

Banning Plastic Straw by Straw:

Why California needs a more harmonized approach to plastics management

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When you want something, all the universe conspires in helping you to achieve it.
- Paulo Coelho, *The Alchemist*

Abstract

Over 150 local communities in California have implemented bans as a way to decrease stress on landfills, reduce non-recyclable materials, and manage litter. Plastic product bans such as plastic bags, polystyrene, or single-use plastics, are used to address both local (e.g. litter reduction or community aesthetics), and global (e.g. microplastic pollution or wildlife entanglement) problematizations of plastic waste. As an environmental leader within the United States, California is positioned to lead other states towards effective policy implementation to mitigate the effects of plastic waste and pollution. However, local agencies bear the burden of collecting, sorting, and sometimes, selling recyclables in a rapidly closing global market. A clear consensus on policy goals is needed to understand if plastic bans are a successful means of solving the plastic pollution and waste crisis in the State. This thesis aims to understand the motivations and anticipated effects of local plastic bans in California in order to understand and analyze the justification for a statewide, harmonized plastics strategy. Through the use of in-depth interviews and policy document analysis this qualitative study uses policy diffusion theories to outline the motivations for local agencies to implement bans, and thematic content analysis to determine anticipated effects, and policy harmonization theory to create a framework for a California “plastics playbook” which outlines recommended actions on a State level to more effectively address plastic waste and pollution.

Keywords: plastic waste, plastic pollution, plastic product bans, plastics recycling, policy diffusion, policy harmonization

Executive Summary

Plastic pollution entering the environment has reached a tipping point in societal and consumer consciousness that has resulted in quick and reactive policy activity by various levels of government. The abundance of plastic packaging and a faltering global recycling market has forced political actors to react swiftly without a unified direction of specific policy goals. In California, local municipalities have been spearheading the development and implementation of plastic pollution policies with minimal coordinated effort or strategic support by the State. They bear the burden of managing and paying for waste disposal in their communities and use **bans** (e.g. plastic bags, polystyrene, and single-use plastics such as straws, cutlery, and cups) as a way to decrease stress on landfills, reduce non-recyclable materials, and manage litter. Over 150 local municipalities in California have implemented plastic bans as a means for addressing a wide variety of issues tied to plastic waste and pollution.

This thesis aims to understand why plastic is being regulated through mostly localized bans in California, what the anticipated effects of these bans are, and analyze the role the State has and should have in mitigating plastic pollution. To do this, the following research questions guided the research process:

RQ1: What are the motivations for local municipalities in California to implement plastic product bans and how has it contributed to policy diffusion at the local level?

RQ2: What are the expected effects of local plastic pollution bans and how do contextual factors influence the expected effects?

RQ3: How can the motivations and expected effects inform a more harmonized approach to plastic pollution in California?

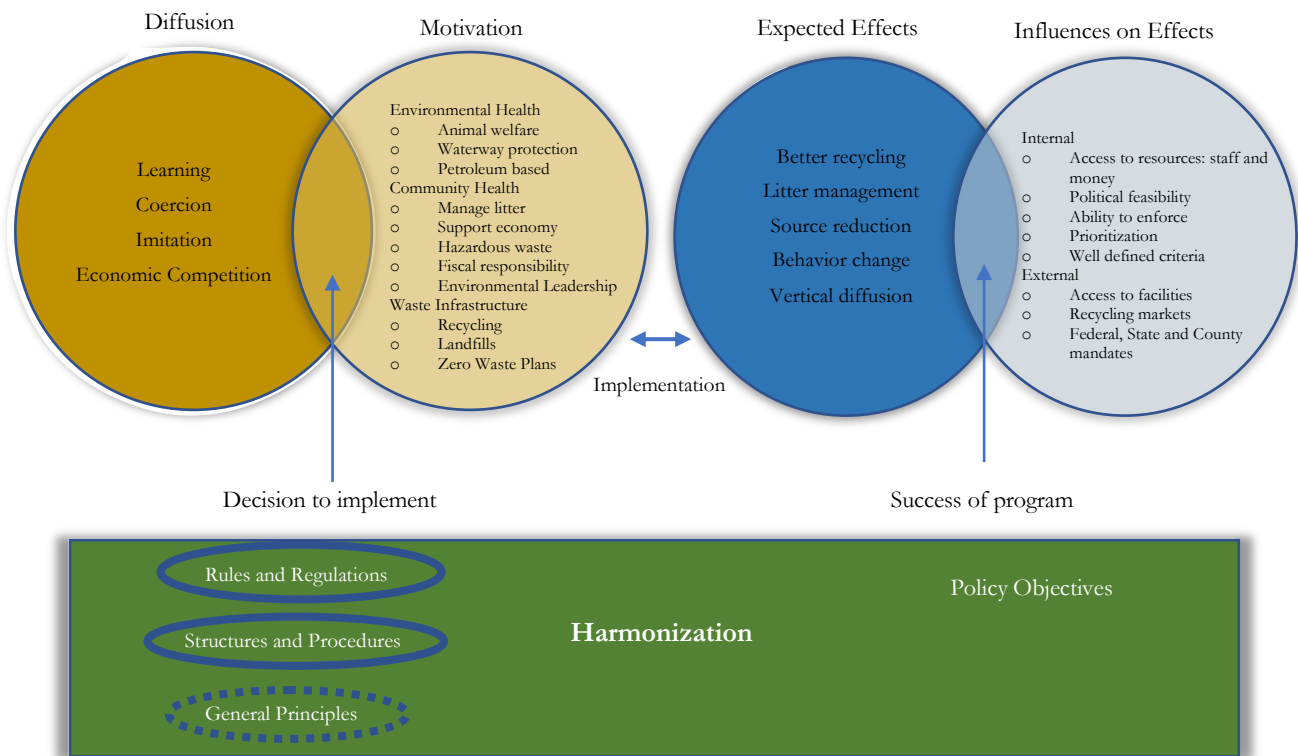
A qualitative research design was used to develop in-depth knowledge of the internal workings of local agencies and other relevant actors through the use of interviews and publicly available policy documents. Eleven interviews were conducted from four stakeholder groups: (1) local agencies who have implemented bans, (2) local agencies who have not implemented bans, (3) NGOs, and recycling and plastics associations, and (4) non-plastic single-use alternative producers. Policy comment letters, op-eds, and online interviews were used to gain the perspective of private industry. Interview questions were centered around three major themes tied to the research questions: **motivations and diffusion** to understand why bans were chosen (or not) as a means for controlling plastic waste and pollution; **expected effects** such as lower municipal costs, less street or beach litter, consumer behavior change, or influencing upper levels of government; **harmonization** between state and local policy to grasp what the perceived role of the State is, or should be, in managing plastic waste and pollution.

Results: The motivations for local policy implementation are mostly aligned under themes of environmental health, community health, and waste infrastructure. One of the more controversial motivations being to pressure the State to act. Motivations aimed to solve both local and global issues of plastic waste were found. The main motivations were to decrease marine pollution and manage litter. Recycling used to be the most prominent solution for plastic waste however, China's National Sword policy combined with the ever-evolving quality of plastic materials has driven the need for more robust plastic waste and pollution policies. This has led to plastic product bans diffusing at the local level.

The expected effects of these policies are heavily influenced by the *internal* and *external* contextual factors of each city. Internal factors such as access to financial resources, availability of staff to enforce ordinances, the stringency of the ordinance, and political will of the city management will determine how a policy is drafted, implemented, and enforced. External factors, such as State mandates or access to alternatives, are beyond the direct control

of the agency but also influences the implementation and success of a policy. Determining if these effects were achieved was not always clearly or consistently defined across agencies. This indicates a prevalence for softer policies that may, or may not, have a noticeable impact on mitigating plastic pollution. The importance of thinking holistically about plastics management is exemplified by the emphasis on the *availability of alternatives*, such as compostables. Alternatives highlight the need to have consistent messaging across the State to not confuse consumers and businesses. Considering available end processors and their willingness to take alternatives in their compost or recycling facilities is particularly important when thinking about using bans as a main form of management.

To know if a policy is successful it is necessary to have *defined policy objectives, metrics, and enforcement* to determine if goals are being met. Currently, California does not have a unified objective or goal specific to plastic waste management. CalRecycle, the state agency responsible for waste and recycling programs, does have a universal goal of 75% diversion of all material from landfill. For plastics, this diversion goal focuses on increasing recyclability of plastic waste. Conversely, as none of the analyzed policy documents mention the 75% diversion goal as justification for banning specific plastic products, it can be inferred that the local policies do not directly correlate with this State goal. The variety of motivations in the policy documents and lack of uniform criteria or metrics for establishing effectiveness specific to plastics consumption supports the need for a more harmonized approach. The figure depicts the completed analytical framework based on the data collection. It shows that the method of diffusion combined with a city's motivations generates the decision to implement policy or to not implement policy. Likewise, the expected effects and the influences of those

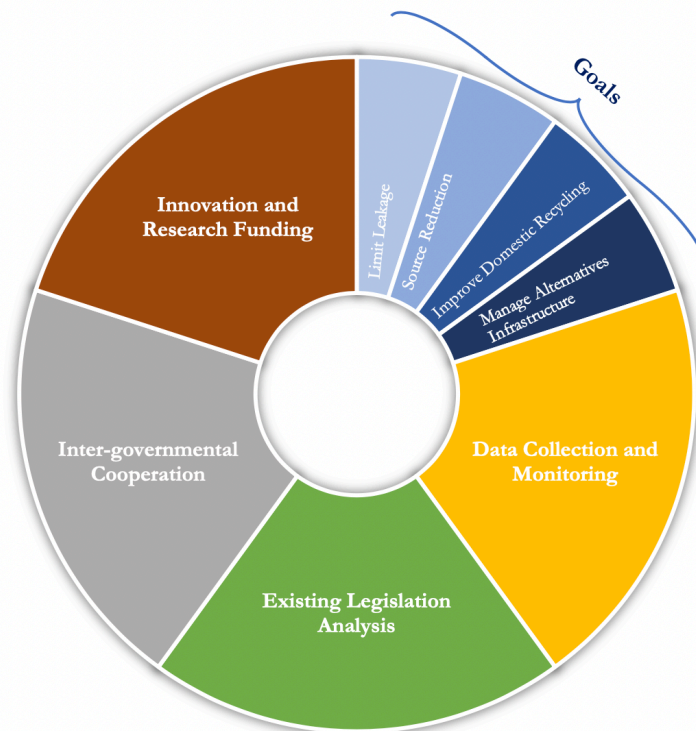


effects define the success of the program. Harmonization at the State level changes the policy landscape that local agencies operate within. The harmonization of rules and regulations, structures and procedures, and general principles influence the decision to implement, while a harmonized policy objective influences the success of a program. Rules and regulations, and structures and procedures are currently employed by the State for plastics management. General principles, such as the polluter pays, are not currently employed by the State for

plastics, but for other waste streams. Harmonized policy objectives specific to plastics are not currently used by the State.

Conclusions and Recommendations: Plastics need to be managed more intentionally. One way the State can support local agencies is to create a comprehensive and coordinated strategy specific to plastics management and mitigation that goes beyond banning individual plastic products. In lieu of another State mandated program, a “plastics playbook” would provide cohesive guidance and aid agencies in developing local policies within a greater policy plan. It could guide policymaking at multiple levels of government, account for legislation already in place, and assess existing programs and gaps at each stage of the plastics value chain. The playbook would aim to limit purely “feel-good,” reactive policy on the local level in pursuit of longer-term policy objectives. If the State can regulate higher up the value chain it would mean less pressure on local enforcement, fewer actors to regulate, and less dependence on the whims of consumers.

The plastics playbook (depicted below) includes (1) goals to reduce plastics leakage into the environment, improving the domestic recycling value chain, source reduction programs, and assessing infrastructure needed to manage alternatives. The State should collaborate with NGOs and nonprofits to come up with (2) a management tool for data collection to monitor the progress of each goal. A large component of the playbook would be to (3) analyze existing State regulations for policy coherence and (4) clearly delineate of roles for each level of government. Finally, (5) a private and public innovation fund would expand infrastructure and pilot new systems that focus on source reduction through reusables, not just recycling systems.



As plastic pollution policy begins diffusing state to state, endorsing a more comprehensive regulatory strategy could have even greater implications for the US as a whole. California is uniquely positioned as an environmental thought leader with relatively sizable state resources for developing and implementing thorough and innovative environmental policies. A plastics playbook that is as comprehensive as possible could be a beneficial resource for other states who would not have the capacity or political will to do so on their own.

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Abbreviations

American Society for Testing and Materials (ASTM)

California Department of Resources Recycling and Recovery (CalRecycle)

California Product Stewardship Council (CPSC)

Chlorofluorocarbon (CFC)

European Union (EU)

Extended Producer Responsibility (EPR)

Non-governmental organization (NGO)

Perfluoroalkyl and polyfluoroalkyl substances (PFAS)

United Nations (UN)

United Nations Environmental Program (UNEP)

United States (US)

United States Environmental Protection Agency (USEPA)

1 Introduction

Plastic pollution entering the environment has reached a tipping point in societal and consumer consciousness that has resulted in quick and reactive policy activity by various levels of government. Geologists have reported a “stratigraphically distinct” sediment layer characterized by man-made materials, including plastics, marking the beginning of the Anthropocene (Waters et al., 2016). Reports of plastic accumulation in the marine environment from the coasts to the deep sea are calling this a planetary boundary level threat due to the irreversible damage plastic pollution is having on Earth’s system at a chemical level (Villarrubia-Gómez et al., 2018). The seeming failure of private industry to control end of life management of the fastest growing material on earth (Geyer et al., 2017) has become impossible for political actors to ignore and has forced them to react swiftly.

There is a large and steadily increasing body of literature documenting the problem of plastic in the environment (Heidbreder et al., 2019; Jambeck et al., 2015; Schnurr et al., 2018; Xanthos & Walker, 2017) especially in marine ecosystems (Jambeck et al., 2015; Schnurr et al., 2018; Xanthos & Walker, 2017). The Ellen MacArthur Foundation (2017) estimates that 7.3 billion kilos of plastic are entering the marine environment annually worldwide with single-use plastics often cited as the main culprit (Avery-Gomm et al., 2019; Dauvergne, 2018a; Eunomia & ICF, 2018; Iverson, 2019; Schnurr et al., 2018) in addition to microplastics (Dauvergne, 2018a; Prata et al., 2019; J. Romer, 2007; Worm et al., 2017), ghost fishing gear (Iverson, 2019) and nanoplastics (Worm et al., 2017). This leakage of plastic into the environment is being blamed on the abundance of plastic packaging (Hahladakis et al., 2018) and a faltering global recycling market (Katz, 2019).

The combination of increased production, leakage into the environment, and globalized exporting of waste have caused a transnational pollution problem being addressed by a variety of policy measures at various levels of governance, but most explicitly at the regional, national, state, and local levels (Raubenheimer & McIlgorm, 2017; Worm et al., 2017). This has created a fragmented and sometimes contradictory set of policy measures that attempt to service multiple interests (Dauvergne, 2018b; Schnurr et al., 2018). Without an international agreement to rally around, cities, states, and countries are implementing their own regulations to tackle the growing plastic pollution problem without a clear indication if there is a cumulative effect. These responses have been centered around specific aspects e.g. microbeads (Xanthos & Walker, 2017) or single-use products e.g. plastic bags (Dan Nielsen et al., 2019) in lieu of more comprehensive plastic waste regulation or strategy.

A number of policy instruments are being used by governments at various levels to better manage or restrict consumption in order to reduce plastic entering the environment. Table 1 generally defines the broad categories used to manage plastic waste as described in academic literature.

In North America, California has been striving for more regulatory actions regarding plastic waste. California is one of the largest economies in the world and is the United States’ (US) most populous state. Local municipalities in California are both autonomous law-making bodies and are subject to regulation by upper levels of federal and state governments. There are also formal and informal regional authorities that agencies belong to in an effort to coordinate policy e.g. Los Angeles Regional Authority which is comprised of 18 cities in Southern California that together coordinate and report on State waste mandates. The State

has a number of policies regulating plastic waste¹ including a goal of 75% diversion of material from landfills. However, it is local municipalities who have been spearheading the development and implementation of various plastic pollution policies with minimal coordinated efforts or strategic support by the State.

Table 1: Types of plastic pollution and waste policies.

