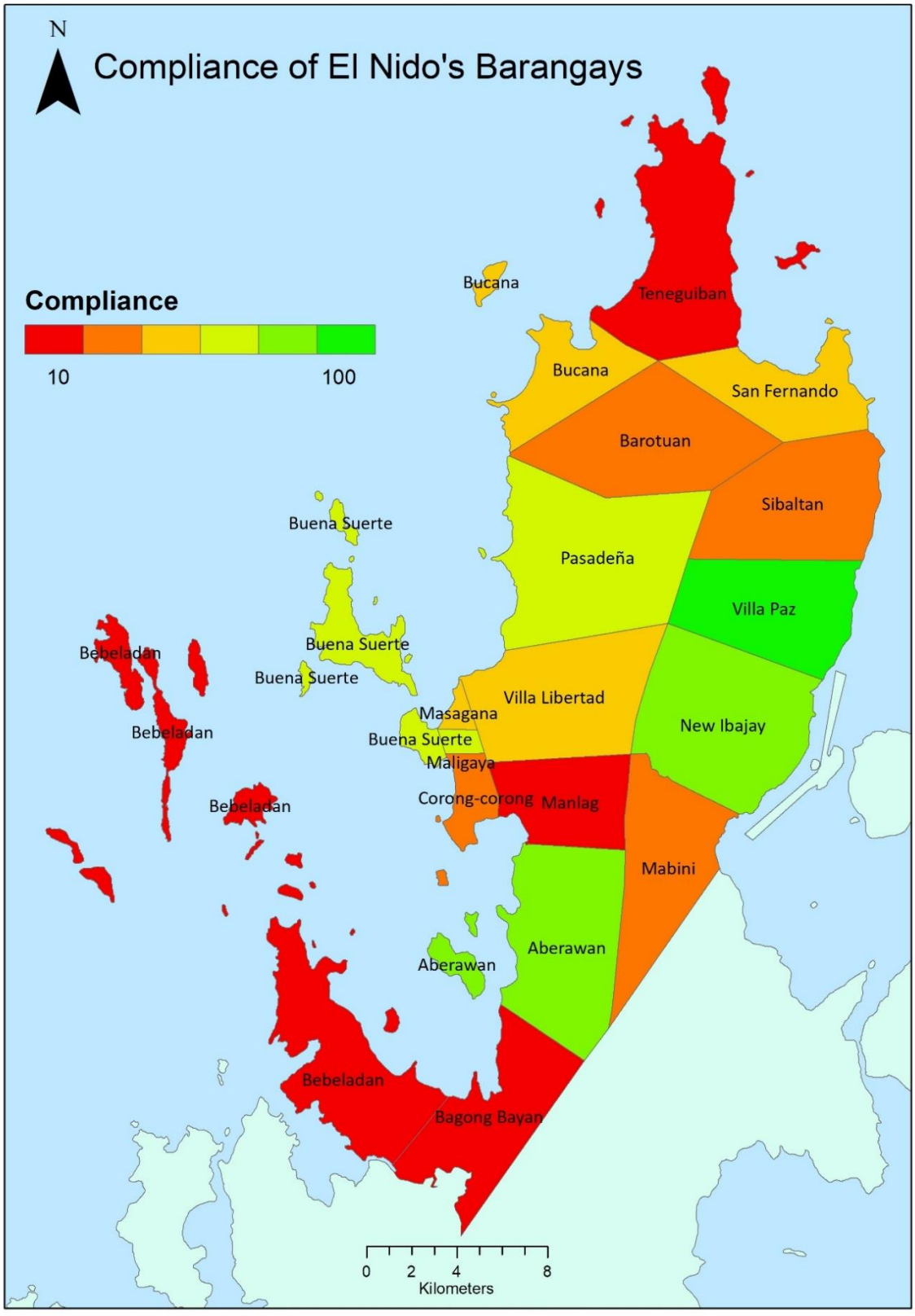


Figure 7. Levels of compliance to the single-use plastic ban and proper waste management among the barangays of El Nido

(Map created by author using adapted index by AlHumid et al. 2019 and base maps from NAMRIA)

5. CONCLUSION

Based on the interviews, waste characterization survey, and consultation of relevant literature, clear insights have materialized. First of all, the single-use plastic ban has been effective only for single-use plastics that are easily replaceable, namely, straws, utensils, and other dining ware. Whilst the government has provided ecobags to replace plastic shopping bags it has been difficult to replace *plastic labo*, the small, thin, and translucent plastic bag that locals fill with water to make and sell ice as well as use to hold wet items purchased from the public market such as grated coconut or various viands. Moreover, the municipality has been unable to completely ban bottled water due to safety issues with groundwater supply, therefore, plastic bottles are still widely used. Since El Nido is a tourist town where most residents are transient and temporary, bottled water and sachets are the preferred choice as compared to their refillable or bulk sized counterparts. Although the ban does not include sachets in its list of banned items and only prohibits bottled water inside boats, the actual effectivity of the ban in reducing plastic waste is questionable given the bigger impact of bottled water and sachets. The ban has been effective in eliminating plastic usage in the poblacion or central business district of El Nido, the outlying barangays where tourists rarely venture have not been as monitored.

According to most interviews, there has been observably less litter on the streets since the ban was imposed not just with the plastics included in the ban but also other types of waste in general. In terms of negative unintended effects, it seems that some people discard still serviceable ecobags instead of reusing them which undermines their very purpose. Additionally, the ban has had the unintended effect of compelling people to buy goods in the neighboring municipality of Taytay where there is no single-use plastic ban. Thus, while single-use plastics are getting harder to acquire within the municipality of El Nido, its proximity to Taytay means it will be more difficult to completely eliminate them in the waste stream.

In terms of equity, the ban places a disproportionate burden on poorer households and tourists, arguably most of the inhabitants of El Nido. Locals report feeling unfairly targeted

with some advising that efforts should be made to make large corporations change their packaging style.

As for implementation-variables, first of which are the costs associated with this ban, it seems that the collection of fines has been mostly concentrated in the urban barangays of Buena Suerte, Masagana, Maligaya, and Villa Libertad. This is likely due to the fact that the local government is able to oversee enforcement plus these barangays have the highest concentration of restaurants, accommodation establishments, and markets or grocery stores. Collection of fines in other barangays are left up to the barangay captains and their tanods. Based on interviews, their needs to be stronger enforcement in these outlying barangays. The cost of ecobags is also higher than a typical plastic shopping bag which are basically free of charge. The local government encourages people to keep reusing the ecobag but, as stated earlier, some people discard them while still functional.

Enforcement in outlying barangays are much harder since households are spread far apart. There is a need to cross islands or travel around hills in order to reach all households. This means that it has been unfeasible to enforce the ban on a stronger level for the entirety of El Nido.

In terms of acceptability, tourists wholly accept and support the ban more than locals. Locals feel inconvenienced with those owning businesses such as restaurants or tour operations having had to adjust to comply with the ban. Tour guides who do not agree with the ban even allow tourists to bring bottled water while island hopping and just advise them to hide their water from other tour guides. Therefore, acceptability of the ban is divided.

The long term effects of the ban depend largely on sustained enforcement by the local government and barangay captains as well as the support of local businesses in compliance. However, sentiments echoed by locals disgruntled by the perceived unfairness of the ban may hold some truth. Large corporations who provide fast moving consumer goods should be held more accountable of the waste they produce. Likewise, there needs to be a discussion regarding

their extended responsibility on the health and safety of their products since it has been a hindrance to refill delivery models of purchase and consumption. Meanwhile, local support of the ban may provide some minimization of single-use plastic waste. However, the local government needs to seriously address the contaminated water issue of El Nido not only to minimize bottled water purchase but also for public health in general.

The WACS attempted to validate what people were saying in interviews: that a noticeable decrease in plastic waste has occurred thanks to the ban. The local government conducted a WACS before the ban was put in place which was used to compare to this WACS done. According to the WACS, biodegradable waste seems to be higher post-ban. Presumably, what may be contributing to the increase would be biodegradable packaging and diningware such as banana leaf packaging for vegetables or bamboo straws and utensils in lieu of plastic ones. Residuals, where most of the single-use plastic items included in the ban would fall under showed a relative decrease across households, commercial establishments, and institutional establishments.

Although, it needs clarification whether this has been due to the ban or other external factors such as a general decrease in consumption of fast moving consumer goods packaged in sachets. There was a decrease in recyclable waste for both commercial establishments and households although it significantly increased for institutional establishments. This is unsurprising, given that institutional establishments such as government buildings and schools are the collection point for the barangay's recyclable items wherein most institutions have a materials recovery facility (MRF) where households and commercial establishments can drop off their recyclable items. Additionally, the decrease in recyclable waste for both commercial establishments and households may signal their increased usage of recyclable items due to the ban. Glass jars could have been reused, for example.

Finally, the compliance map illustrates the differences among the levels of compliance among barangays. What influences strong compliance is either good implementation of the ban

such as in barangay Villa Paz where the local government and elementary school have a good partnership in getting the community to practice better waste management or good community acceptance and participation such as in barangay Buena Suerte where locals who own businesses agree and support the less plastic waste movement by sharing advice and guidelines with one another on how to reduce plastic waste through community meetings and social media.

There was nearly no compliance found for barangays Bebeladan and Bagong Bayan. Interestingly, both barangays are located adjacent to the municipality of Taytay. Barangay Bebeladan is also a partner for community outreach for El Nido Resorts given that most locals are employed in the resorts. This potentially signals a lack of acceptance of the ban which can open up lines of discussion regarding approaches to reducing plastic waste that does not impede on local contexts and realities. Considering the movement of pollutants such as plastics across the natural environment both El Nido and Taytay have to work together in the future to consider the environmental needs of Bacuit Bay. The scoring shows that there is no barangay where both approaches are practiced therefore having both approaches may considerably increase better waste management overall.

Reducing plastic pollution the natural environment feature many solutions ranging from recreating the properties of plastic with biodegradable materials, reusing and recycling products to lessen plastic waste, and single-use plastic bans being a few examples. Plastic straws and plastic bags, both common items included in many single-use plastic bans, have become emblematic of sustainable development. Many critics argue that banning these items represent a mere blink in the vast array plastic products produced by large corporations who, as critics argue, need to be pressured to internalize the plastic waste they create. However, by banning these common items, consumers begin to take a step forward in making a real impact for a sustainable future. This could produce a signal that corporations and governments can take notice of and begin to enact systemic levels of change that invests in sustainable alternatives.

6. RECOMMENDATIONS

Effective implementation of the ban can be achieved by addressing the lack of enforcement. Government institutions in the Philippines are, unfortunately, weak and ill-equipped. A possible solution to administering compliance is using the help of supportive locals to monitor and implement the ban. It was the lobbying of locals that convinced the Mayor to create the ban initially. This group of locals maintain a Facebook group called "Plastics Free El Nido." According to the group's description, the purpose of this Facebook community is "finding best practice solutions to a plastic-free life, generally reducing waste, and working together for a cleaner country, cleaner beaches, and a healthy community." Members of the community regularly shares tips on reducing plastic usage, recommends brands as well as disparages other brands, names and shames local businesses and individuals that violate the ban as well as other waste management ordinances such as the anti-littering act. The local government can partner with the most active and willing members of this group to give them authority to monitor compliance in public areas as well as hand out fines. This can foster a grassroots approach to compliance which can ease acceptance among skeptical individuals throughout the different barangays of El Nido.