Type of Regulation	Definition	Source
Full Ban	A ban on either/or use, sale, manufacturer, distribution and/or import	(Knoblauch et al., 2018)
Partial Ban	Bans that restrict the availability of a product, substance or attribute in certain circumstances, or contexts.	Author's own definition ²
Fee or Tax	Charges, levies, or taxes paid by consumers or retailers which rely on market-based pricing or economic-based logic to influence behavior.	(Dan Nielsen et al., 2019; Knoblauch et al., 2018; 2018)
Extended Producer Responsibility (EPR)	Places responsibility on the producer for the entire life cycle of a product including the post-consumer or end-of-life phase.	(Carney Almroth & Eggert, 2019; Knoblauch et al., 2018)
Recycling Collection or diversion targets	Mandates a specific percentage of material is collected or diverted from landfills through waste reduction or recycling.	(California Solid waste management, source reduction, recycling, composting, and market development, 1989)
Public Procurement: post-consumer recycling content	When public authorities procure goods or services with reduced environmental impact. In the context of this thesis that includes products that have a certain percentage of post-consumer recycled content.	(European Commission, 2016)
Deposit Refund Systems	Consumers pay a refundable deposit on a product e.g. plastic PET bottle which is returned to them once brought back for recycling.	(Saphores & Nixon, 2014)
Voluntary Agreements	Policies initiated on a voluntary basis, often due to public pressure, most often by non-public actors.	(Dan Nielsen et al., 2019)
Information Campaigns	Aimed to raise awareness and reduce consumption. Often led or sponsored by public entities.	(Dan Nielsen et al., 2019)

Source: Author's own compilation

Local municipalities bear the burden of managing and paying for waste disposal in their communities (Lifset, 2003). In the early 1990s local governments in the US were faced with a crisis of low landfill space, increasingly difficult to recycle materials, and increased consumption (Reynolds, 1993; Thurner et al., 1990). Communities have continually implemented **bans** as a way to decrease stress on landfills, reduce non-recyclable materials, and keep toxic substances from leaching into the surrounding soil and water (Achterman, 1994; Levenson, 1993; Lifset, 2003; Thurner et al., 1990). Over 150 local municipalities in California have implemented regulations regarding plastic (Californians Against Waste, n.d.), mostly in the form of restricting the sale of single-use plastic products in retail, restaurants,

1 California has a statewide plastic bag regulation (SB 270); a straw upon-request bill (AB 1884), a deposit refund system under the California Beverage Container Recycling and Litter Reduction Act, and a waste diversion goal of 75% (AB 939), among others.

2 Xanthos & Walker (2017), Schnurr et. al (2018) and Nielsen et. al (2019) reference the term "partial ban" but do not explicitly define it, therefore a definition was crafted based off of the implied meaning from these sources.

and grocery stores (see Figure 1). Berkeley became the first local municipality in California to ban polystyrene in 1988 which started the first wave of bans that lasted until 1993.

The industry response to legislative bans, or threats of bans, on their materials, is to join the political sphere to lobby against them and instead promote the recyclability of their products while pledging to increase recycling infrastructure (Achtermann, 1994; Knoblauch et al., 2018; Levenson, 1993; Pollack et al., 2020; Reynolds, 1993; Rose, 2020). In an effort to work with industry, communities established, promoted, and expanded recycling programs as a system for management instead of moving forward with material bans through the early 2000s. Yet, the costs of collection, sorting, and processing still fell onto local agencies who have since struggled to deal with municipal waste in an environmentally and fiscally effective manner (Lifset, 2003; Pollack et al., 2020).

Exporting plastic waste to developing countries is an essential part of recycling infrastructure (Brooks et al., 2018; Hook & Reed, 2018) for local communities. Up until recently, California was exporting one-third of its recycled material with most of it was going to China (CalRecycle, 2020b). In 2018, China, the largest importer of recycling globally, implemented National Sword³ which halted the importation of recyclables citing the influx of contaminated trash disguised as mixed recycling. Despite industries push for it, recycling has not been successful. Almroth and Eggert (2019) report that of the 8,000 million metric tons of cumulative plastic produced globally since 1950, only 9% has been recycled exhibiting a torrential leak in the recycling value chain.

National Sword sent shocks through the global recycling market forcing many countries and communities to reassess their (lack of) domestic recycling infrastructure (Hook & Reed, 2018). The variety of plastic compositions and products has made recycling prohibitively expensive and made it difficult to find buyers for recycled plastic feedstock (Golding, 2016). This has led to reactive policy to fix recycling and reduce plastic pollution, creating a resurgence of plastic material bans among local municipalities. The narrative of plastic pollution and waste policy can be roughly divided into three distinct phases:

- Phase I (1988-1993): Initial banning of non-recyclable materials (mostly polystyrene)
- Phase II (1993-2003): Expansion of recycling programs and subsequent slowing of bans
- Phase III (2004-2020): Simultaneous policy support of recycling and revival of plastic bans

The resurgence of plastic bans as a means for management has made it important to understand what role bans play within plastic pollution policy when they are used, and what the intended policy outcome is meant to be. If the trend of local municipalities regulating plastic material through the use of bans continues, it is necessary to critically analyze if the underlying motivations of these policies aid in decreasing the abundance of plastic waste and plastic pollution in the environment.

³ China implemented National Sword on January 1, 2018. It restricted the imports of plastic significantly in an effort to combat the influx of non-recyclable waste and illegal trash imports. The move collapsed the price of plastic scrap and was so drastic many in the industry didn't believe it would happen (Hook and Reed 2018).

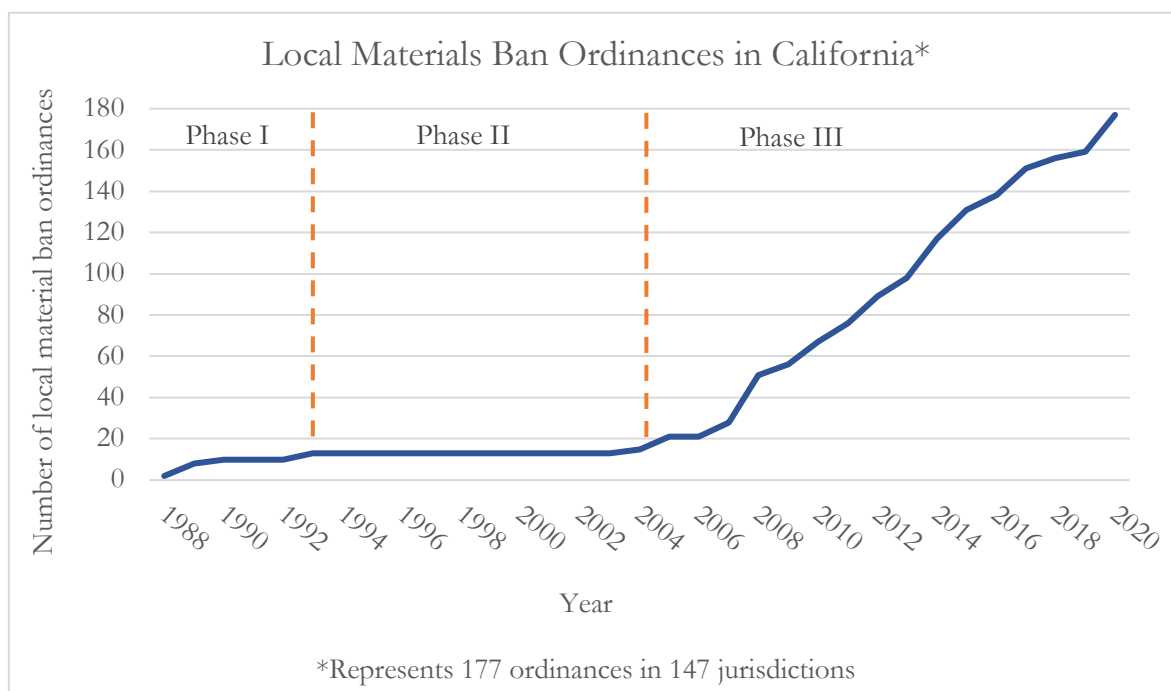


Figure 1: Cumulative number of local material ban ordinances in California. Includes plastic bags (prior to statewide ban in 2014), single-use plastics, and polystyrene. (Source: Author’s own compilation using Californian’s Against Waste and CalRecycle data)

A “ban” is a verb meaning, “to prohibit by legal means; to prohibit the use, performance or distribution of (Ban, n.d).” In the literature, there is sometimes a distinction between policies that employ full bans (Prata et al., 2019) versus partial bans (Schnurr et al., 2018; Xanthos & Walker, 2017) or bans that are in combination with a fee or tax (Dan Nielsen et al., 2019) which employs a policy mix. According to Dan Nielsen et. al (2019), bans follow a “certain administrative rationale” where a clearly defined line is drawn between a problem and its effect.

For instance, in a United Nations Environmental Programme (UNEP) (2016) report on marine plastic debris and microplastics, they recommend “a drastic reduction or ban of single-use plastic products (p. xiii)” such as banning microbeads from washable cosmetics which are not recoverable in wastewater treatment plants (Schnurr et al., 2018; Xanthos & Walker, 2017). Another example is banning flame retardants in plastics to protect first responders from toxic fumes (Pelley, 2014). Bans are increasingly being used to regulate single-use plastics because single-use plastics are “difficult to recycle, easily littered, and often...float (Carney Almroth & Eggert, 2019, p. 318).”

In a Eunomia (2018) report which aims to reduce certain plastics in the environment in the EU, there is a differentiation between “bans” which are employed to completely eliminate the sale of a product, and “specified sales restrictions” that are designated to “restrict the sale of [single-use plastic] items in various locations (p. 42).” This distinction in the language is reflected in the colloquial and often convoluted use of the term in application. To exemplify this we will take the example of plastic bag bans which have been the subject of regulation and consequently evaluation for the last decade (Dan Nielsen et al., 2019).

Bans are the most deployed instrument worldwide to regulate plastic bags. However, there does not seem to be a unified definition or format as to what a plastic bag “ban” actually means in practice. In California, SB 270 the “Solid waste: single-use carryout bags” (Solid

waste: single-use carryout bags, 2014) regulation does not use the word “ban” in the legislative text but instead says the bill would “prohibit stores...from providing a single-use carryout bag to a customer” and charges customers for recycled paper bags. However, the California Department of Resources Recycling and Recovery (CalRecycle), which is the agency responsible for enforcing the regulation refers to SB 270 as the “single-use carryout bag ban” on their website. Secondly, the ballot initiative voters passed was referred to as *Proposition 67, Plastic Bag Ban Veto Referendum* where a yes vote “supported upholding the contested legislation banning certain plastic bags...(*California Proposition 67, Plastic Bag Ban Veto Referendum*, 2016).” So, when applied to the case of California, the word “ban” is used to describe a mix of a partial ban and a fee. Rwanda, considered to have one of the strictest regulations on plastic bags, not only prohibits the sale of ultra-thin plastic bags punishable by a fine and jail time but also prohibits them in airport luggage (Dan Nielsen et al., 2019). In Taiwan, they announced a “blanket ban” on plastic bags, disposable utensils, and beverage cups by 2030 (Cheng 2018). The State of New York implemented its “Bag Waste Reduction Law” which “banned” all “plastic carryout bags...from distribution by anyone required to collect New York State sales tax (*Bag Waste Reduction Law*, 2019).” The meaning of bans is subjected to a spectrum of severity in implementation and sanction.

There is not a uniform definition of what constitutes a ban, but there is a colloquial use of the term that covers a variety of policy interventions that fall under the categorical term “ban.” For the sake of this thesis, bans, partial bans, and bans in combination with fees are grouped under the general term “bans” because they all perform the same function of restricting market access. Clarification of this terminology is imperative to ensure that understanding and interpretation of policy is well understood.

Part of the difficulty with plastic waste policy is there is a wide variety of problematizations, values, and behaviors used to interpret, understand, and address the general issue of plastic waste. How an issue is valued connects to the motivations behind pursuing a particular course of action to solve the problem that has been identified (Loges & Jakobi, 2019). For instance, if plastic as a material is viewed as the problem, then the elimination of all plastics, with viable substitutes, will most likely be the behavior selected to address it. Alternatively, if specific attributes of a product are the focus, like microbeads, then the solution would be to eliminate the problematic element. The issue of plastic waste can also be tied to specific features, such as toxicity of chemicals or additives or littering. Even with littering the associated problems can vary such as clogged drains, decrease in tourism due to an unaesthetic environment, or animal ingestion or entanglement. The perception of the issue is often tied to what is valued by individuals or society which in turn influences what behavior (policy) is taken to address it and what actions are prioritized.

While tied to the same issue of plastic waste, the various problematizations are tangled in an abundant set of values people place on their communities and the environment in line with their identity and personal worldview (Mukand & Rodrik, 2018). Unlike other environmental issues, this decentralized perception of what the problem is and the underlying values people have regarding the problem make direct and consistent policy implementation difficult (Loges & Jakobi, 2019). For instance, coastal communities may favor restricting market access of certain products that often wash ashore on their local beach while inland desert communities may find it difficult to support restrictions of products found on beaches. Alternatively, proponents of market-based solutions may favor eliminating difficult to recycle materials with little economic value from the market thus supporting recycling initiatives. This difference in values, problematizations, and behaviors generate solutions at different points in the plastics value chain (Milius et al., 2018) and create a fragmented policy (Dauvergne, 2018b) with varying levels of support.

Despite potential differences in the problematization of plastic as described by Loges and Jakobi (2019) and the call for more research to be done on the effectiveness of existing measures (Dauvergne, 2018a; Schnurr et al., 2018; Xanthos & Walker, 2017), similar plastic pollution policies are diffusing at a rapid rate and are being enacted reactively and indiscriminately. Many of these responses to plastic waste are too new to have been studied for their individual effectiveness. Some plastics policies that have been around longer have been studied for their individual impacts in their countries, states or cities (such as Bharawaj, 2016; Convery et al., 2007; Dikgang et al., 2012; Poortinga et al., 2013) and there have been some attempts to understand if regulations, specifically on single-use plastics, have a cumulative impact (Dan Nielsen et al., 2019; Schnurr et al., 2018; Xanthos & Walker, 2017). This can make understanding the collective effectiveness of these policies difficult as the definition of “success” may differ (Evans, 2017). Which in turn can create a potential conflict between policies that have different aims i.e. source reduction vs. recycling targets. Therefore, it is imperative to understand the motivations for policy implementation and what their expected effects are supposed to be able to assess if they are effective.

The increasing use of bans has triggered a number of academic articles (Clapp & Swanston, 2009; Dan Nielsen et al., 2019; Dauvergne, 2018a, 2018b; Iverson, 2019; Loges & Jakobi, 2019; Prata et al., 2019; Vince & Hardesty, 2017) on the effectiveness of individual policies at the national level and the rapid diffusion of plastic pollution policies. Despite the growing body of literature, it is unclear if harmonized policy or coordinated strategy between levels of government is crucial for policy success when it comes to plastic pollution prevention. The various problematizations addressed by over one hundred local ordinances and several long-standing, statewide programs make it hard to determine if California’s approach to plastic waste and plastic pollution mitigation is effective when it lacks a uniform policy objective.

In 2019, the State of California tried to regulate plastics through a number of bills that addressed single-use plastics, producer responsibility, and domestic infrastructure in response to the faltering recycling market. None of these bills passed before the 2019 legislative session ended. Some bills are being amended with industry and community input. Until additional State regulation is passed, local agencies will continue to drive the reduction of plastic products through the use of bans. However, it still remains unclear if differing problematizations of the plastic problem and fragmented local policy, with various expected effects, will be cumulatively successful without a coordinated strategy or policy for managing plastic waste in the State. The need for California to have a cohesive approach to plastics pollution mitigation needs to be further explored to better assess the impacts of plastic pollution policy.

1.1 Aim & Research Questions

This thesis aims to understand why plastic is being regulated through mostly localized bans in California, what the anticipated effects of these bans are, and analyze the role the State has and should have in mitigating plastic pollution. To do this, the following research questions guided the research process:

RQ1: What are the motivations for local municipalities in California to implement plastic product bans and how has it contributed to policy diffusion at the local level?

RQ2: What are the expected effects of local plastic pollution bans?

Sub question: What factors influence the expected effects of plastic pollution bans?

RQ3: How can the motivations and expected effects inform a more harmonized approach to plastic pollution in California?