In terms of present monitoring efforts, the local government should know that tour operators need to have stricter measures to prohibit bottled water from being brought by tourists inside the boat. It was observed that this was not strictly enforced by tour guides while some instructed tourists to simply hide the bottled water in their bags. Marshals that roam the beach every morning should confiscate bottled water brought by guests. Tour operators and hotels need to remind tourists that bottled water cannot be brought onto boats and that safe drinking water and reusable cups are provided on each boat instead.

The ban itself can be improved by adding several more items to the list: coffee cup lids and balloons. Coffee cup lids are one of the most thrown away single-use plastic in the world. Promoting reusable coffee cups and purchasing to-go coffee sans the lid are lifestyle choices

that won't impede too much on convenience.

Helium balloons that are released into the sky are potential choking hazards for marine life when they inevitably drift back down to the earth. The ban should include balloons that are commonly sold in the public market. Alongside with this, the ordinance should also include a section on what should be done during events and festivals where disposable items are frequently used. Although commonly used items for events and festivals, such as disposable cups, plates, cutlery, and banderitas, are included in the ban it should be clarified that the ban is still effective during events and festivals.[23]

On the other hand, the ban should remove from its list plastics used for ice making or provide reasonable alternatives to locals that sell ice as a form of supplemental income. The ban effectively prohibits ice making but almost no barangay enforces it. This potentially creates weakens the ban since the impossibility of prohibiting ice making makes people reject the ban in its entirety. They see the ban as impossible to comply with and, together with weak enforcement, refuse to obey altogether. In the interest of easing the burden on locals and strengthening the ban on easier items such as straws and plastic shopping bags the ban should remove plastics used for ice making on the list. Or provide alternative materials for ice-making that is as cheap and as convenient to use as plastic bags.

In lieu of plastic shopping bags, the local government promotes the use of ecobags. Sometimes, however, these ecobags, while decidedly more expensive than plastic shopping bags but reusable and more durable, have been found in the trash, disposed of by locals and tourists. Therefore, anyone who buys and uses ecobags should be made aware that disposing them defeats their very purpose. The local government could add ecobags to the list of items not allowed to be disposed of. Garbage disposal management can help remove these items from the trash if they are relatively clean and dry then turn them over to the local government who

[23] Observations during the town fiesta and interviews with schools have proven that disposable single-use plastic items are still commonly used

can then resell them. Alternatively, promoting other forms of ecobags such as those made of plant leaves[24] can be a potential source of livelihood for locals of El Nido.

Bottled water is still commonly used throughout El Nido. Unfortunately, the issue of its usage is tied into the issue of tainted ground water due to a poor waste water treatment system. A workaround to this issue is the promotion of refillable drinking stations all throughout the municipality. The local government, or anyone willing, can create a map of where people can refill their reusable tumblers. This can potentially alleviate the use of bottled water.

Since the protected area status of El Nido is formally known as El Nido-Taytay Managed Resource Protected Area, there is a need for stronger collaboration between the two municipalities in the protection of Bacuit Bay that does not impede on livelihood. Local governments in both municipalitis and the Protected Area Office may consider a joint effort by enacting the single-use plastic ban in Taytay as well.

The ecobrick hub to be built by Green Antz will be an opportunity to lessen municipal plastic waste from sachets and other plastics not included in the single-use plastic ban. It could also be a timely opportunity to put pressure on corporations that produce fast moving consumer goods to address the plastic waste that their products create.

Overall, the single-use plastic ban in El Nido can be effective if stronger implementation can be provided by the local government and stronger community acceptance can be provided by tourists and locals. Lastly, future studies on waste management and plastics should focus on the movement of pollutants from their generation sources, which are from households, commercial establishments, and institutions, through the environment, most especially to Bacuit Bay and quantify the amount of waste being improperly disposed of. Additionally, the local government, environmentally conscious businesses, and non-government organizations could explore reducing municipal plastic waste via other means than an outright ban.

[24] Buri bags are made from dried palm leaves

7. BIBLIOGRAPHY

Abbondanza, M.N.M., and Souza, R.G. 2019. Estimating the Generation of Household E-Waste in Municipalities Using Primary Data from Surveys : A Case Study of Sao Jose Dos Campos , Brazil. *Waste Management* 85. Elsevier Ltd: 374–84. doi:10.1016/j.wasman.2018.12.040.

Abrina, D. 2018. Cavite Town's "Plastic Waste for Rice'' Project Gains Ground November 16, 2018, 1:49 Pm Share. *Philippine News Agency*, November 16. https://www.pna.gov.ph/articles/1054066.

Abu Qdais, H.A. 2007. Techno-Economic Assessment of Municipal Solid Waste Management in Jordan. *Waste Management* 27 (2007): 1666–72. doi:10.1016/j.wasman.2006.08.004.

Alhumid, H.A., Haider, H., Alsaleem, S.S., Alinizzi, M., and Sadiq, R. 2019. Performance Assessment Model for Municipal Solid Waste Management Systems : Development and Implementation. *Environments* 6 (19): 1–26. doi:10.3390/environments6020019.

Al-khatib, I.A., Monou, M., Salam, A., Zahra, F.A., Shaheen, H.Q., and Kassinos, D. 2010. Solid Waste Characterization , Quantification and Management Practices in Developing Countries . A Case Study : Nablus District – Palestine. *Journal of Environmental Management* 91 (5). Elsevier Ltd: 1131–38. doi:10.1016/j.jenvman.2010.01.003.

Andrady, A.L., and Neal, M.A. 2009. Applications and Societal Benefits of Plastics. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 1977–84. doi:10.1098/rstb.2008.0304.

Ang, Rodolfo P., and J. A. Sy-Changco. 2007. The phenomenon of sachet marketing: Lessons to be learned from the Philippines. *Enhancing Knowledge Development in Marketing*.

Anzilotti, E. 2018. We Need so Many Paper Straws Now, They're Building a Whole New Factory to Meet Demand. *The Fast Company*, December. https://www.fastcompany.com/90274356/we-need-so-many-paper-straws-now-theyre-building-a-whole-new-factory-to-meet-demand.

Arvanitoyannis, I.S., and Bosnea, L.A. 2001. Recycling of Polymeric Materials Used for Food Packaging: Current Status and Perspectives. *Food Reviews International* 17 (3): 291–346. doi:10.1081/FRI-100104703.

Bahri, Girum. 2005. Sustainable Management of Plastic Bag Waste. The Case of Nairobi, Kenya.

Banerjee, Abhijit V., and Esther Duflo. 2005. The economic lives of the poor. *Journal of economic perspectives* 21 (1): 141-168.

Barnes, D.K.A., Galgani, F., Thompson, R.C., and Barlaz, M. 2009. Accumulation and Fragmentation of Plastic Debris in Global Environments. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 1985–98. doi:10.1098/rstb.2008.0205.

Barr, S. 2007. Factors Influencing Environmental Attitudes and Behaviors: A U.K. Case Study of Household Waste Management. *Environment and Behavior* 39 (4): 435–73.

Bergman, S. 2018. Everything You've Been Told about Plastic Is Wrong – the Answer Isn't Recycling. *Independent*, February 21. https://www.independent.co.uk/voices/plastic-waste-wish-recycling-bins-black-environment-green-shopping-a8548736.html?fbclid=IwAR2uj9MkX89YmoNsK0btUIDtwknBDk-

dXtt8gL_Y2HCUN8bg-owI8J18tO0.

Berins, Michael, ed. 1991. *Plastics engineering handbook of the society of the plastics industry*. Springer Science & Business Media.

Blank, R.M. 2003. Selecting Among Anti-Poverty Policies: Can an Economist Be Both Critical and Caring? *Review of Social Economy* 61 (4). Routledge: 447–69. doi:10.1080/0034676032000160949.

Carrgian, M., and Ahmad, A. 2001. The Myth of the Ethical Consumer - Do Ethics Matter in Purchase Behaviour? *Journal of Consumer Marketing* 18 (7): 560–78.

Census of Population. 2015. Region IV-B (MIMAROPA). El Nido: Total Population by Province, City, Municipality and Barangay. PSA.

Cherubini, F., Bargigli, S., and Ulgiati, S. 2009. Life Cycle Assessment (LCA) of Waste Management Strategies : Landfilling , Sorting Plant and Incineration. *Energy* 34 (12). Elsevier Ltd: 2116–23. doi:10.1016/j.energy.2008.08.023.

Chinda, Thanwadee, Natthida Leewattana, and Nichanan Leeamnuayjaroen. 2012. The study of landfill situations in Thailand. In *Proceedings of the 1st Mae Fah Luang University International Conference, Changrai Rai, Thailand*, vol. 29.

Coelho, Hosmanny Mauro Goulart, Liséte Celina Lange, and Lineker Max Goulart Coelho. 2012. Proposal of an environmental performance index to assess solid waste treatment technologies. *Waste management* 32 (7): 1473-1481.

Dauvergne, Peter. 2018. Why is the global governance of plastic failing the oceans?. *Global Environmental Change* 51: 22-31.

Derraik, Jose GB. 2002. The pollution of the marine environment by plastic debris: a review. *Marine pollution bulletin* 44 (9): 842-852.

Donevska, K.R., Gorsevski, P. V, Jovanovski, M., and Peševski, I. 2012. Regional Non-Hazardous Landfill Site Selection by Integrating Fuzzy Logic, AHP and Geographic Information Systems. *Environmental Earth Sciences* 67 (1): 121–31. doi:10.1007/s12665-011-1485-y.

Eriksen, Marcus, Laurent CM Lebreton, Henry S. Carson, Martin Thiel, Charles J. Moore, Jose C. Borerro, Francois Galgani, Peter G. Ryan, and Julia Reisser. 2014. Plastic pollution in the world's oceans: more than 5 trillion plastic pieces weighing over 250,000 tons afloat at sea. *PloS one* 9 (12): e111913.

Fabro, K.A. 2018. El Nido Rehab to Focus on Water Quality, Coastal Easement, Carrying Capacity. *Rappler*, November 30. https://www.rappler.com/nation/217870-el-nido-palawan-rehabilitation-focus.

Field, Alexander J. 2003. The most technologically progressive decade of the century. *American Economic Review* 93 (4): 1399-1413

Fünger, Friedrich, Reinhold Kappenstein, Lieven Ven, and Jacques De Lalaing. Apparatus for utilizing solar energy. U.S. Patent 6,543,441, issued April 8, 2003.

Garrod, Guy, and Ken Willis. 1998. Estimating lost amenity due to landfill waste disposal. *Resources, conservation and recycling* 22 (1-2): 83-95.

Geyer, Roland, Jenna R. Jambeck, and Kara Lavender Law. 2017. Production, use, and fate of all plastics ever made. *Science advances* 3 (7): e1700782.

Gillespie, Rosemary G., Bruce G. Baldwin, Jonathan M. Waters, Ceridwen I. Fraser, Raisa Nikula, and George K. Roderick. 2012 Long-distance dispersal: a framework for hypothesis testing. *Trends in ecology & evolution* 27 (1): 47-56.

Gillis, J., and translator Ralph E. Oesper. 1964. Leo Hendrik Baekeland (1863-1944). *Journal of Chemical Education* 41 (4): 224.

Gregory, M.R. 2009. Environmental Implications of Plastic Debris in Marine Settings - Entanglement, Ingestion, Smothering, Hangers-on, Hitch-Hiking and Alien Invasins. *Philosophical Transactions of the Royal Society B: Biological Sciences*, no. 364: 2013–25. doi:10.1098/rstb.2008.0265.