A literature review was conducted to provide background on the current issues with plastic, regulation and globalized end of life management, as well as create an assessment framework grounded in norm dynamics, policy diffusion, and policy harmonization. All three research questions utilize semi-formal interviews as the main source of empirical data collection to gain in-depth insight into the structures, decisions, content, and anticipated effects that influence policy decisions. *RQ1* also utilizes policy documents from cities around the State to encompass more publicly available viewpoints in the allotted time of the study. Due to limited interview responses, *RQ2* uses industry policy response documents to gain an industry perspective. The interview transcripts and policy documents are then combined, analyzed, and coded for themes against the prescribed framework outlined in Chapter 3.

1.2 Scope

The scope of this study is limited geographically to the State of California. California is the US' largest economy and the world's fifth-largest economy (Associated Press, 2018). It is the most populous state in the US and has 3,427 miles (5,515 km) of coastline (NOAA Office for Coastal Management, n.d.). California is known for its progressive environmental legislation. Similar to the Brussels Effect (Bradford, 2020), Vogel (1997) coined the term "California Effect" because the State's "relative size and wealth within the American economy has helped drive many American environmental regulations upward...(pg. 6)." It was the first in the nation to pass a statewide ban on ultrathin plastics bags and plays a leading role in setting environmental standards for the entire country (CalEPA, n.d.; Californians Against Waste, 2017; Vogel, 1997).

The scope of this thesis excludes the assessment of state to state policy diffusion and subsequently disregards what is happening on the local level in other states. As well, California's track record of forward-thinking environmental policies, its extensive coastline, and large, mostly dense population, create conditions within the State that may limit the transferability of the analysis and conclusions to similar coastal states. This is explored further in Chapter 6.6.

1.3 Audience

The main aim of this research is to help local governments make informed decisions on policy prioritization. To that end, local officials and civil servants will find this research useful when contemplating plastic waste and plastic pollution strategy. State-level actors may be interested in the framework established to draft a statewide plastics strategy. It is the ultimate hope that this research can jumpstart a meaningful conversation on all levels of government in California to have a harmonized, cohesive, and deliberately cooperative approach to plastics management.

Additionally, this research is meant to contribute to the fast-growing literature on plastic mitigation and policy work being done in academia. The concept of bans has quickly spread through policy diffusion and it is important to assess the context of these policies alongside determining if they are effective on a global scale. This study fills a research gap in local-level policy diffusion through the case of plastics policy.

1.4 Disposition

The rest of this thesis will proceed in the following manner:

Chapter 2 will have an overview of the rise of plastic as a material to its modern-day position in the global economy and how its recent fall out of the public's favor has led to demands for change in plastic pollution and plastic waste policy. As well as review types of bans and how they impact different actors along the plastics value chain.

Chapter 3 grounds the research into norm-dynamics, policy diffusion, and policy harmonization concepts found in the literature which are then organized into an analytical framework to help address the research questions.

Chapter 4 will cover the research design and methodology for conducting the interviews with a variety of relevant actors and subsequent analysis of transcripts and relevant policy documents used in current plastic pollution policies. Limitations and ethical considerations for research are also outlined in this chapter.

Chapter 5 presents the results with minimal analysis by first defining how “bans” are used in practice. The motivations surrounding environmental health, community health, and waste infrastructure are explored. Then the internal and external contextual factors that influence the anticipated effects of plastics policy are described. Followed by the motivations for harmonizing policy.

Chapter 6 discusses the results and their relevance in shaping California policies on plastics on a local and state level. The types of harmonization currently employed in California help justify the development of a “plastics playbook.” This chapter concludes with reflections on the methodology and further areas of research.

Chapter 7 concludes the study by addressing the research questions and presents the thesis' relevance to the overall plastic pollution problem, as well as recommendations for the stated audience.

2 The rise, fall, and regulation of plastics

2.1 Plastics Popularity

The market share of plastic production has grown tremendously since its introduction into the consumer market over fifty years ago (Allwood et al., 2012; Geijer, 2019; Jia et al., 2019). Production has increased from two million tons in 1950 to 380 million tons in 2015 (Geyer et al., 2017) due in part to plastics significant advantage as a shelf-stable and protective packaging and its tactile appeal. This, along with plastics enablement of efficient and economic transportation of goods in an increasingly globalized economy, has led to plastic being produced in larger quantities than any other man-made material (Brooks et al., 2018).

Throughout its development, the plastics industry has designed products to need less raw material (Allwood et al., 2012). This has resulted in a variety of compositions and uses for plastics that have added to their popularity. Additionally, manufacturers have increased the material efficiency by reducing the size and weight of packaging by 50% since 1970, thereby lowering the transport weights and in turn the carbon footprint of shipping (Allwood, 2014; Geijer, 2019; Holdway et al., 2010; Jia et al., 2019).

Since the 1990s recycling has been publicized by industry as the main end of life treatment for plastic waste in response to concerns over limited landfill capacity, increasing waste tonnage, and higher municipal costs from infrastructure damage caused by plastic waste (Achtermann, 1994; Levenson, 1993; Thurner et al., 1990) such as sewer blockages and street litter cleanup. However, as discussed below, drastic changes to the recycling market have exacerbated challenges with managing plastic at the end of its life.

2.2 Leakage into the Environment

Many agree that the mismanagement of plastics along its value-chain has caused severe leakage into the marine environment often originating in the terrestrial environment (Brooks et al., 2018; Carney Almroth & Eggert, 2019; Dauvergne, 2018a; Iverson, 2019; Worm et al., 2017). While countries in Asia are responsible for most of the marine pollution (Dauvergne, 2018a) due to a lack of infrastructure, Iverson (2019) claims that even in the US where 98% of waste is managed efficiently, the remaining mismanaged waste ends up in the oceans due to dense coastal populations and high waste per capita consumption. Carney Almroth & Eggert (2019)

Table 2: Classification of marine plastics.

Classification	Size	Example
Nanoplastic	<1 μ m in diameter	3D printing particles. Particles smaller than the diameter of a human hair
Microplastic	1 μ m–5 mm	Clothing fibers, microbeads
Mesoplastic	5–200 mm	Fragments of macroplastics, straws, cutlery
Macroplastic	> 200 mm	Bottles, buoys, toys

Source: Adapted from (Alan & Elliott, 2016; Carney Almroth & Eggert, 2019; Worm et al., 2017)

reference two models that suggest land-based plastic pollution is mainly sourced from rivers, stormwater runoff, wind, and/or littering. While a portion of marine plastic appears from the shipping and fishing industries (Iverson, 2019), this thesis will focus on land-sourced plastic pollution.

Marine plastic pollution is classified by particle size. Nanoplastics, which are the least studied but potentially most problematic are small enough to pass through cell walls and could disrupt nutrient cycles (Carney Almroth & Eggert, 2019). Microplastics are large enough to sink to the bottom of the sea, accumulate in sediment, and disrupt the food chain as it is consumed by organisms (Worm et al., 2017). Meso- and macro plastics are the most visible and often cited as the main causes of wildlife ingestion and entanglement (Avery-Gomm et al., 2019; Hahladakis et al., 2018; Iverson, 2019; Worm et al., 2017) as well as blocking drainage pipes and being unsightly on beaches (Carney Almroth & Eggert, 2019).

There is now a conversation that the prevalence of plastic pollution at the nano- and micro-level may have created a planetary boundary level threat (Prata et al., 2019; Stafford & Jones, 2019; Villarrubia-Gómez et al., 2018) but there is not complete consensus. Stafford & Jones (2019) point out that there is less evidence that plastic is having an effect at a “planetary, ecological or toxicological level (p. 188)” in regards to the effect ingestion or entanglement is having on wildlife populations. There is consensus that more research still needs to be done on the effects of marine plastics, especially of the smallest classifications (Carney Almroth & Eggert, 2019; Schnurr et al., 2018; Worm et al., 2017) but generally, the literature agrees that plastic in the environment is detrimental to marine life.

2.3 Types of Bans

This study places regulatory bans in three broad categories: products (e.g. plastic bags), chemicals and additives (e.g. BPA), or specific materials or qualities of products (e.g. microbeads). This taxonomy of bans is important when discussing at which levels of government regulation is taking place. As is shown in the proceeding sections, different levels of government are more willing or able to employ different types of bans as shown in Figure 2.

Table 3: Examples of local plastic product bans in California

Type of ban	Motivations for bans	Number of local bans in California
Plastic Bags⁴	Minimal or no recycling market; not economical to include in municipal recycling programs. High likelihood of becoming litter. Gets caught in sorting machinery.	151
Polystyrene	Minimal or no recycling market; not economical to include in municipal. High likelihood of becoming litter.	125
Single-use plastics (e.g. straws, cutlery, cups, lids)	High volume of material with little to no recycling potential. High likelihood of becoming litter.	9
Straws (upon request)	High volume of material with little to no recycling potential. High likelihood of becoming litter.	5

Source: Author’s own compilation. The number of bans based off of resources from Californians Against Waste, motivations for bans summarized from results presented in Chapter 5.

⁴ The number of local plastic bag ordinances prior to the California statewide ban in 2014. These ordinances are not preempted by the statewide law. The state law does preempt any plastic bag bans after 2014.

Products

Product bans across the globe occur at the national, state, or local levels. Regulations can cover the production and/or sale of plastic products (Iverson, 2019). While product bans typically focus on a small portion of the waste stream (Levenson, 1993), Godfrey (2019) states that governments will turn to banning products if they are unable to manage the material through traditional waste management services or “where they have little control over the design of products in their market (p. 3).” Bans often regulate the availability of products to consumers (see Table 3 for examples) by restricting market access through retailers (Lifset, 2003; Schnurr et al., 2018) but can also place the burden of implementation on industry (Schnurr et al., 2018). The level of governance at which the regulation takes place can be a deciding factor in which actor is burdened with implementation as shown in Figure 3.

Chemicals

Regulation of chemicals is mostly done at upper levels of governance such as:

- the international level with the Stockholm Convention (2001) that aims to reduce persistent organic pollutants,
- the European Union (EU) level with the REACH regulation (European Council Directive 1907/2006),
- the national level such as the US Toxic Substance Control Act (1976),
- or the state level in the US such as California’s list of designated and priority chemicals (*Chemicals Biomonitoring in California* n.d.)

These regulations often cite impacts on human health as the main driver for regulation, but the inability to properly recycle has also been cited for the banning of certain additives in plastics in the EU (European Commission COM(2018)32 Final; Hahladakis et al., 2018).

Often it is plastic additives that are banned through the above-mentioned chemical legislations. Additives are mixed with plastic polymers to improve the performance, functionality, and aging properties of the polymer and include things like plasticizers, flame retardants, colorants, pigments, and fillers (Hahladakis et al., 2018). Plastic polymers themselves are “biochemically inert” according to Worm et al. (2017), making the additives the main barrier to recycling. Additives can cause damage to the environment on a molecular level and are harmful to human health (Hahladakis et al., 2018; Worm et al., 2017). It has been shown that concentrations of banned substances can persist in plastic material flows for extended periods of time (Pivnenko et al., 2017), therefore banning chemicals or additives found in plastics should be considered in long-term plastic waste management.

One of the more known additives is bisphenol A (BPA). Evidence points towards its negative effects on humans (Siracusa et al., 2018) yet its regulation is inconsistent around the world. There is not a federal law in the United States banning BPA, but it is banned in 12 states, including California, and the District of Columbia (NCSL.org, n.d.) as well as from baby products in the EU (Erickson, 2018) and Canada (Canada.ca, n.d.). There is an ongoing conversation in the scientific community about the effects BPA’s replacements have on human health and the environment (Siracusa et al., 2018). BPA has the potential to stay in the recycling stream if products containing it are kept in the value chain.

Another additive common to plastic production that is inconsistently regulated across the world and the US is brominated flame retardants (Kaldveer, 2007). While brominated flame retardants have a number of industrial applications including fabrics (Kaldveer, 2007), they are often found in the plastic casings of electronic products (Leslie et al., 2016). The EU and California ban the use of these additives. The EU cites them as negatively impacting the recycling process and included recyclers in stakeholder engagement around flame retardant regulation (European Council Directive 2002/95/EC). California labels brominated flame retardants as a “priority” chemical which means they are likely to be carcinogenic or toxic (*Chemicals Biomonitoring in California* n.d.). California does not seem to link banned chemicals and recycling, so it is unclear if banning chemicals or additives sometimes found in plastic are taken into consideration for in-state recycling programs.

Materials/qualities

Material or quality ban examples mostly take place at the state or country level. Beginning in 2014, countries began implementing bans on microbeads in wash-off cosmetics (Dauvergne, 2018a; Iverson, 2019; Schnurr et al., 2018) which were cited as a low percentage of microplastics in the oceans but a highly hazardous one due to their size, ingest-ability (Guerranti et al., 2019) and inability to be removed via wastewater treatment plants (Xanthos & Walker, 2017). A second example would be the regulation of plastic bags thickness. Plastic

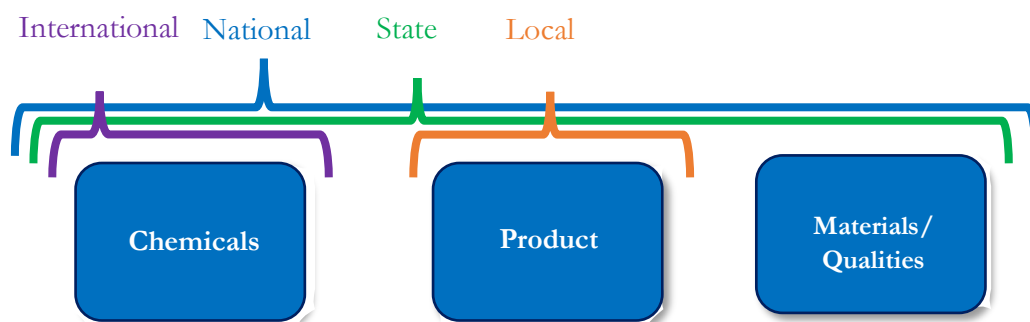


Figure 2: Type of ban that occurs at each level of governance. Different types of bans can occur at some but not necessarily all levels of governance. For instance, chemical bans occur at the international, national, or state (referencing the United States) levels, but not at the local level. There are occurrences of product bans at the local, state and national levels, but not yet at the international level. Material/quality bans have occurred at the state and national level. (Source: Author’s own compilation)

bag regulations that do not fully ban their sale or use will often designate the thickness of bag citing that thicker bags can be reused or pose less of a “flight risk” into the environment (Iverson, 2019; Schnurr et al., 2018; United Nation Environmental Programme, 2016; Xanthos & Walker, 2017). In the case of plastic bags, the regulation on thickness is sometimes paired with a fee or tax on thicker plastic bags (Dan Nielsen et al., 2019).

The only US federal law addressing plastic pollution is the Microbead-Free Water Act of 2015 which prohibited sales of wash-off cosmetic products containing microbeads as of 2018 (Iverson, 2019). The US, United Kingdom, and Canada all have country-wide bans prohibiting industry from including microbeads in their products (Schnurr et al., 2018). Some of the reasons cited for passing legislation at a federal level in the US was the availability of alternatives to the plastic microbeads (Xanthos & Walker, 2017), the difficulty industry had with the variability of regulation across state lines, and the low political stakes associated with implementation (Dauvergne, 2018b). Microbeads are still used in a variety of products such as printer toners and other industrial applications (Schnurr et al., 2018) and therefore still pose a threat to the marine environment.

Other

Other bans relating to plastic waste, and waste in general, include bans on materials going into landfills, or on the transport of waste across state or national borders (Levenson, 1993). China's National Sword policy would fall under this type of ban. These types of bans can be viewed as indirect market restrictions because without a way to dispose of a product, producers may be less likely to make it, or consumers may be less likely to buy it. Further analysis of these types of bans is outside the scope of this thesis.

2.4 Determining the Effectiveness of Bans

Frank Fischer (1995) proposes that the first order of evaluation is to determine if the policy meets the goals it sets out to achieve. When an idea is translated into an implementable program, governments can go through a process of verification and measure "whether a policy program does or does not fulfill specified criteria (Fischer 1999)." Evans (2017) argues that when looking at the effectiveness of policy outcomes, it is important to understand how success and failure are defined as well as understanding the intention of the policy and who the policy is intended to affect. It is important then, when planning policy and defining anticipated effects that there is a metric or quantifiable objective established to assess if that policy is working.