Gubrium, Erika K., and Sony Pellissery, eds. *The shame of it: Global perspectives on anti-poverty policies*. Policy Press, 2013.

He, H. 2012. Effects of Environmental Policy on Consumption : *Environment and Development Economics* 17 (May 2019): 407–31. doi:10.1017/S1355770X1200006X.

Higgs, M.M. 2019. America's New Recycling Crisis, Explained by an Expert. *Vox*. https://www.vox.com/the-goods/2019/4/2/18290956/recycling-crisis-china-plastic-operation-national-sword.

Highfill, J., and Mcasey, M. 1997. Municipal Waste Management: Recycling and Landfill Space Constraints. *Journal of Urban Economics* 41 (1997): 118–36.

Ho, V. 2018. "People Need Them:" The Trouble with the Movement to Ban Plastic Straws. *The Guardian*. https://www.theguardian.com/us-news/2018/aug/25/plastic-straw-ban-california-people-with-disabilities.

Hoffman, Andrew John. Climate change as a cultural and behavioral issue: Addressing barriers and implementing solutions. (2010).

Hook, L., and Reed, J. 2018. Recycling Is Broken, Can We Fix It? *Financial Times Weekend Magazine*, October.

Hopewell, J., Dvorak, R., and Kosior, E. 2009. Plastics Recycling: Challenges and Opportunities. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 2115–26. doi:10.1098/rstb.2008.0311.

Hosler, Dorothy, Sandra L. Burkett, and Michael J. Tarkanian. 1999. Prehistoric polymers: rubber processing in ancient Mesoamerica. *Science* 284 (5422): 1988-1991.

Huang, Y., Pan, T., and Kao, J. 2011. Performance Assessment for Municipal Solid Waste Collection in Taiwan. *Journal of Environmental Management* 92 (4). Elsevier Ltd: 1277–83. doi:10.1016/j.jenvman.2010.12.002.

Hutchcroft, Paul D., and Joel Rocamora. 2003. Strong demands and weak institutions: The origins and evolution of the democratic deficit in the Philippines. *Journal of East Asian Studies* 3 (2): 259-292.

Johnston, I. 2016. Anthropocene: Planet Earth Has Entered New Epoch, Experts Say. *The Independent*, August 16. https://www.independent.co.uk/environment/anthropocene-epoch-new-planet-earth-man-made-what-is-it-a7215116.html.

Koch, H.M., and Calafat, A.M. 2009. Human Body Burdens of Chemicals Used in Plastic Manufacture. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 2063–78. doi:10.1098/rstb.2008.0208.

Kum, V., Sharp, A., and Harnpornchai, N. 2005. Improving the Solid Waste Management in Phnom Penh City : A Strategic Approach. *Waste Management* 25 (2005): 101–9. doi:10.1016/j.wasman.2004.09.004.

Latini, G., Marcella Ferri, and Federica Chiellini. 2010. Materials degradation in PVC medical devices, DEHP leaching and neonatal outcomes. *Current Medicinal Chemistry* 17 (26): 2979-2989.

Lebreton, L., and Andrady, A. 2019. Future Scenarios of Global Plastic Waste Generation and Disposal. *Palgrave Communications* 5 (1): 6. doi:10.1057/s41599-018-0212-7.

Leung, H. 2018. Five Asian Countries Dump More Plastic Into Oceans Than Anyone Else Combined: How You Can Help. *Forbes*, April. https://www.forbes.com/sites/hannahleung/2018/04/21/five-asian-countries-dump-more-plastic-than-anyone-else-combined-how-you-can-help/.

Lewis, Helen, Karli Verghese, and Leanne Fitzpatrick. 2010. Evaluating the sustainability impacts of packaging: the plastic carry bag dilemma. *Packaging Technology and Science: An International Journal* 23 (3): 145-160.

Ligthart, T.N., and Ansems, A.M.M. 2007. *Single Use Cups or Reusable (Coffee) Drinking Systems: An Environmental Comparison*. Apeldoorn, Netherlands.

Lim, C.N.G., Diaz, G.B., and Vidal, J.R.T. *Ordinance No. 004 Series of 2013: An Ordinance Regulating the Use of Cellophane, Plastic Bags, and Styrofoam for Container of Goods and Commodities, and Promoting the Use of Ecobags and Other Environmental Friendly Materials as an Alternative*.

Lindh, H., Williams, H., Olsson, A., and Wikström, F. 2016. Elucidating the Indirect Contributions of Packaging to Sustainable Development: A Terminology of Packaging Functions and Features. *Packaging Technology and Science* 29 (4–5): 225–46.

Lipton, Michael. *Why poor people stay poor: a study of urban bias in world development*. London: Canberra, ACT: Temple Smith; Australian National University Press, 1977.

Liu, Jianguo, Shuxin Li, Zhiyun Ouyang, Christine Tam, and Xiaodong Chen. 2008. Ecological and socioeconomic effects of China's policies for ecosystem services. *Proceedings of the National academy of Sciences* 105 (28): 9477-9482.

Mabini, K.B. 2019. Sari-Sari Store in Negros Occidental Joins Action against Single-Use Plastics; Sells Goods through "Wala Usik" Refilling System. *Virtual Pinoy*, April 7. http://virtualpinoy.com/2019/04/sari-sari-store-in-negros-occidental-joins-action-against-single-use-plastics-sells-goods-through-wala-usik-refilling-system/.

Macali, A., Semenov, A., Venuti, V., Crupi, V., D'Amico, F., Rossi, B., Corsi, I., and Bergami, E. 2018. Episodic Records of Jellyfish Ingestion of Plastic Items Reveal a Novel Pathway for Trophic Transference of Marine Litter. *Scientific Reports* 8 (1): 6105. doi:10.1038/s41598-018-24427-7.