The City of San Jose implemented its plastic bag ban in 2012 which prohibits single-use plastic bags and a charge for paper bags. Staff used four metrics to determine its effects: (1) visible litter in creeks and storm basin catchment areas, (2) plastic bags found in recycling facilities, (3) percent of retailers in compliance, and (4) visual observations of consumers bringing reusable bags into stores. Two years after implementation, these metrics showed a 73% decrease in plastic bags in creeks and a 59%, a 25% reduction in plastic bags at the city's recycling facility, an observation by staff showed a 98% compliance rate in retailers and 62% of shoppers bringing their own bags (League of California Cities, 2014). The policy is seen as successful. By having established criteria in which to compare before and after the implemented policy, the effectiveness can be adequately determined.

Enforcement and monitoring are also crucial in determining effectiveness. For instance, in a study on the effectiveness of different local bans done in Nepal by Bharawaj (2016), effectiveness varied greatly between municipalities depending on the type of ban (full or partial) and the level of enforcement (probability of being caught * amount of fine for non-compliance). The study looked at consumer and retailer compliance as a means for measuring effectiveness. They found that in agencies with full bans who had strong enforcement, (meaning the fine was given and they were likely to get caught) due to sufficient monitoring, compliance neared 100%. The study noted significant costs associated with monitoring, enforcement, and regular communication regarding the ban. It is therefore important to local Nepalese governments for the bans to be effective. The need for resources to enforce and monitor plastic product bans on a local level also presents as necessary for local agencies in California throughout the research process.

Without defined metrics and regular enforcement and monitoring the effectiveness of these policies can be difficult to determine. Sometimes politicians and other stakeholders will emphasize the success of policies without demonstrating it to be true often due to the lack of defining success against any measurable criteria (Marsh & McConnell, 2010). The momentum from single-use plastic product bans can be used to produce additional policies, essentially being a political success without having to prove the effectiveness of the program itself (Lifset, 2003; Marsh & McConnell, 2010). Without being able to determine success, government regulation intended to mitigate plastic pollution will not keep up with the "rising

environmental costs from the globalization of plastic” (Dauvergne, 2018a, p. 29) that is needed for large scale change to be effective (Stafford & Jones, 2019).

2.5 Regulation of Actors

The type of ban and the governance level at which it occurs indicates which actors are more likely to be affected by the regulation. A report by Eunomia and ICF (2018) points out that a shift from local policy to statewide policy shifts the responsibility for implementation from retailers to producers. Studies typically focus on the consumer behavior or consumer effects of plastic pollution policies, but there is a call to address the range of effected actors (Dan Nielsen et al., 2019). Figure 3 shows which actors are affected at what level of governance. The rest of this section will briefly touch on what the literature has to say about the role of different actors in plastic pollution policies.

Nongovernmental organizations are said to be essential in raising awareness of an issue (Schnurr et al., 2018) and ultimately norm spreading (Loges & Jakobi, 2019) which will be discussed in Chapter 3. They play a role in all phases and levels of policy implementation because they help translate issues between science, policy, and society (Fossi et al., 2020) as they call for improvement of the environment. They exhibit influence on all levels of government.

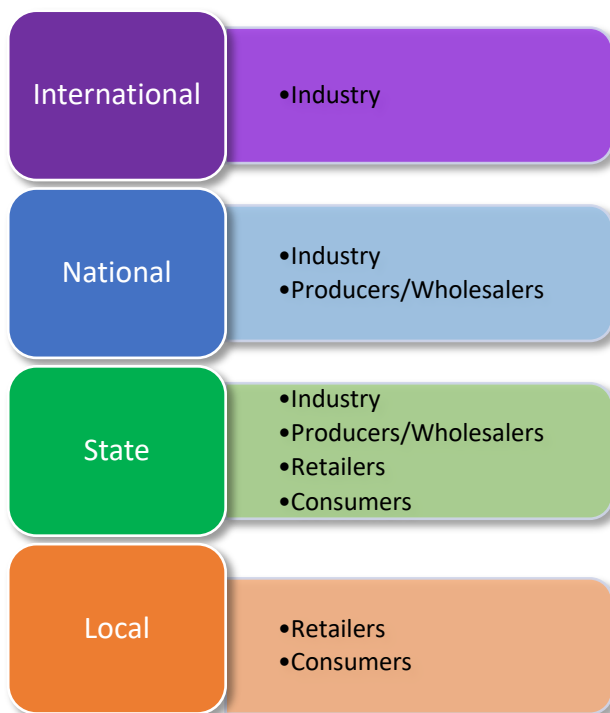


Figure 3: Actors regulated at different levels of governance. (Source: Author’s own compilation)

Petroleum, and subsequently the *plastics industry*, is one of the largest manufacturing sectors in the United States (Bureau of Economic Analysis, 2019; J. Romer, 2007) contributing around \$77 billion USD in GDP in 2017 (U.S. Bureau of Economic Analysis, 2019). Although product bans are “attractive” to consumers and local officials because the accountability is placed on companies and retailers to be more proactive (Lifset, 2003), plastic bags and other single-use plastics are a small percentage of overall revenue (J. R. Romer & Foley, 2012). Nevertheless, plastic bags have become a symbolic tipping point causing industry to become more proactive or preventative as opposed to reactive. This is characterized by spending millions of dollars to change the reputation of plastics in general through recycling initiatives

and the convenience of single-use plastics (J. R. Romer & Foley, 2012) and lobbying against both local and state bans (Pollack et al., 2020). Currently, about 8% of oil production goes into making plastics (Dauvergne, 2018b) so a shift in the perception of plastic is debatably an important concern for industry growth especially as the demand for fossil fuels for energy decreases. Local producers who are concerned about job loss have even more of a stake in maintaining levels of production (Dan Nielsen et al., 2019).

It is in the interest of *retailers* to cooperate with, or fight against, pending regulation since they're business is often directly impacted by local regulations. Retailers are likely to incur some costs if they are mandated to switch away from single-use plastic items, like plastic bags, to multi-use or non-plastic single-use products (Eunomia & ICF, 2018) which can cause pushback. Conversely, it is proposed that retailers will spend less on overhead costs for materials that need to be repeatedly purchased while maintaining their customers' prices resulting in additional revenue (Eunomia & ICF, 2018). Retailers are often impacted most by product bans e.g. grocery stores who utilize plastic bags or restaurants who use takeaway food containers.

This thesis does not address the effect bans have on *consumers* or consumer behavior. However, it is important to acknowledge that they play an integral role in both providing public pressure for change to happen and accepting interventions (Schnurr et al., 2018). Consumers' attachment to plastics as an issue may be due to its high visibility in the environment and also the "shareability" of using alternatives (Stafford & Jones, 2019) on social media platforms. The norm spreading that occurs between consumers instills a set of social sanctions that are either self-imposed (e.g. shame) or socially imposed (e.g. embarrassment) that further codifies the norm of anti-plastic behavior (Prata et al., 2019) and catalyzes the public pressure for regulation to occur (Pollack et al., 2020).

2.6 Role of the Plastics Value-chain

In the early 1990s when governments began banning materials that were hard to manage at the end of life, the plastics industry countered with a pledge to increase recycling infrastructure and recyclability of their products (Achterman, 1994; Reynolds, 1993). When assessing the new wave of regulatory bans, it is important to establish the part recycling plays in the globalized plastics value chain, its significant role in leaking plastics into the marine environment, and establishing the context it operates in.

The plastics value chain is complex and made up of several stages (Milios et al., 2018) which are driven by a number of factors including the cost of collection and processing, revenues from sales along the chain, and avoided disposal costs through diversion from landfills or incinerators (Lifset, 2003). In the Global North, once the plastic is discarded it is collected and brought to a facility to be mechanically or chemically sorted (Hahladakis et al., 2018; Milios et al., 2018). The value of recycling depends on the homogeneity of polymers and materials (Hahladakis et al., 2018; Milios et al., 2018) meaning sorting directly impacts the value of the material along the remainder of the value chain. Once sorted, it's sold to be processed most often into pellets that are then sold to producers who will combine it with virgin plastic to make packaging and products (Milios et al., 2018). Plastic pellets, semi-processed parts, and post-consumer plastic are traded across borders multiple times throughout the value-chain, making it difficult to pin down which part of the value-chain is responsible for the material (Dauvergne, 2018a) when we talk about regulation or system leakage.

As shown in Figure 4, the majority share of plastic waste is imported into South East Asia (Hook & Reed, 2018) to be processed. Importing countries in Asia have dealt with a huge increase in production and consumption since the 1990s and with rising imports from much

of the developed world (Dauvergne, 2018a). The UNEP (2016) states that losses from the recycling sector are thought to be relatively low, “provided good [formal] waste management practices (2016, p. 36).” Yet, there is a historical precedent of wealthier nations who have more “robust” waste management infrastructure (Brooks et al., 2018) sending waste to low- or middle-income countries despite having insufficient waste management systems to deal with the materials (Dauvergne, 2018a). Consequently, it has been proposed that sending plastic to countries with less developed infrastructure is where the main points of recycling system “leakage” is occurring (Dauvergne, 2018a).

Up until 2018, China was the world’s largest importer of plastic for recycling (Dauvergne, 2018a; Hook & Reed, 2018). China found it profitable to import plastic (Brooks et al., 2018) to fill the need for more raw materials which were difficult to source domestically, and as a means for filling returning container ships from developed countries which at the time provided a clean and steady stream of recyclables. This helped develop a globalized recycling trade that exporting countries could rely on to prevent recyclables from being landfilled or incinerated (Brooks et al., 2018).

Much of the world’s plastic recycling has been shipped to China and Southeast Asia. As the variety of plastic compositions grew these countries began struggling to deal with the large quantity of low-value materials (Hook & Reed, 2018). An estimated 1.3-3.5 million MT of plastic is thought to go into the ocean from China’s coastline, annually (Brooks et al., 2018). According to some, China and other countries in South East Asia account for nearly 44% of marine plastic pollution (Worm et al., 2017) most of which originates in the developed world.

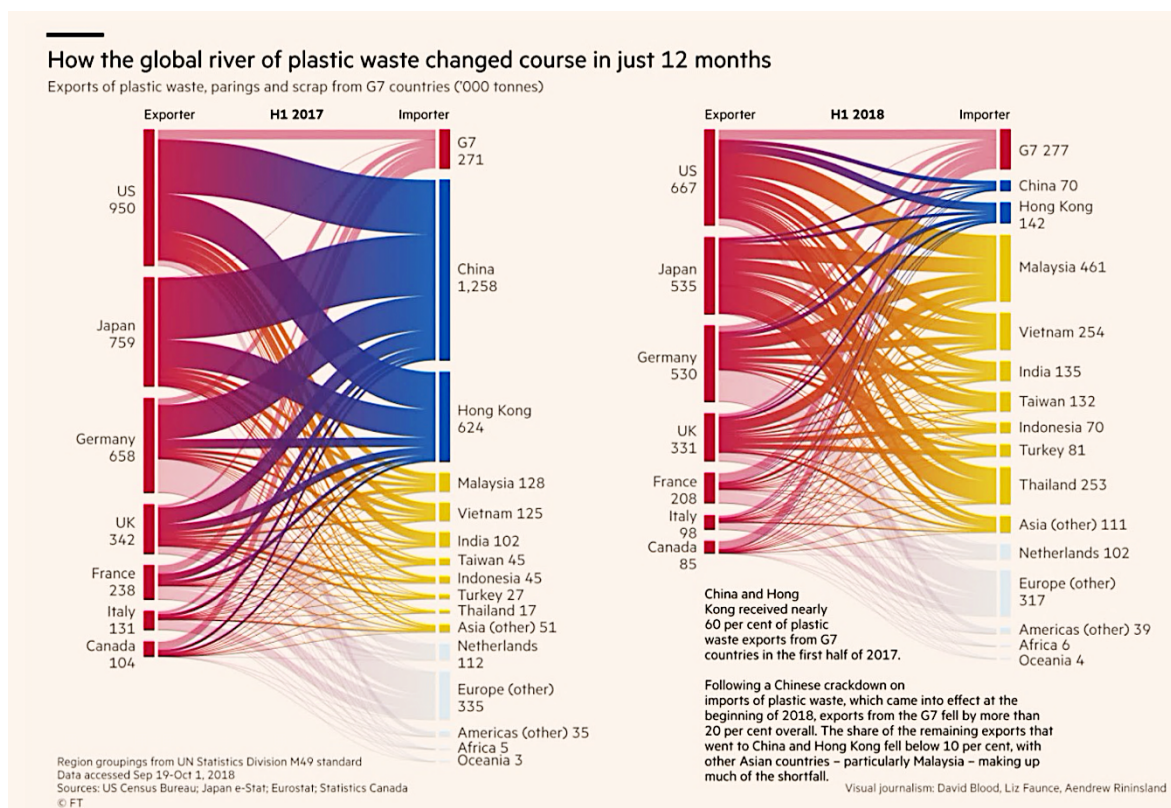


Figure 4: Plastic material flow changes to China and Hong Kong between 2017 and 2018, in blue. (Source: Hook & Reed, 2018)

China implemented its National Sword program in 2018 which restricted the imports of plastic significantly in an effort to combat the influx of non-recyclable waste and illegal trash

imports (Hook and Reed 2018). This policy drew attention to a major failure of the globalized recycling system (Dauvergne, 2018a). Commingled and single stream⁵ recycling programs are common in exporting countries, especially in the US and California. These programs boasted high recycling rates when in fact, the material was not being recycled once exported because it was too low-quality (Brooks et al., 2018; Dauvergne, 2018a). This was further compounded by the growing range of products with complicated plastic blends and additives created by the plastics industry (Brooks et al., 2018).

The implementation of National Sword has forced agencies to deal with the plastic waste in their own communities (Brooks et al., 2018; Dauvergne, 2018a) or closer to home. Brooks, Wang, and Jambeck (2018) project that 111 million tons of plastic waste will be displaced by 2030 now that China is not taking it. With no standard classification of plastics or standards for how importing countries are going to manage it (Brooks et al., 2018), the existing infrastructure cannot “handle the tsunami of new plastic pouring out of the petrochemical industry (Joyce, 2019, p. 6).” A major shift is needed to be able to handle the quantity of material being generated as communities work to find viable solutions.

2.7 Bans & Recycling

As shown in the introduction, bans were a community’s way of regulating problematic plastic waste and industry countered by promoting the recyclability of their products. Links between bans and recycling do not seem primarily connected but they are historically linked as two opposing methods of management. Furthermore, both are currently being used simultaneously with unclear implications of how they interact. It is important to address and understand the interplay between the two types of management policies as both are brought up in the empirical data collection.

Products

The limited literature available states that in practice product bans provide no incentive for recovery of material or building recycling infrastructure, and make a small and indirect contribution to recycling demand (Levenson, 1993). Products that were regulated were those that took up landfill space and were less recyclable (Levenson, 1993). Lifset (2003) argues that the products most often banned are too small or lightweight to make a significant impact on landfill space and calls bans “negligible” in increasing capacity. Consequently, the plastics industry argues that banning specific products removes the likelihood of establishing a viable recycling market (Achterman, 1994; Godfrey, 2019).

Initially, product bans for plastic bags or polystyrene takeaway containers were the most straightforward legislation local governments could use to regulate the flow of materials into the landfills they operated (Levenson, 1993; Stone & Ashford, 1991). The shift back towards banning products, like plastic straws, cups, and cutlery, is mostly due to products having very little if any recycling infrastructure in place because these materials are “either not economically or environmentally efficient to recycle... (J. Romer, 2007).” Bans have become a way to mitigate smaller, avoidable, non-packaging items (Godfrey, 2019) that are prone to becoming litter therefore having little chance of being recycled (Eunomia & ICF, 2018). Industry has had to come up with new messaging, political action, or products to maintain its business model.

Despite the assertion that the availability of alternatives is essential for product bans, there is not a lot of research available on if bans ensure that replacement products are recyclable or

⁵ Refers to all recyclable commodities being placed in the same container for collection.

environmentally sound (Avery-Gomm et al., 2019; Dan Nielsen et al., 2019; Lifset, 2003). For instance, the use of biodegradable plastics as an alternative material for single-use plastics can be particularly problematic due to its incompatibility with traditionally recycled plastic and the uncertainty of how the material acts in the marine environment (Carney Almroth & Eggert, 2019; Dan Nielsen et al., 2019). Alternatives are further explored in Chapters 3.2, 5.3, and 6.1.

Chemicals

The various chemical compositions of plastic products can make recycling difficult for a number of reasons. First, recycling plastic polymers of different types together degrades the quality making it less usable and less valuable (Milius et al., 2018). Until plastic can be broken back down into its components through chemical recycling, it is not technically or economically efficient to recycle non-similar plastic products (Closed Loop Partners, 2019). Second, even with standardized labeling of plastic polymers one through seven, the lack of standard labeling about the additives or multiple polymers used in a product can make it difficult to streamline clean recycling streams. Likewise, additives or chemicals in plastic products that have been banned can still show up in recycling streams and make entire batches of recyclables unusable.

The European Commission COM(2018)32 Final, Communication on the Implementation of the Circular Economy Package: Options to Address the Interface between Chemical, Product and Waste Legislation, addresses how chemicals can create technical and economic obstacles for recycling and reuse. In it, they address these concerns, as well as how the definition of “product” to “waste,” especially in terms of hazardous waste, is important to delineate. As these concerns directly impact the EU’s circular economy legislation, the communication calls for “full coherence between the laws implementing waste and chemicals policies (European Commission COM(2018)28 Final).” While it is unclear how full coherence is defined, the Communication at least highlights the attempt to evaluate the interaction of potentially conflicting regulations. There is not currently a written document on the interface between chemical legislation and recycling legislation in California for plastics.

A report by Closed Loop Partners (2019) outlines several methods and technologies for breaking down plastic polymers as a means for handling the vast composition of plastic materials and meeting the high-quality demands of plastics producers. Their report is aimed at encouraging investment in companies who are developing these technologies to increase the feasibility of chemical recycling thereby raising the amount of available recycled plastic (Closed Loop Partners, 2019). The commercialization of these technologies could potentially change the recycling market, but more research and investment are needed.

Materials/Qualities

The examples of bans on materials and qualities cited in this thesis are inherently non-recyclable or least likely to be recycled. Microbeads in wash-off cosmetics enter the municipal water system and waterways (McDevitt et al., 2017) with little intention of collection for reuse. While the ultra-thinness of plastic bags is banned two-fold. First, because of the environmental risks they pose. Second, they hinder recycling facilities by clogging machinery wasting valuable staff time and money (Californians Against Waste, 2017). Plastic bags can be recycled if collected separately through voluntary take-back programs (Shapley, 2016) but the low value of plastic film, regardless of its thickness, often makes it uneconomical for local municipalities to collect it. So, cities will regulate how thick plastic bags must be to promote them as reusable and limit the risk of them being caught up by the wind.

3 Analytical Framework

Two theories from the literature are used to analyze the defined research questions. The existing literature on plastic pollution policy utilizes policy diffusion (Knoblauch et al., 2018) and norm dynamics (Clapp & Swanston, 2009; Dauvergne, 2018a; Loges & Jakobi, 2019) to understand how and why the spread of plastic policies has differed from other environmental movements. Therefore, these theories are used to create a framework to analyze the key elements of policy motivation and the expected effects of bans. Policy harmonization helps explain inter-governmental cooperation and provides a theory to evaluate the interaction between local and state levels of government in California. A graphic depiction of the analytical framework can be found at the end of this chapter in Figure 6.

3.1 Norm Dynamics and Diffusion

Dauvergne (2018b) and Loges and Jakobi (2019) use norm dynamics to explain the spread of the growing anti-plastic movement that is being motivated by increased scientific consensus, media coverage, NGOs, and consumer demand. Norms are defined as “ideas and beliefs about what is appropriate (Clapp & Swanston, 2009, p. 316).” In particular, environmental norms can “...diffuse rapidly to change government policy, business practices, and global consumption... (Dauvergne, 2018b, p. 580),” as knowledge of harmful impacts become better known, which has been the case for biodiversity, climate change, and now plastic pollution (Loges & Jakobi, 2019). Global norm adoption is typically codified by international law (Clapp & Swanston, 2009) but, as will be discussed below, this is not the case for the diffusion of plastic pollution policies.

Those who initiate the process of spreading new norms with the aim of general acceptance and support (Loges & Jakobi, 2019) are called “norm entrepreneurs” (Dauvergne, 2018b). Norm entrepreneurs frame the issue, create a language to discuss it, and place it in contention with or alongside the current norm (Finnemore & Sikkink, 1998). Norm entrepreneurs can come from a large variety of actors who will fight to change or maintain the status quo depending on their personal interests (Loges & Jakobi, 2019; Mukand & Rodrik, 2018) or empathetic, altruistic ideation (Finnemore & Sikkink, 1998). Which role a norm entrepreneur takes on is not necessarily tied to a specific type of actor (Loges & Jakobi, 2019) but is context-specific. For instance, Romer (2007) recognized that while the very strong plastics lobby and grocers association in San Francisco adamantly opposed implementing regulation on plastic bags, retailers in Modbury, England voluntarily decided to ban all plastic bags. Regardless of which side an actor takes the role of the entrepreneur is to push an agenda forward.

Loges and Jakobi (2019) propose that norm entrepreneurs try to “persuade states to evaluate existing behavior as ‘wrong’ and to promote novel types of behavior (2019, p. 4).” This coincides with John Kingdon’s (1984) idea of “policy entrepreneurs” who are “intrinsically motivated and persistent individuals who spend an extensive amount of resources in gathering support for their plans (via Huitema et al., 2018, p. 1248).” Majone (2014) puts forth that “political entrepreneurs” will consult with colleagues to collaborate or harmonize their activities, and do not act alone. In some cases, they may even integrate operations to strengthen their norm building. Huitema, Boasson, and Beunen (2018) argue that “governance entrepreneur” is a more appropriate term because it reflects movement initiated by different actors at different levels from multiple sectors. Regardless of what they are called, the consensus seems to be that norm development and normative framing actions are driven by actors who themselves are driven by either self-interest or intrinsic motivation. For the remainder of the thesis the term “governance entrepreneurs” will be used as the study addresses several types of actors both inside (e.g. local government staff) and outside (e.g.

NGOs, industry) of government (Hawkins et al., 2020) who act on either or both the local and state levels.

Policy diffusion is typically carried out by governance entrepreneurs (Clapp & Swanston, 2009; Huitema et al., 2018) such as city staff or city management, NGOs, or even representatives from the plastics industry trying to persuade favorable action towards recycling. A minimalist definition of policy diffusion is the intentional act or process that takes policy decisions and knowledge from one context and uses it to develop policy decisions in another context (Evans, 2017; Hawkins et al., 2020; Marsh & Sharman, 2009). While the term policy transfer⁶ could also be employed to describe this process the difference between the terms is more nuanced than this study will explore (see Marsh & Sharman, 2009 for a complete discussion). Regardless of the definition, the literature on policy diffusion and policy transfer utilizes the same mechanisms: learning, competition, coercion, and imitation, which will be discussed in the context of local policy movement in Section 3.1.3. Policy diffusion will be used to describe the influence of policy decisions and mechanisms in different settings.

Policy diffusion can occur between levels of government and governments on the same level. This can take on several forms when translated into policy content. The formative paper by Dolowitz and Marsh (2000) outlines a model that shows policy diffusion can happen either horizontally (across the same level of government) or vertically (between levels of government). The most common form of policy diffusion in developed countries is voluntary and lesson-drawing and often occurs from dissatisfaction with existing policy, as an agenda introduced by a new government, or to upgrade existing policies to promote politicians (Evans, 2017).

Additionally, market-driven diffusion can occur when entities with large market pull such as the EU, on a global scale, or California, within the US, enact standards and regulations that without adjustment, would cut industry players out of that market share (Bradford, 2020; Vogel, 1997). A common example is American automakers abide by California's strict emissions requirements for all of their cars because if they didn't they would not have access to the country's largest car market or would have to follow different standards for that market which would be less economically and resource efficient. It's easiest to make all of their cars to the strictest standard.

Diffusion of Plastic Regulation

On the international stage, environmental policy has mostly been initiated in industrialized countries in the Global North in conjunction with international institutions such as the United Nations (UN) or C40 via a "...networked international 'movement' led by transnational norm entrepreneurs from the Global North (Clapp & Swanston, 2009, p. 318)". However, the policies surrounding plastics have not followed this pattern (Clapp and Swanston 2009; Knoblauch, Mederake, and Stein 2018). Instead, the first signs of plastic pollution policy emerged in the Global South in the late 1990s and early 2000s when Bangladesh⁷ became the first country to implement a plastic bag ban (Clapp & Swanston, 2009) which then spread throughout the Global South with strong regulatory bans on the import, production, sale, and use of plastic bags (Knoblauch et al., 2018).

⁶ Knoblauch et. al (2018) disagree that 'diffusion' can only occur at a macro-level and that on a city level or micro-level this process would be policy transfer. The difference being that policy transfer is the movement of content and process, while diffusion looks at the patterns of adoption.

⁷ According to (Knoblauch et al., 2018), even though Germany and Denmark implemented regulations (taxes) on plastic bags in the early 1990s, there is "no direct effect on the diffusion of plastic bag policies in subsequent years (2018, p. 6)."

The catalyst for the adoption of these policies in developing and emerging countries was a lack of proper waste management infrastructure (Clapp & Swanston, 2009; Knoblauch et al., 2018) which led to a visual presence of plastic bag litter, clogged pipes, death to livestock (Clapp & Swanston, 2009) and a weak plastics industry (Knoblauch et al., 2018). With support from work done by Finnemore and Sikkink (1998), Clapp and Swanston (2009) first proposed that new norms are likely to be adopted when there are short and clear cause and effect links. For example, Bangladesh banned plastic bags after they were found to be the cause of exacerbated flooding due to blocked drainage pipes (Molla, 2018).

The Global North has a much more structured waste management system. The immediate need to handle plastic bag waste was less pervasive (Knoblauch et al., 2018) making the adoption of policies debatably less urgent. The speed at which plastic pollution regulation has mobilized in the Global North can be explained by the growing global pressure around the mismanagement of plastic waste (i.e. low recycling rates in their own countries) and marine pollution via NGO campaigns, press coverage (Knoblauch et al., 2018), and the internet (Clapp & Swanston, 2009).

This delineation in context and motivation between the Global North and the Global South signifies two things. First, it illustrates a shift from localized issues of plastic pollution in the Global South (e.g. clogged pipes, unsightly litter) to a transboundary understanding of plastic waste (e.g. microplastics in the ocean). Second, that there are more dominant types of policy in different parts of the world with taxes, fees, and policy mixes found more often in the Global North while more stringent full bans occur in the Global South (Knoblauch et al., 2018).

The Global South began regulating plastic pollution as a way to cope with local issues that it was causing. The Global North has been confronted with the reality of their role in marine plastic. It is arguable that the spreading of an anti-plastic norm in the Global North exemplifies governance entrepreneurs successfully promoting norm-based messaging at multiple levels of government through policy intervention (Abbott & Sumaila, 2019; Clapp & Swanston, 2009) despite having mixed motivations for doing so.

The dispersion of the anti-plastic norm and its corresponding policies between different levels of governance is an example of what Finnemore and Sikkink (1998) call a “two-level norm game (1998, p. 893).” The connection between levels of government helps governance entrepreneurs strengthen their arguments domestically using international precedent as support in later adopting contexts, especially at the beginning stages of a norm’s adoption. However, the unique movement of plastic pollution policy from local settings to a more international setting makes it an intriguing case for understanding policy diffusion and the interaction between levels of governance. Analyzing the motivations for policy adoption in the local context can help explain the institutionalization of plastic pollution policies in a global context.

Horizontal and Vertical Diffusion

While the diffusion of plastic pollution policy has not been motivated by a specific international agreement there are increasing calls for one (Dauvergne, 2018b; Raubenheimer & McIlgorm, 2017). There have been several suggestions to tie plastic pollution to existing international or multilateral marine agreements by classifying plastic or plastic additives as persistent organic pollutants linking it to the Stockholm Convention (Leslie et al., 2016; Worm et al., 2017) or enabling a new Article under the UN Law of the Sea Convention or UN Regional Seas Convention as a means for preventing land-based pollution ending up in the ocean (Raubenheimer & McIlgorm, 2017; Vince & Hardesty, 2017). The challenges brought up by these authors include the protocol for amendments by the parties and difficulty with

enforcement. Ultimately, the difficulty is that the transboundary and global nature of plastic pollution in the open seas makes it difficult to pin down responsible parties (Vince & Hardesty, 2017).

Another suggestion has been to amend the Basel Convention to include plastic as hazardous waste (Avery-Gomm et al., 2019; Brooks et al., 2018) to prevent it from being sent to countries with less developed waste management systems. In April 2019, the Conference of the Parties did just that in a legally binding framework to better regulate and manage the flow of plastic waste. This will significantly limit the flow of plastic into countries that have historically mismanaged it due to a lack of infrastructure. In a news article about the amendment, the Director General of World Wildlife Federation International said this was a step in the right direction but a comprehensive treaty to address the global plastic crisis is still needed (Holden, 2019).

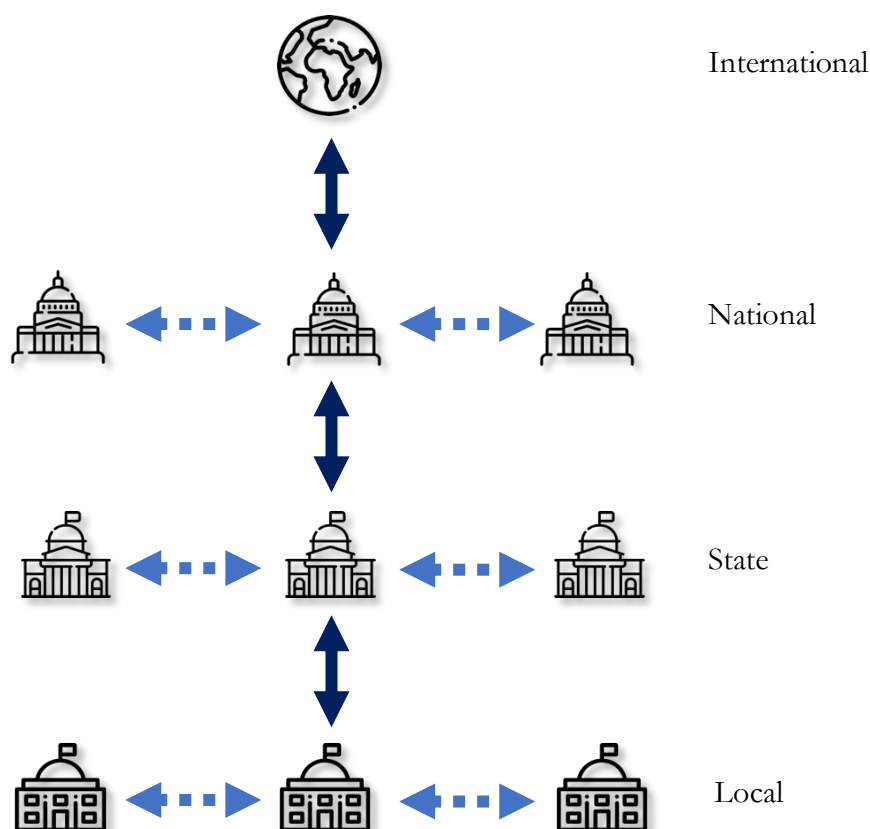


Figure 5: Vertical diffusion occurs between levels of government and horizontal diffusion occurs between similar levels of government. (Source: Author's own compilation)

Policy diffuses both horizontally across the same levels of governance and vertically between levels of governance (see Figure 5), this thesis focuses on horizontal diffusion at the local level and vertical diffusion between the local and state level. A significant amount of literature is written about these upper levels of horizontal and vertical governance diffusion⁸. As will be discussed in the next sections, many of the same concepts used in upper levels of government policy diffusion can be and have been applied to lower levels of diffusion as well.

⁸ (See Berry & Berry, 2018; Mooney, 2001 for state-to-state diffusion) or (Evans, 2017; Marsh & Sharman, 2009; Simmons & Elkins, 2004 for international diffusion).

Local Policy Diffusion

Local agencies are being recognized more for the pivotal role they play in global-scale environmental policy partially because of their willingness to act as political laboratories (Huitema et al., 2018; Reynolds, 1993). Experimenting with policy on a local level highlights potential challenges and tests effectiveness without having to wait for a politically favorable environment on the state or national level (Huitema et al., 2018; J. Romer, 2007). It's argued that local policy is more likely to be adopted because of the localized nature of some environmental issues, the ease of including local actors, and the accessibility governance entrepreneurs have to local officials (Huitema et al., 2018). Hence, it is worth looking at policy diffusion at a local level.