Martínez, Eduardo, Félix Sanz, Stefano Pellegrini, Emilio Jiménez, and Julio Blanco. 2009. Life cycle assessment of a multi-megawatt wind turbine. *Renewable Energy* 34 (3): 667-673.

Mato, Y., Isobe, T., Takada, H., Kanehiro, H., Ohtake, C., and Kaminuma, T. 2001. Plastic Resin Pellets as a Transport Medium for Toxic Chemicals in the Marine Environment. *Environmental Science & Technology* 35 (2). American Chemical Society: 318–24. doi:10.1021/es0010498.

Mcbean, E.A., del Rosso, E., and Rovers, F.A. 2005. Improvements in Financing for Sustainability in Solid Waste Management. *Resources, Conservation and Recycling* 43 (2005): 391–401. doi:10.1016/j.resconrec.2004.06.009.

Mendes, P., Carina, A., Miguel, L., and Ribau, M. 2013. Evaluating Municipal Solid Waste Management Performance in Regions with Strong Seasonal Variability. *Ecological Indicators* 30. Elsevier Ltd: 170–77. doi:10.1016/j.ecolind.2013.02.017.

Milio, N. 2001. Glossary: Healthy Public Policy. *Journal of Epidemiology and Community Health* 55 (9): 622 LP – 623. doi:10.1136/jech.55.9.622.

Milton, Beth, May Moonan, D. Taylor-Robinson, and M. Whitehead. How can the health equity impact of universal policies be evaluated. *Insights into approaches and next steps WHO Collaborating Centre for Policy Research on Social Determinants of Health* (2011).

Nicholson, Joseph L., and George R. Leighton. 1942. Plastics come of age. *Harper's Magazine* (1942): 300-307.

North, E.J. 2013. Plastics and Environmental Health: The Road Ahead. *Reviews on Environmental Health* 28 (1): 1–8.

Nutley, S.M., Walter, I., and Davies, H.T. 2007. *Using Evidence: How Research Can Inform Public Policies*. Bristol, United Kingdom: The Policy Press.

Onyanga-Omara, J. 2013. Plastic Bag Backlash Gains Momentum. *BBC News*, September 13. https://www.unenvironment.org/news-and-stories/story/birth-ban-history-plastic-shopping-bag.

Parizeau, K., Maclaren, V., and Chanthy, L. 2006. Waste Characterization as an Element of Waste Management Planning : Lessons Learned from a Study in Siem Reap , Cambodia. *Resources, Conservation and Recycling* 49 (2006): 110–28. doi:10.1016/j.resconrec.2006.03.006.

Pineault, Raynald, and Carole Daveluy. *La planification de la santé: concepts, méthodes, stratégies*. Agence d'ARC, 1986.

Plata-díaz, A.M., Zafra-gómez, J.L., Pérez-lópez, G., and López-hernández, A.M. 2014. Alternative Management Structures for Municipal Waste Collection Services : The Influence of Economic and Political Factors. *Waste Management* 34 (2014): 1967–76. doi:10.1016/j.wasman.2014.07.003.

Raniwala, Subodh. Sterilization system and method for food packaging. U.S. Patent 6,645,429, issued November 11, 2003.

Rochman, Chelsea M., Akbar Tahir, Susan L. Williams, Dolores V. Baxa, Rosalyn Lam, Jeffrey T. Miller, Foo-Ching Teh, Shinta Werorilangi, and Swee J. Teh. 2015. Anthropogenic debris in seafood: Plastic debris and fibers from textiles in fish and bivalves sold for human consumption. *Scientific reports* 5: 14340.

Rustagi, N., Pradhan, S.K., and Singh, R. 2011. Public Health Impact of Plastics: An Overview. *Indian Journal of Occupational and Environmental Medicine* 15 (3). Medknow Publications & Media Pvt Ltd: 100–103. doi:10.4103/0019-5278.93198.

Rutherford, Stuart, and Sukhwinder Arora. 2009. The need to save. *The Poor and their Money: Microfinance from a twenty-first century consumer's perspective* 1 (14): 14.

Ryan, P.G. 2015. A Brief History of Marine Litter Research BT - Marine Anthropogenic

Litter. In , edited by Melanie Bergmann, Lars Gutow, and Michael Klages, 1–25. Cham: Springer International Publishing. doi:10.1007/978-3-319-16510-3_1.

Rychetnik, Lucie, Michael Frommer, Penelope Hawe, and Alan Shiell. 2002. Criteria for evaluating evidence on public health interventions. *Journal of Epidemiology & Community Health* 56 (2): 119-127.

Sangguniang Bayan of El Nido. 2015. *Ordinance No. 041 Series of 2015: An Ordinance for the Implementation of Solid Waste Segregation at Source and Providing Penalties for Violations Thereof.*

Senate and House of Representative of the Philippines in Congress. 2001. *Ecological Solid Waste Management Act of 2000*. https://www.lawphil.net/ statutes/repacts/ra2001/ ra_9003_2001.html

Shaxson, L. 2009. Structuring Policy Problems for Plastics, the Environment and Human Health: Reflections from the UK. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 2141–51. doi:10.1098/rstb.2008.0283.

Shelton, S. 2018. Is Big Business's New Conscience about Plastic Waste Just Greenwashing? *The Fast Company*. https://www.fastcompany.com/90228110/are-new-plastic-waste-bans-just-greenwashing.

Song, J.H., Murphy, R.J., Narayan, R., and Davies, G.B.H. 2009. Biodegradable and Compostable Alternatives to Conventional Plastics. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 2127–39. doi:10.1098/rstb.2008.0289.

Swinburn, Boyd, Tim Gill, and Shiriki Kumanyika. 2005. Obesity prevention: a proposed framework for translating evidence into action. *Obesity Reviews* 6 (1): 23-33.

Teehankee, Julio C. 2016. Weak State, Strong Presidents: Situating the Duterte Presidency in Philippine Political Time. *Journal of Developing Societies* 32 (3): 293-321.

Thompson, R.C., Swan, S.H., Moore, C.J., and Vom Saal, F.S. 2009. Our Plastic Age. *Philosophical Transactions of the Royal Society B: Biological Sciences* 364 (1526): 1973–76. doi:10.1098/rstb.2009.0054.

Tierney, John. 1996. Recycling is Garbage. *New York Times Magazine* 30 (1996): 24-29.

Ud, S., Oskui, R.P., Dusseault, M.B., and Ghadban, A.N. Al. 2009. Multi-Criteria Evaluation Technique for SFI Site Identification of NORMS and Oil Industry Waste Disposal – Possibilities in Kuwait. *Journal of Environmental Management* 91 (1). Elsevier Ltd: 186–94. doi:10.1016/j.jenvman.2009.08.004.

UNEP. 2018. *Single-Use Plastics: A Road Map for Sustainability*. *United Nations Environment Programme*. Nairobi, Kenya. https://ec.europa.eu/commission/news/single-use-plastics-2018-may-28_en.

Urban, F., Journal, L., and Salamon, L.M. 2011. The New Governance and the Tools of Public Action : An Introduction TOOLS OF PUBLIC ACTION : 28 (5).

Vineles, Phidel. 2016. Duterte's Victory: The Face of Alternative Leadership?.

Vlachopoulos, John, and David Strutt. 2003. Polymer processing. *Materials Science and Technology* 19 (9): 1161-1169.

von Goetz, Natalie, Lars Fabricius, Reto Glaus, Volker Weitbrecht, Detlef Günther, and Konrad Hungerbühler. 2013. Migration of silver from commercial plastic food

containers and implications for consumer exposure assessment. *Food Additives & Contaminants: Part A* 30 (3): 612-620.

Wagner, M., and Oehlmann, J. 2011. Endocrine Disruptors in Bottled Mineral Water: Estrogenic Activity in the E-Screen. *Journal of Steroid Biochemistry and Molecular Biology* 127 (1–2): 128–35. doi:10.1016/j.jsbmb.2010.10.007.

Winistorfer, Paul, Zhangjing Chen, Bruce Lippke, and Nicole Stevens. 2007. Energy consumption and greenhouse gas emissions related to the use, maintenance, and disposal of a residential structure. *Wood and Fiber Science* 37: 128-139.

Zaman, A.U. 2014. Measuring Waste Management Performance Using the " Zero Waste Index " : The Case of Adelaide , Australia. *Journal of Cleaner Production* 66. Elsevier Ltd: 407–19. doi:10.1016/j.jclepro.2013.10.032.

Ziccardi, Linda M., Aaron Edgington, Karyn Hentz, Konrad J. Kulacki, and Susan Kane Driscoll. 2016. Microplastics as vectors for bioaccumulation of hydrophobic organic chemicals in the marine environment: A state-of-the-science review. *Environmental Toxicology and Chemistry* 35 (7): 1667-1676.

8. APPENDICES

8.1 Sample Tables for WACS Data

Commercial Establishments							
Barangay	Establisment	People	Bio	Res	Rec	Special	Total
Maligaya	Amakan	59	2.14	1.94	1.59	0.42	6.09
	Silog Rep	55	6.90	4.21	1.22	0.21	12.54
	Lolo Oyong	24	1.77	0.39	1.80	0.24	4.20
Buena Suerte	Forever Blessed Hotel	13	5.33	1.73	1.71	0.00	8.78
	Happyness	105	1.66	1.44	0.39	0.00	3.49
	Art Café	100	5.60	3.58	6.70	0.04	15.91
Villa Libertad	JVM Trading	40	0.36	0.14	0.20	0.31	1.01
	Palabajan Mini Mart	45	0.34	0.26	0.17	0.00	0.77
	Pong's Poultry	50	0.05	0.01	0.41	0.00	0.47
Pasadeña	Villarmino Store	20	0.03	0.09	2.39	0.01	2.52
	Mylene's Store	10	0.03	0.13	1.62	0.06	1.84
	Rosie Store	30	0.05	0.28			0.33
Barotuan	Norlie Store	10		0.06	0.21		0.27
	Nelson Store	20	0.01	0.59	0.16		0.75
	DDJ	15	0.10	1.39	0.85	0.19	2.52
Bucana	Jinjian Trading	15		0.17	0.61	0.51	1.28
	Recto Store	20	0.06	0.11	1.39	0.04	1.60
	Selma	30	1.80	0.86	0.19		2.85
TOTAL		661	26.23	17.36	21.59	2.03	67.20
Per Capita Generation			0.01	0.01	0.01	0.00	
Daily Projection			7.23	4.79	5.95	0.56	18.54
Yearly Projection			2640.62	1747.66	2173.45	204.09	6765.82
% Component			0.39	0.26	0.32	0.03	

Institutions		Staff	Bio	Res	Rec	Special	TOTAL
Maligaya	Brgy Hall	15	0.58	0.76	0.74	0.43	2.50
	Palawan Medical City	18	2.88	0.48	0.17	0.43	3.96
	School	89	1.51	0.52	0.50	0.03	2.56
Buena	Baptist	10	1.22	1.57	0.40	0.06	3.25

Suerte	Church						
	Brgy Hall	15	2.94	0.11	0.60	0.84	4.48
	Daycare Center	20	0.91	0.09	3.37	0.00	4.37
Villa Libertad	School	56	0.12	0.12	0.24	0.00	0.48
	Brgy. Hall	15	0.56	0.16	0.22	0.00	0.93
							0.00
Pasadeña	PSU	60	0.28	0.11	0.09		0.48
	High School	207	1.39	0.16	3.51		5.06
	Brgy Hall	15	0.03	0.29	0.38		0.70
Barotuan	Brgy Hall	15	0.15	0.15	0.37	0.14	0.82
							0.00
							0.00
Bucana	Brgy Hall	15		0.20			0.20
							0.00
							0.00
TOTAL		550	12.56	4.71	10.58	1.92	29.77
Per Capita Generation			0.01	0.12	0.75	0.06	0.94
Daily Projection			103.65	1702.08	10203.45	825.83	12835.01
Yearly Projection			37832.86	621260.15	3724259.78	301426.97	4684779.76
% Component			0.01	0.13	0.79	0.06	