Table 4: Mechanisms for Policy Diffusion

Mechanism	Definition	Temporal Condition	Spatial Condition	Sources
Learning⁹	Cities will look to other cities for verifiable 'successful' policies to act upon and implement in their own city, or to plan for potential challenges	Long-term: success of a policy needs to be evaluated which takes time to implement. Once success is determined, policy will continue to diffuse over a long time period	Low: cities are not limited geographically to learn from one another	Shipan & Volden (2008); Simmons & Elkins (2004); Berry & Berry (2018); Hawkins (2020)
Economic Competition	When there is 'economic spillover' between jurisdictions where one government will be either positively or negatively affected if they do (or do not) implement the same policies as their neighbors	Long-term: implementation occurs over a long time period, and continues to be implemented over a long time period	High: cities in close proximity are more likely to be economically competitive or intertwined	Shipan & Volden (2008); Simmons & Elkins (2004); Berry & Berry (2018); Hawkins (2020)
Imitation¹⁰	Copy the actions of another city to look like that city. The focus is on who is implementing, not what is being implemented. The aim is to be perceived as modern, "progressive" or "morally praiseworthy"	Short-term: implementation occurs quickly but then dies down over the long-term	High: Mostly larger cities are imitated, so there is a likelihood of smaller surrounding cities to imitate their nearby large cities	Shipan & Volden (2008); Marsh & Sharman (2009)
Coercion¹¹	In city-level policymaking, coercion is the likelihood of a city implementing local policy (or not) in the wake of state policy.	Long-term: happens over a long time period, but the time scale is less clear than the other three mechanisms	N/A: the reviewed literature does not support a relationship between spatial nature and coercion	Shipan & Volden (2008); Berry & Berry (2018); Hawkins (2020)

Source: Author's own compilation

⁹ Simmons and Elkins (2004) and Berry & Berry (2018) refer to "new information" or "information" respectively. In Table 4t this is categorized as "learning" because as defined, it performs the same function for cities.

¹⁰ Also referred to as "mimicry" by some of the literature (Marsh & Sharman, 2009).

¹¹ Knoblauch, Mederake & Stein (2018) state a major part of policy diffusion is its voluntary nature and therefore do not think coercion or harmonization is a mechanism for diffusion.

As discussed earlier, there are four mechanisms used in policy diffusion (Marsh & Sharman, 2009) which Shipan and Volden (2008) contend also operate on a city-to-city level. Learning, economic competition, and imitation are defined as horizontal mechanisms, while coercion is defined as a vertical, top-down mechanism. These mechanisms are subject to temporal and spatial conditions that are dependent on the characteristics of the city and its capacity to be proactive or reactive. (Shipan & Volden, 2008).

There are two conditions that influence the mechanisms. First, the proximity of cities or spatial condition, (Mazzanti et al., 2012; Simmons & Elkins, 2004) is especially true for cities that may share infrastructure like a recycling facility (Mazzanti et al., 2012), or are economically intertwined or competitive (Shipan & Volden, 2008) such as cities that both run landfills or recycling centers and need private entities to choose their facility over others. The second is the temporal condition which shows how long a particular mechanism's influence will most likely be felt. Table 4 defines these mechanisms and their related conditions.

According to Evans (2017), the content of policies initiated by diffusion done via learning, in particular, can occur in four ways by:

- copying a policy without adapting it for the local context (copying),
- accepting another institution or governments policy standards for policy implementation at home (emulation),
- creating a hybrid of several program elements from multiple settings to create one that is context-specific (hybridization), or
- inspiring agents for a new policy idea (inspiration).

Copying is said to be the least common form of transfer while hybridization is the most common.

3.2 Influences on Expected Effects

Even if an agency is motivated to enact a plastic pollution policy, there are other contextual factors that will affect whether or not it is feasible to implement and if its anticipated effects are achieved. The following is a set of considerations that appear repeatedly in the literature as necessary for the implementation of plastic pollution policies to be successful. These include enforcement, access to suitable alternatives, and political feasibility.

Enforcement

As noted earlier, enforcement is key to having successful policy implementation. The time and money needed to monitor and enforce policy are important in ensuring compliance and ultimately the success of the regulation. Poor enforcement of bans can potentially lead to less effective policy or a lack of suitable infrastructure. If bans are not enforced, participation can decrease or never rise to the level needed for actors to fully participate in the regulation (Iverson, 2019). Alternatively, if banned materials are still appearing at facilities such as recycling centers, that could potentially cause issues (Godfrey, 2019) due to the lack of infrastructure needed to manage that material or create added costs for additional treatment or disposal.

Alternatives

The literature states that single-use plastics bans need suitable alternatives for consumers in the marketplace that are either non-plastic single-use, or multiple-use (Eunomia & ICF, 2018), recyclable (Avery-Gomm et al., 2019; Levenson, 1993; J. Romer, 2007), or compostable (J. Romer, 2007) to be effective. Although the use of alternatives may or may not be better than the original product from a life cycle perspective (Lifset, 2003), the repetition in the literature that alternative products are imperative in the success of plastic bans is echoed throughout. Interestingly, there is uncertainty pertaining to biodegradable plastic products as acceptable alternatives because of their inability to degrade in the marine environment and if it becomes a contaminant within recycling streams. This is not well studied and is highly conditional upon the type of polymer and its end of life processing (Carney Almroth & Eggert, 2019; Fossi et al., 2020). The types of suitable alternatives still depend on appropriate recovery and end of life management infrastructure.

Political Feasibility

Political feasibility can be defined as “the potential for conflict that comes with a certain policy (Knoblauch et al., 2018, p. 14).” On one hand, plastic pollution policies may present little conflict and be highly feasible to implement. In these contexts, plastic pollution policies are attractive for politicians and the public because they are easy to communicate, low risk for incumbent politicians, and in the case of product bans are fairly easy to implement with low financial barriers (Dauvergne, 2018b; Knoblauch et al., 2018; Lifset, 2003; J. Romer, 2007). For local governments, product bans have become a way to make a statement without needing a more hospitable state or national political climate to act (J. Romer, 2007). Bans may also be the only viable course of action for local agencies as they have little influence on manufacturing (Godfrey, 2019; Levenson, 1993).

On the other hand, governments of larger cities, state governments, and national governments could all be influenced by the strength of the plastics industry. In the US, plastics is the largest manufacturing industry in the country (Romer 2007) and lobbies against all levels of regulations trying to restrict its products. Manufacturers can threaten to leave states or even countries to dissuade action against them (Lifset, 2003). There are instances of state governments in the US who have proposed anti-anti-plastics regulation, meaning they have preemptively regulated against local ordinances that restrict single-use plastics (J. R. Romer & Foley, 2012). How a policy is communicated can impact the political feasibility because it depends on how the public perceives the state of the world and if they have the power to enact change within it (Mukand & Rodrik, 2018).

As discussed previously, governance entrepreneurs can communicate how the world is doing and how a consumer’s identity ties into the perception that the world can maintain the status quo or change it. As an example, the plastics industry promotes that they make a material essential to society’s quality of life and recycling is an answer to the amount of generated plastic waste. Consumers do a positive thing for the environment when they recycle and therefore will continue to buy and use plastic products. It is an example of how the perception of why plastics manufacturing (a societal structure) should be maintained and supported while simultaneously promoting those who recycle are doing a good thing for the environment and therefore are environmentalists (an identity). This is a main driver for consumers to support different plastics policies.

3.3 Harmonization

Policy harmonization can be defined as making regulatory requirements or governmental policies identical or similar and is a form of inter-governmental cooperation (Leebron, 1996).

A large number of cities in California are regulating plastic independently, creating a disjointed patchwork of policies. This calls into questions if there is a need for harmonized policy across regions or from the State level.

Leebron (1996) proposes four types of harmonization: (1) specific rules and regulations, (2) general government policy objectives, (3) general principles that should be followed e.g. polluter pays principle, or (4) structures and procedures which are often used to reinforce one of the other types of harmonization. Harmonization of policy goals does not always translate to actual harmonized policy. To do that, you would need additional action or execution of policy (Leebron, 1996).

Harmonization can be normative by encouraging the adoption of better standards by multiple parties, or more neutral by suggesting that policies should be made similar without a persuasion as to which one. An example of this is the metric vs. imperial systems of measurement (Leebron, 1996) where consistency of measurement is more important than the actual system used. As discussed above, plastic policies are very much normative forming as they encourage a specified set of behaviors which associate with the norm development and identity formation of consumers.

Leebron (1996) outlines different justifications for harmonization, some of which can be applicable to plastic pollution in a local and local to state context including:

- enabling participants of different systems to communicate and interact,
- limiting externalities, that rules in one jurisdiction can affect those in another,
- limiting the leakage of products into or out of a system that does not have the same rules
- enabling manufacturing and industry to utilize economies of scale
- enabling political economies of scale, meaning that some decisions made at different levels of government can be more effective because they have access to more resources.

These can lead to different degrees of harmonization and often more than one justification can be used.

Harmonization is often discussed between upper levels of government or in terms of international trade (Drezner, 2005; Leebron, 1996) or used when referring to the EU (Lerum Boasson & Wettestad, 2016). However, as Leebron's (1996) definition implies, harmonization applies to intergovernmental coordination without specifying at which level of government and "has been pursued in a variety of political situations [including] among constituent territories of a political unit (Leebron, 1996, p. 65)," which can arguably be applied to local agencies within a federal state. As discussed in the introduction, local agencies in California are both autonomous lawmakers and subject to regulation by other levels of government such as the county or state. This relationship means that policy coordination or fragmentation can happen at the local, county, regional, or state levels. So while there is no precedent in the literature for policy harmonization to be applied specifically at lower levels of government, it is applicable in the case presented in this thesis.

3.4 Analytical Framework

The analytical framework is shown in Figure 6. The factors for policy diffusion and the motivations by local agencies create an intersection at which decision-makers initiate a new policy, or not. The expected effects of the policy and the contextual factors of each agency decide the seeming success of the policy. Both the motivations and the expected effects influence the implementation of the policy. Harmonization can change the policy landscape which is explored further in the Results Chapter.

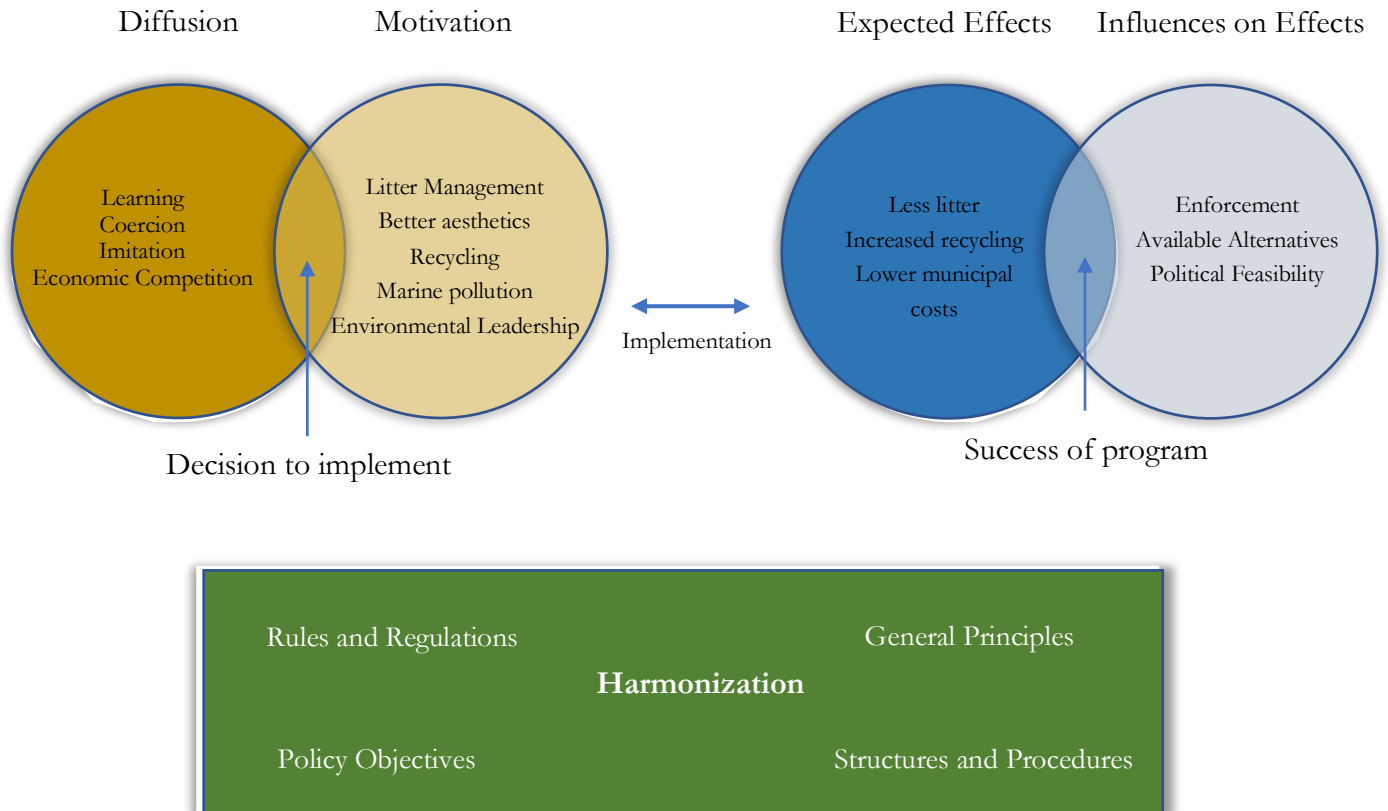


Figure 6: Analytical Framework based off the reviewed literature.

4 Methodology

This chapter outlines the methodology used to conduct the research for this thesis. The data collection is broken into a literature review, semi-structured interviews, and policy document analysis. All of the data was then analyzed using thematic content analysis. The conclusion of the chapter discusses limitations to data collection and ethical concerns.

4.1 Research Design

This thesis uses a qualitative research design with the aim to provide insights into the research questions which ask why bans are being used, the expected effects of bans, and how harmonization can help mitigate plastic pollution in California. These questions require in-depth knowledge of the internal workings of local municipalities and businesses which can be obtained through qualitative interviews. Additionally, throughout this research, it became evident that the use of the term “ban” is interpreted to mean several kinds of policies. Morrison, Haley, and Taylor et. al (2011) write that how a term is interpreted into policy and political actions can change from context to context and evolve over time. Therefore, qualitative research in the form of semi-structured interviews allows the researcher to understand the context in which bans take place, as well as gain access to internal structures, perceptions, and behaviors (Morrison et al., 2011) from experts in a consistent and systematic manner (Blaikie & Priest, 2019).

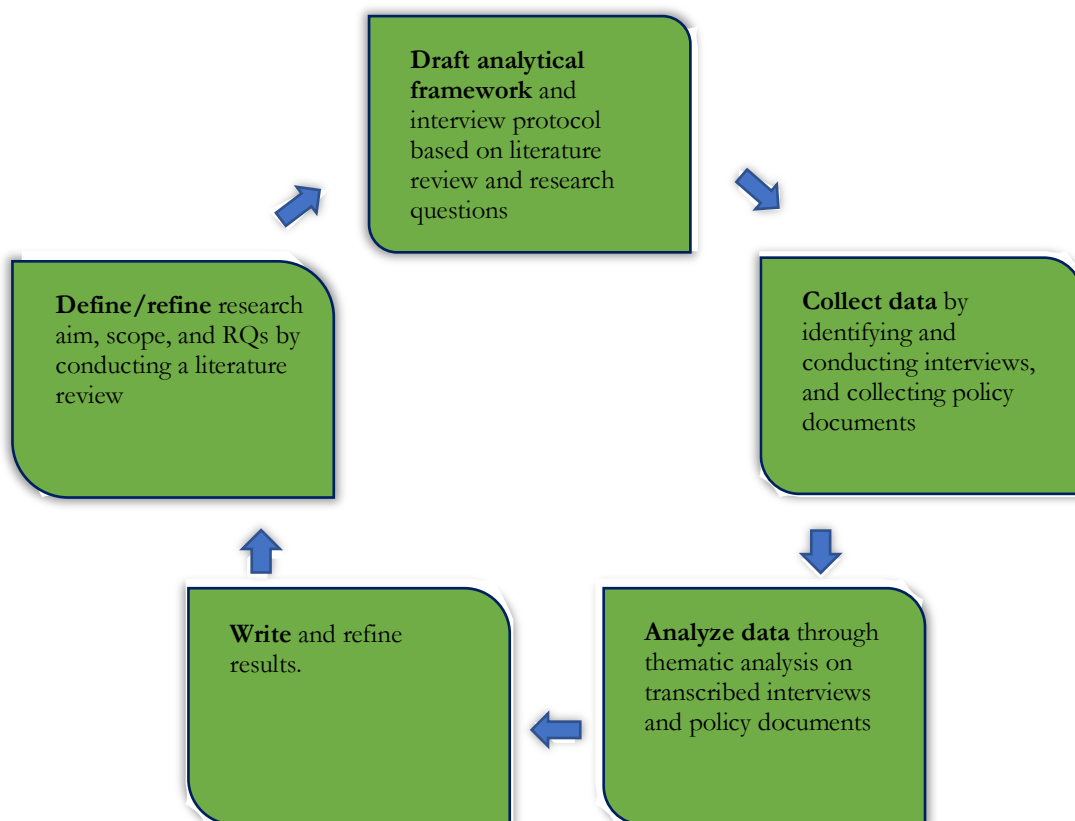


Figure 7: Research Process. The research process was cyclical throughout the thesis process and was constantly refined as data collection and writing was conducted.