Household Establishments							
Barangay	Household	Residents	Bio	Res	Rec	Special	TOTAL
Maligaya	Gabo	7	0.16	0.40	0.25	0.33	1.13
	Distal	7	1.55	0.16	0.21	0.18	2.09
	Gutchoko	7	1.88	0.06	0.36	0.11	2.41
Buena Suerte	Drio	6	0.75	0.06	0.20	0.00	1.00
	Ubida	8	0.49	0.16	0.05	0.36	1.06
	Costales	3	0.12	0.29	0.47	0.23	1.11
Villa Libertad	Dadule	7	0.37	0.17	0.06	0.02	0.62
	Cabate	6	0.25	0.37	0.00	0.00	0.62
	Anda	8	0.05	0.04	0.61	0.03	0.73
Pasadeña	Domarig	7	0.01	1.20	0.50		1.71
	Elliazar	4		0.67	0.18		0.86
	Ludivico	5		0.60	2.65		3.25
Barotuan	Taring	2	0.01	0.11	1.94		2.06
	Simeon	4			2.80		2.80

							0.00
Bucana	Veliosa	4		0.30	0.10	0.13	0.52
	Hara	5		0.39			0.39
	Fajud	8	0.97	1.00			1.97
	TOTAL	98	6.59	5.98	10.36	1.39	24.32
Per Capita Generation			0.02	0.02	0.04	0.00	0.08
Daily Projection			305.31	112.33	194.82	26.15	638.61
Yearly Projection			111439.70	41001.71	71108.33	9544.70	233094.44
% Component			0.48	0.18	0.31	0.04	

8.2 Sample Consent Form

Consent for Participation in a Research Interview

I agree to participate in a research project led by Carissa Quintana for the purpose of her thesis on the plastic ban in El Nido, Palawan, Philippines. The purpose of this document is to specify the terms of my participation in this project through being interviewed.

1. Nabigyan ako ng sapat na impormasyon tungkol sa proyektong ito. Malinaw ang aking tungkulin bilang tagapanayam.

   [I have been given sufficient information about this research project. The purpose of my participation as a research interviewee in this project has been explained to me clearly.]

2. Boluntaryo ang aking partisipasyon sa proyektong ito. Hindi ako sapilitan na isinali dito.

   [My participation in this project is voluntary. There is no implicit or explicit coercion whatsoever to participate.]

3. Maaaring 15-60 minutos ang pakikipanayam na ito. Pumapayag ako na magnota ang mga tagapagpananaliksik habang ako ay nakikipagpanayam. Pumapayag din ako na irecord ang panayam na ito para makatulong sa pagsusuri ng nananaliksik.

[Participation involves being interviewed for approximately 15-60 minutes. I allow the researcher to take written notes during the interview. I also allow the interview to be recorded for analysis purposes.]

4. My karapatan akong huwag sumagot sa mga tanong ng nananaliksik kapag ayaw ko. Maaari akong umayaw sa panayam kung nais ko.
   [I have the right to refrain from answering any questions. I can withdraw my participation from the interview at any time.]

5. Hindi ako ibubunyag ng nananaliksik sa mga dokumentong magreresulta sa impormasyon ng aming panayam. Para sa pagsusuri ng tagapanaliksik lamang ang impormasyon na makukuha sa panayam na ito.
   [The researcher will not identify me by name or function in any reports resulting from the information obtained from the interview. Information obtained will only be used for the researcher's study.]

Participant's Signature: Date:

8.3 Outline of Interviewees

Affiliation	Number of Participants
Hotel and Resort	10
Restaurant	10
Tour Operator	10
Local Tourists	11
Foreign Tourists	14
Barangay Representatives	18
Locals	18
School Representatives	36
Local Government	3
Landfill Manager	1
TOTAL	131

8.4 Raw Scores for Index

A. Buena Suerte
B. Corong-corong
C. Maligaya
D. Masagana
E. Villa Libertad
F. Bagong Bayan
G. Barotuan
H. Bebeladan
I. Mabini
J. New Ibajay
K. Pasadena
L. San Fernando
M. Sibaltan
N. Teneguiban
O. Bucana
P. Villa Paz
Q. Aberawan

PI	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**
Effects of ban	6	2	4	5	3	1	2	1	3	7	3	5	1	4	6	9	7
Implementation of ban	6	3	6	7	2	0	2	0	4	6	5	4	2	4	6	7	6
Community involvement	4	3	7	4	3	0	3	0	4	7	3	2	4	3	2	7	4
Public acceptance	8	3	4	4	2	2	3	0	1	7	5	5	3	2	2	8	5
Enforcement	7	1	5	4	2	0	2	2	3	6	4	4	3	0	5	9	8
Community awareness	9	2	8	3	9	1	7	3	8	7	7	4	6	2	7	7	7
Presence of MRF	0	3	2	0	8	2	3	1	4	5	6	3	8	1	2	8	5
List of fines	5	4	4	3	2	0	0	0	0	4	0	3	0	0	2	8	5
WACS results	3	1	2	3	4	2	2	2	2	8	4	2	1	2	4	9	4
Odor impact	4	2	4	3	2	1	2	1	1	6	4	5	4	2	3	8	9
Visual impact	4	2	4	2	2	1	1	0	3	7	8	3	2	2	2	7	5
TOTAL	56	26	50	38	39	10	27	10	33	70	49	40	34	22	41	87	65