To strengthen the research design two methods of data collection were used to ensure triangulation. Triangulation is the use of multiple methods and perspectives in qualitative research which helps support the conclusions in the analysis and eliminate some of the bias prone to qualitative research (Morrison et al., 2011). First, actors from both private and public

agencies were interviewed to get multiple perspectives on the issue of plastic waste. The selection of interviewees is discussed in detail in Section 4.3. Secondly, publicly available policy documents (e.g. ordinances, staff reports, press releases) and industry response letters to local and state laws were gathered to expand the data set and to fill in gaps in actor perspectives. Elaboration on which documents were selected is found in Section 4.4.

4.2 Literature Review

To inform the background and rationalization of this thesis, a literature review on academic journals, news articles, and grey literature was conducted. The purpose was to evaluate how plastics became popular, the main issues they present, and how they are being regulated at each stage of the plastics value chain. Once literature was evaluated, it was synthesized using a review matrix to identify themes and patterns which were presented in Chapters 1 and 2.

Literature was first gleaned from two previous research papers written for the Environmental Management and Policy Master's program. The first on "Plastic Bag Management: how decentralized behavior change influences policy patterns" which yielded the articles by Clapp & Swanston (2009), Taylor and Villa-Boas (2016), and Xanthos & Walker (2017). The second, "Plastic Bag Levy in South Africa: determining environmental effectiveness" provided a foundational understanding of effectiveness through Fischer (1999). Both previous papers sparked the researchers' interest in studying plastic pollution as a topic.

These two papers provided the foundation for search strings combining the terms: "bans," "product bans," "recycling," "effects," "effectiveness," "policy diffusion," "plastic waste," "plastic pollution," "single-use plastic bans," and "harmonization." Snowballing was used to cross-check data on plastic waste and marine plastic pollution and resulted in the inclusion of highly cited articles by Geyer, Jambeck and Law (2017), Jambeck, Geyer, Wilcox et. al (2015), and Brooks, Wong, and Jambeck (2018). Google Scholar and Ebscohost were used to search for peer-reviewed articles and grey literature.

The issue of plastic waste and pollution is a rapidly evolving and currently relevant topic both politically and in the academic world. Therefore, the literature review primarily focused on articles written after 2016. However, search strings linking plastic bans and recycling mostly yielded articles from the early 1990s. This handful of articles were included in an expanded time frame to best understand and reflect on the emerging phases of plastic product bans (mainly polystyrene) from the early 1990s. Additionally, several references emerged as relevant outside of the described timeframe including Lifset (2003) who poignantly addressed the link between municipal product bans and recycling, and Romer (2007) who wrote a historical account of San Francisco's successful implementation of the first bag ban in the US. Another pivotal article emerged through snowballing as a key data source for the importance of studying and mitigating plastic pollution which fell just outside of the time frame. The first attempt to calculate how much plastic was entering the marine environment from land was published in the seminal article by Jambeck et. al (2015) and was thus included in the literature reviewed. Papers dealing with concepts and theories outlined in Chapter 3 did not have a set temporal scope.

To confirm a research gap in local policy diffusion in California the search terms "plastic," "pollution," "waste," "policy diffusion," and "California" were used to search for articles in Google Scholar and Ebscohost. It was found that there are no peer-reviewed papers that study plastic policy diffusion in California. In 2015, a master's thesis was written on the diffusion of the plastic bag ban in the Bay Area (Finck, 2015). There are countless newspaper articles regarding the effectiveness of the plastic bag ban (Gardiner, 2019; Philips, 2017; Rosalsky, 2019; Times Editorial Board, 2017) and the newly implemented plastic straw

restriction (Hamblin, 2018; Ho, 2018; McCarthy, 2019). There is one paper by Taylor & Villa-Boas (2016) that assesses the effectiveness of changing consumer behavior regarding plastic bag fees versus bans in California. Additionally, the NGO Californians Against Waste (2017) has reported on the effectiveness of these plastic product bans.

The literature review revealed a set of articles (Clapp & Swanston, 2009; Dan Nielsen et al., 2019; Dauvergne, 2018a, 2018b; Iverson, 2019; Loges & Jakobi, 2019; Prata et al., 2019; Vince & Hardesty, 2017) that presented applicable theories and concepts currently used to evaluate the regulation of plastic globally. It is from these articles that the analytical framework to evaluate RQ1 and RQ2 was developed as examined in Chapter 3.

4.3 Data Collection: Interviews

In total, 24 potential interviewees from seven different stakeholder groups were contacted via email to set up 30-40-minute interviews over a six-week period. Additional follow up communication over the phone or email with three of the interviewees was done towards the end of the writing process to further clarify points on evaluation and the State's role. Eleven total interviews from five groups responded as shown in Table 5. The main reasons for limited response are thought to be the global pandemic that disrupted business as usual during the month scheduled for data collection, and a perceived unwillingness of private industry to engage in this research. These limitations are discussed in detail in Section 4.6. Publicly available position papers were used as a supplement for private industry.

Opoku, Ahmed and Akotia (2016) support that qualitative research design which “focuses on smaller groups of expert practitioners so as to obtain the optimum data in order to evaluate a particular context in great detail...(p. 37)” can be done with a relatively small sample size of individuals to reach saturation of ideas. Although the sample of 11 actors is limited, it is believed that the triangulation of data sources and supplemental sources provide an adequate data set to address the research questions.

4.3.1 Selection of Interviewees

Local Agencies in California

According to the California Department of Finance (2019), there are 487 registered cities and towns in the State of California that operate independently. Due to a large number of cities, it is not feasible to interview all public agencies and therefore a sample was used to determine which cities or towns would be interviewed for this study.

This study sought out the views of experts with agencies who have both plastic bans and those who did not. Therefore, two types of sampling methods were used to determine which agencies to contact for interviews: *cluster sampling* for agencies who have implemented plastic bans, and *purposive sampling* for agencies who have not implemented plastic bans. Interviewing experts from contrasting samples and from two different sampling methods limited some of the sampling bias prone to these methods (Blaikie & Priest, 2019; Opoku et al., 2016).

Cluster sampling is used when a specific set of elements of a population want to be assessed (Blaikie & Priest, 2019) in this case the implementation of bans and geography. As stated in Chapter 3.1, geography plays a role in policy diffusion, therefore this was used as justification for cluster sampling. Details on how the cluster sampling was done can be found in Appendix A. Four interviews were conducted from this sample.

Unlike agencies who had implemented regulations, those who had not were a much larger population. Purposive sampling covers a range of actors who were found by a number of

means that had limited unifying population elements (Blaikie & Priest, 2019). A limited set of criteria were used to determine experts to interview in this category including those who were not subject to County-wide restrictions and were within or close to one of the six clusters identified in Appendix A. Purposive sampling is limited by the likelihood of homogeneity within a sample (Blaikie & Priest, 2019). Therefore geography and city size were again employed to limit some of this bias. Three interviews were conducted in this sample.

Additional relevant policy actors include state-level politicians who are actively working on plastic legislation at the State level. Two representatives were contacted, one responded and was interviewed.

Table 5: Summary of anticipated versus actual data set collected

Actor	Potential Interviewees Contacted	Final Data Set
Local agencies who have bans	6	4 Interviews
Local agencies who do not have bans	5	3 Interviews
Manufacturers/Wholesalers of plastic products	3	30 Industry response letters
Non-plastic Alternative manufacturers/wholesalers	3	1 Interview
Plastic recyclers	2	2 Industry op-ed/response letters
NGOs and Associations	4 (2 plastics industry, 2 “anti-plastics”)	2 Interviews (both anti-plastics) Plastics Industry included in response letter count above.
State-level representatives	2	1 Interview

Manufacturers or wholesalers

California is the US’ largest economy and the fifth-largest economy in the world (Forbes.com, n.d.). Regulations restricting market access in the State will be felt by producers around the country. Prospective interviewees were found through various news articles and Google with search strings using the terms “plastic,” “manufacturer,” and “US”. The use of an online business-to-business platform that connects suppliers was also utilized to find plastics manufacturers. Manufacturers were then vetted to ensure that they manufactured or distributed plastic food ware or food-based packaging¹². Companies were eliminated as possible interviewees if their main product group was not food ware, their main product group was unclear, or their website was unclear about the services they provided.

In total six companies and plastics associations were contacted but none responded. This could be due in part to the pandemic that erupted during data collection or because US-based companies are less willing to be interviewed by an environmental student. To gain the industry perspective, 30 industry response letters to local and statewide plastics legislations in California were analyzed. These are publicly available documents that were found online or as attachments to policy documents. The list of these policy documents can be found in Appendix D.

¹² A large variety of single-use plastics are food or beverage based and consumer-facing. Most local plastic product bans deal with plastic food ware, and a majority of policy documents ban polystyrene food ware. This was deemed as an appropriate criterion but did limit the pool of plastic producers considerably.

Having non-plastic alternatives is cited in the literature as necessary for bans to be effective (Avery-Gomm et al., 2019; Eunomia & ICF, 2018). Therefore, it is necessary to interview companies who provide alternatives to plastic products to understand how plastic bans are affecting their business. These companies were found mainly using news articles while searching for manufacturers and wholesalers of single-use plastics or through the use of an online business to business platform that connects suppliers. Three companies were contacted, one company that provides alternatives to single-use plastic products responded and was interviewed.

Plastics Recyclers

As market restricting policies can have (un)intended consequences on recycling markets, interviewing recyclers in California was important to understand this perspective. When assessing policy documents, it was determined that recyclers serve as both opponents and proponents of bans. It was from these policy documents the list of private recycling companies were determined to reach out to for an interview. Unfortunately, none of the three companies contacted responded. Therefore op-eds and response letters from companies that collect and sort recyclables, as well as compounders¹³ were used for this stakeholder group to determine their viewpoint.

NGOs and Associations

Recycling and plastics associations and NGOs were selected based on their appearance in legislative stakeholder engagement and presentations at conferences. One NGO was interviewed who provided a local, state, national, and international perspective on the issues around plastic waste and current solutions. A representative from a statewide recycling and resource recovery association was also interviewed.

The full list of interviewees can be found in Appendix C.

4.3.2 Interview Protocol

Eleven semi-structured interviews were conducted with the groups of actors identified above. Interviews were conducted over the phone over the course of six weeks. An interview protocol was structured based on the category of the actor: local municipalities who have implemented regulations, local municipalities who have not implemented regulations, businesses with alternative products, and NGOs/associations. The interview questions were compiled under three major themes gleaned from the research questions and supported by the literature review:

- **motivations and diffusion** which intended to understand why bans were chosen (or not) as a means for controlling plastic waste and pollution. Questions also ascertained what due diligence was done prior to enactment and challenges around implementation.
- **expected effects** such as lower municipal costs, less street or beach litter, consumer behavior change, or influencing upper levels of government. This line of questions was centered around the goals of the policy and factors that influenced those goals.

¹³ Compounders are the actors in the plastics-value chain who transform sorted recyclables into pellets or granulates to be sold (Milios et al., 2018). Since a large number of policy documents were from polystyrene bans, most of the compounders represented were from this plastics industry segment.

- **harmonization** between state and local policy meant to grasp what the perceived role of the State is, or should be, in managing plastic waste and pollution to understand if goals are aligned, similar or contradictory.

A sample of the interview protocol can be found in Appendix B.

4.4 Data Collection: Policy Documents

To get a larger set of data regarding the aims and objectives of plastic pollution policy and ensure triangulation, relevant policy documents were found on the internet from agencies who have implemented plastic pollution policies. The most prevalent pollution policy was local polystyrene ordinances¹⁴, making it the largest category of policy documents assessed with 127 city documents. This covered the widest timespan of policies enacted and presented the most uniform data set. Newer single-use plastics ordinances from 9 cities and straws upon request ordinances from 5 cities were also included in the data set. Additional documents include press releases and staff reports. Documents from 146 agencies were included in the data set. A list of these documents can be found in Appendix D.

A limitation of this data set was the lack of county ordinances or documents. This mid-tier governance level that operates between the local agency and state level is often overlooked in the policy diffusion literature (Egner, 2019). There are 58 counties in California, which operate in two broad categories: general law and charter counties. General law counties account for 44 of the state's counties and follow state law closely. While the remaining 14 charter counties have some additional "home-rule" authority which grants them the power to regulate the cities within their borders (California State Association of Counties, n.d.). It is this unequal power distribution and the limited availability of literature about the operationalization of mid-level governance that the decision to leave county's out was made. However, a joint-powers authority¹⁵ was interviewed which governs an entire county's waste management system. So while policy documents from counties were not included, a county-wide perspective is included in the data set.

4.5 Methods to Process Data

To analyze the data gathered from the interviews and the policy documents, thematic content analysis is used to help categorize the data against the framework set out in Chapter 3. Clarke, Braun, and Hayfield (2017) put forth a systematic way of analyzing qualitative data across a data set by establishing patterns of common meaning, which they term themes, as they relate to particular research questions. The goal of thematic analysis is to help identify the patterns that answer the specified research question. The thematic analysis provides a structured and systematic, yet flexible analysis needed for this study. While this research is being approached with a described framework generated from the literature, thematic analysis allows for additional themes to be found during empirical data collection.

The first step of thematic analysis is to become familiar with the data which in this thesis is done by conducting and transcribing the interviews and reading each policy document. Next, a

¹⁴ Polystyrene ordinances usually entail a product ban on a combination of take-away containers, packing materials, packaging, meat trays, egg cartons, coolers, and others. Some ordinances are explicit in what is (or is not) included. The ordinance will outline which type of businesses are affected and (un)acceptable alternatives. It will include enforcement mechanisms, a justification for the ordinance, and exemptions.

¹⁵ A joint powers authority is when two or more local agencies agree to exercise power together over contracting services (such as emergency services, water, or waste) in an effort to combine resources as established by Section 6502 of the State Government Code.

coding structure is established to generate themes which are reviewed to ensure they are fully representative of the data collected. It is in this step the generated themes are categorized against the framework(s) and new themes are established as they emerge. Finally, the themes are clearly defined and analyzed (Hayfield et al., 2017). The coding framework is analyzed using NVivo software to easily create a systematic coding framework that could be analyzed to find emerging patterns and explanations. The coding framework can be found in Appendix E.

4.6 Limitations

A missing stakeholder group in this thesis is the retailers who are directly affected by local municipal plastic product bans. While finding an adequate sample in the time allotted was difficult, the Covid-19 pandemic closed all restaurants and retail establishments or forced them to quickly adapt to an uncertain landscape. This made it difficult to ascertain an adequate sample based on who was open or not and limited availability for interviews. However, since the research questions are mostly focused on the anticipated effects and the content of policies, this limitation should not have a severe impact on the quality of the data and analysis.

Limiting plastics manufacturers to companies that produced food ware decreased the pool of potential interviewees considerably. It was deemed necessary due to the large number and variety of plastics producers. However, this also limited the pool of prospective interviewees which became problematic when California and most other states in the US implemented stay-at-home orders. Several attempts to contact half a dozen recycling and plastics manufacturing companies were made prior to the enactment of California's stay-at-home order. The order forced all non-essential businesses to close and work from home, or scramble to create safe working conditions for essential businesses of which local governments and waste collection services are included. It is thought that this is one of the main reason's requests for interviews for this group went unanswered. To make up for this missing stakeholder group, publicly available documents, and interviews were used to gain a perspective of private industry. Recognizing the limitation of this form of data collection is that interviews conducted for newspapers are edited to tell the narrative of the publishing organization, and questions regarding the role of the State or harmonization of policy are notably absent.

It is important to acknowledge the COVID-19 pandemic did have some influence on the content generated in some of the interviews. The pandemic caused some programs to stop, businesses establishments to close or run with limited staff, and created swift shifting of priorities for municipal governments almost all of whom brought up the pandemic and its effects or creation of uncertainty in some capacity. Summed best by Interviewee 11, "...I'm trying to stay optimistic but at the same time from [our] perspective for these weeks or few months, this is not [the] time for us to keep pushing our crisis on people. People need to deal with everything emotionally and all the uncertainty right now...". Interviewee 2 and 9 believe that the pandemic pushed back any plastics legislations upwards of two years. Attempts were made by the researcher to encourage interviewees to think about the interview questions without the context of the pandemic, but this was not always successful.

4.7 Ethical Considerations

Participation in the interviews was voluntary. To protect interviewee anonymity, interviews were coded, and descriptions lack distinguishing characteristics to prevent interviewees from being singled out. This is to prevent interviewees from suffering any disadvantage or damage including reputation, dignity, or privacy. Interviewees were informed of the thesis objective but told that conclusions of this research would not provide contextually specific advice on policy implementation. Confidentiality was verified at the start of each interview followed by consent to record for the researchers' personal reference.

The researcher utilized a prior professional network for contacting governmental agencies, recycling associations, and NGOs used in four of the interviews. The use of this network was limited as much as possible through the triangulation of selected interviewees to whom the researcher had no prior connection and the use of policy documents from all available agencies.

Information from the empirical study was saved on the Lund University cloud software and was subject to the same level of digital safety as provided by Lund University to its students. Limited access to data was granted to the thesis supervisor and other selected academic persons when advising or providing clarifications on data collection and analysis

This research design has been reviewed against the criteria for research requiring an ethics board review at Lund University and has been found to not require a statement from the ethics committee.

5 Results and Analysis

The next section presents the results as it relates to the literature review and analytical framework with minimal analysis. Most of the analysis is discussed in Chapter 6. This section will proceed first by addressing how bans are defined by practitioners as this was largely unclear from the literature. Then, the results are presented for each research question, addressing the motivations for policy diffusion in Section 5.2, the anticipated effects in Section 5.3, and types of harmonization on the State level in Section 5.4. An updated analytical framework can be seen in Figure 9 at the end of this chapter.

5.1 Defining plastic “bans”

As discovered in the literature and discussed in Chapter 1, the word “ban” can be interpreted in several ways. In California, local agencies mostly focus on plastic product bans such as polystyrene, plastic bags, and other single-use plastics such as straws, cutlery, and cups. In the policy documentation, ban policies encompass two general ideas: what is *not allowed* under the ordinance and what *is allowed*. Only 21 of the policy documents use the word “ban” explicitly while the rest use the word “prohibit” or “limit.” A range of activities is prohibited including selling, using, purchasing, providing, keeping, handing out, or giving away the banned product. Additionally, the policies place limits on public procurement and what vendors, contractors, or renters of city facilities can use.

As in the literature, the applicable definition of what constitutes a “ban” is fluid in its severity and actual application. For example, ordinances that ban the use of polystyrene range from covering products just used in city facilities, to banning takeaway containers from sit down restaurants but may, or may not, include takeaway restaurants, to all forms of polystyrene including meat trays, egg cartons, packaging materials, and ice chests. Many of the product bans aim to “eliminate” the material from the waste stream, or “reduce” disposal or distribution of the material, or the amount consumed. At least 17 ordinances include a voluntary measure or aspirational statement encouraging the use of acceptable polystyrene alternative materials for products packaged outside of the jurisdiction.

The use of the word “ban” in actual policymaking or outreach efforts is not always touted as the best course of action. Interviewee 5 stated that the word ban doesn’t leave a lot of room to suggest alternatives to plastic products. They went on to say that cities are, “...trying to help businesses use alternatives...” and while “ban” is a good shorthand term to use between friends or colleagues, most cities are trying to avoid using it when educating the public. Again, as showcased in the literature, CalRecycle’s website for the policy on single-use plastic bags actively uses the word ban. This may be because it’s easy and quick to say, and most consumers will understand the word. However, as stressed by the Interviewee, it doesn’t dissuade confusion either as thicker plastic bags are still available in grocery stores, for a fee. To an average consumer, this may conflict with their understanding of the word ban and what they witness in stores.

Documents that list what is allowed under the ordinance often included a requirement for use of alternative materials, which will be discussed in Section 5.3, or state that products such as straws or cutlery, can be provided upon request and should be made of non-plastic material. Affected vendors in twelve of the ordinances were given permission to charge a fee to cover the cost difference of the alternative material and pass that charge on to customers. One ordinance mandated that affected vendors charge for disposable cups.

Some cities rely on consumers to aide in enforcement making the understanding of bans essential for their success. For instance, Interviewee 4 reported that their city encourages

consumers to report any business not complying with their single-use plastics ban and that it is the main form of enforcement in some cases. A second example is the researcher’s observation of businesses in a city with a ‘plastic straw upon request’ ordinance having businesses hang a flyer in their stores to inform customers of the ordinance and how to report non-compliant businesses to the city.

5.2 RQ1: Motivations & Diffusion

5.2.1 Motivations

As outlined by Loges and Jakobi (2019) in the introduction, the values and problematizations around plastic waste can impact what behaviors or actions are taken to address it. The motivations for implementing plastic product bans by cities in California can be categorized into three major themes: *environmental health*, *community health*, and *waste infrastructure*. Eleven cities sum up these themes by stating the city, “has the duty to protect the natural environment for future generations...” as well as the, “...economy and the health of its citizens...”. For ordinances banning polystyrene, 15 cited a US Environmental Protection Agency (USEPA) study and state “...such materials can also have serious impacts on human health, wildlife, the aquatic environment, and economy.” Table 6 summarizes each theme followed by a deeper look into the codes behind each theme.

Table 6: Summary of motivations by local agencies to implement plastic product bans

Theme	Coded Motivations
Environmental Health	Protecting animal welfare
	Protecting waterways/marine environment
	Reducing dependence on petroleum-based products
Community Health	Reducing litter
	Supporting the local economy
	Reducing hazards to human health
	Responsibly spending taxpayer money
Waste Infrastructure	Ensuring Recyclability
	Reacting to changes brought on by National Sword
	Maximizing/managing landfill space
	Implementing State mandates

Source: Author’s own compilation and analysis

Environmental health

Environmental health is a major motivating factor for most ordinances’ implementation. Environmental health includes animal health, waterways, and the use of petroleum-based materials. Almost all policy documents mention that the banned products have negative implications for marine life, birds, or livestock because of the high likelihood of it being mistaken for food and ingested. Three Interviewees brought up a viral video of researchers pulling a straw out of a turtle’s nose (Interviewee 5, 9, 10) to showcase the public’s awareness of plastics disrupting marine life. An ordinance in the Bay Area mentioned the need to protect two endangered species within their jurisdiction. Plastics’ effect on animal welfare is closely linked to the persistence of plastic in the environment and the probability that plastic will break up into smaller fragments and look like food.

Marine and waterway pollution was a main justification even for non-coastal communities. Cities mentioned that pollution through local creeks, streams, rivers, wetlands, and tidelands directly link to marine pollution. Pollution via stormwater systems was also prevalent as most cities have to maintain these systems as part of city infrastructure and they often discharge directly into waterways without treatment (Interviewee 9). Some cities referenced specific nearby waterways like the San Francisco Bay or the Monterey Bay Marine Sanctuary as particularly vulnerable and in need of protection.

The link between plastic products and its petroleum-based raw material is a notable objection to single-use plastic products (Interviewee 5). Policy documents use a range of language to address petroleum-based materials. Some simply state that the products are petroleum-based with little explanation as to its impact or specifics as to why that would be justification for the ordinance. Some add on that plastic is “manufactured from petroleum, a non-renewable resource” which is not biodegradable and persists in the environment indefinitely as litter. Documents also cite a 2004 California Integrated Waste Management Board report that polystyrene has the second highest energy consumption and greenhouse gas emissions behind aluminum. In all, 43 of the cities in the sample, and Interviewees 2 and 5, cite the petroleum-based nature of the product as a motivation for banning its use or sale.

Community health

Part of the responsibility of local municipalities is to protect human health and maintain a good quality of life for their residents. This theme encompasses a wide range of activities including managing litter, supporting the economy, reducing hazards, and responsibly spending taxpayer money.

Litter is the main driver of the product ban ordinances with 63% mentioning litter clean up. Many of the banned products are lightweight and easily windblown even if the materials are disposed of properly in trash containers (Interviewee 9). Interviewees 2 and 9 both referenced Berkeley’s 2019 Single-Use Foodware and Litter Reduction Ordinance as one of the more progressive in the State. Their ordinance reports that “food and beverage packaging comprise the majority of street litter and is a significant contributor to the total amount of waste entering the waste stream” in the Bay Area. The likelihood of these products littering the environment is high.

“I think it’s very well-known and kind of widespread that plastic, and trash, and litter, is an issue that most jurisdictions and agencies have to deal with (Interviewee 1).”

Polystyrene, in particular, is said to easily break down into small fragments making it difficult to capture. Plastics do not biodegrade in the environment, making them persist indefinitely, creating an unappealing aesthetic. This persistence is seen in terrestrial and marine environments and can negatively impact communities’ economies, particularly coastal communities who depend heavily on tourism as a main stimulant for the local economy. Reducing highly prevalent litter makes beaches more attractive to visitors while also improving the quality of life for year-round residents. Communities with active agricultural areas also cite that agriculture is a mainstay for the economy and that the “...impact of an environmentally damaged...bay or the pollution of our rivers would be felt throughout the area (Monterey Bay).” Industry’s rebuttal is that “focusing on a specific material type does not reduce litter,”

and that, “bans result in litter substitution, not elimination (Food Service and Packaging Waste Reduction Ordinance, 2016¹⁶).”

The hazardous nature of some of the plastic materials was mentioned in 22% of the policy documents that cite federal agencies to support their claims. The US Federal Drug Administration suggests that styrene, a chemical component of polystyrene, can leach into food and water consumed by humans. The USEPA reports that polystyrene can have “serious impacts on health” in both the long- and short-term, while the Department of Health and Human Services labels styrene as a suspected carcinogen and neurotoxin. Policy documents highlighted that polystyrene can contain additives and chemicals such as CFC which can be released during manufacturing processes or if incinerated, harming workers. The public’s awareness of these hazards is limited. Therefore, some of the documents state that the purpose and motivation of the ordinance is to inform the public.

The opposing position taken by industry consistently states that ordinances misuse information and data regarding the “hazards” of plastic materials. For instance, in the case of polystyrene, quotes from several federal level agencies state that the toxic “styrene” is different than “polystyrene” which has been labeled as food safe. Industry consistently requests that the negative impacts on human health be removed from ordinance language. The spread of misinformation on the impacts of their products could potentially violate the Federal Trade Commission’s rules on advertising and environmental claims. It is unclear from published ordinance documents if they do not mention hazardous materials because of the response by industry.

Furthermore, the hazards associated with single-use products are not restricted to plastics which is brought up in the industry’s letters and by one of the Interviewees. Uncoated fiberboard was seen as a viable alternative to polystyrene for takeaway food. It was not plastic, or wax-lined, making it assumedly acceptable in compost facilities. San Francisco had promoted the use of uncoated fiberboard as a viable alternative, and Interviewee 9 had high hopes for it because it would simplify disposal for consumers. However, it was recently discovered that perfluoroalkyl and polyfluoroalkyl substances (PFAS), a chemical water repellent, was used to keep oil and moisture from penetrating the paper container.

PFAS is called a “forever chemical” because it does not degrade, and accumulates in the body and environment (Phillips & Pesce, 2019). PFAS chemicals have recently been discovered in a large number of California drinking water supplies and are being investigated on a state and federal level. While PFAS is found in a number of products, its discovery in uncoated fiberboard has made it unaccepted in industrial compost facilities because when placed on agriculture fields for food production it can enter the food supply. PFAS is not currently a restricted chemical in California.

The final code in this theme involves the fiscal responsibility communities have to their constituents. The cost to clean up litter is a “...problem for any environmentally and fiscally responsible solid waste management program...(Palo Alto)”. Litter cleanup is expensive. Cities mention staff time and financial resources needed to keep litter off of streets, beaches, public spaces, parks, fields, and out of storm drains. The State recognizes that “littered plastic products causes significant environmental harm and have burdened local environment with significant environmental cleanup costs...”. Some costs are specific to stormwater system

¹⁶ The online version of San Francisco’s Food Service and Packaging Waste Reduction Ordinance contains copies of public comment letters that are referenced or quoted throughout this section.

cleanup and maintenance as specialized equipment and skilled workers are needed to fully clean out systems or prevent street litter from entering the environment.

Waste Infrastructure

Waste management is an essential service that cities provide to protect both the wellbeing of residents and the environment. Some plastic products have created issues within city-operated waste management systems causing them to ban those materials as a means of eliminating the problem.

The data shows that materials are banned on the grounds of being an “active problem” or “extremely problematic” due to the “difficulty” or “impossibility” of being recycled, or that do not have a “substantial” recycling market. A major consideration for many agencies is that even if products are technically recyclable, there is no access to a local recycling program, or it is not economically feasible for the product to be recycled. Therefore, most ordinances named recyclability or compostability as a requirement for alternatives. Likewise, materials that were labelled as “biodegradable” would break down if they became litter and would not persist in the environment indefinitely if improperly disposed. The results of how alternatives are defined are outlined in Section 5.3.1 Contextual Factors.

Three newer ordinances that limit single-use plastic products specifically reference China’s National Sword program as having a significant impact on material flows. One mentions that the ordinance is a proactive attempt to reduce consumption with the others saying recycling is uneconomical if there are no restrictions on acceptable materials. Local agencies have especially felt the impact National Sword has had on limiting available markets which is impacting their diversion rates and significantly increasing the costs of their recycling programs. Interviewee 9 spins National Sword in a positive light saying the attention plastic is getting at the local, state, and even national level, “...shows you how much the China collapse has affected us. You're finally getting real attention to this issue...” by consumers and government officials.

There are two aspects presented in regard to banning plastic materials from landfills, both of which come from cities that do not currently have plastic product bans in place. Cities want to maximize landfill space to keep them operational for as long as possible. Interviewee 8 acknowledged that lightweight plastic items can be troublesome in landfill disposal. Plastic products do not compact as well as other waste and take up more space. When materials take up a lot of “air space,” collection trucks are not able to carry as much material at once forcing them to do multiple trips costing additional staff time and fuel. Secondly, while the cost to dump the material at the landfill is the same, the space lightweight plastic takes up is more than an average load of garbage which “fills” the landfill quicker (Interviewee 8). To combat this, the city encourages recycling as a means for managing waste as opposed to banning the materials. They use a market-based approach for management by making trash collection more expensive than recycling collection¹⁷. Meaning higher recycling rates most likely result in lower trash bills.

“...Our recycling program is free to everyone in the city, to commercial and residential, there is no charge for the recycling... We've been running right now the past few years around 65% in our annual report to the State for

¹⁷ Cities in California utilize pay-as-you-throw waste systems. Meaning customers are only charged for a specific level of service they are provided. The smaller the trash bin is, the less money they pay. If a customer recycles more than they throw away, they could use a smaller trash can thereby paying less for service. Recycling bins are typically lower cost or free to customers in most systems, which is the case for Interviewee 8.

diversion. It was higher but because, with China having done what they [did] with the [National] Sword program, it's lowered so we're at 63-64% now (Interviewee 8)."

The second insight into the relationship between product bans and landfills comes from Interviewee 2. They explain that the State tracks their 75% diversion goal by measuring the weight of materials sent to landfills and that is the driving force in many of their waste management policies. Since plastic is a lightweight material, it is less attractive to ban it because it does not greatly contribute to the city's requirements for reducing landfilled material

"There's never been a landfill that closed because it got too heavy. But that said, everything in my world is measured in weight. So that's really the most important thing in terms of our goals. We're trying to keep weight...out of landfill disposal (Interviewee 2)."

Both scenarios outlined for landfill management highlight several key elements. First, managing plastic litter was not as high a priority in their waste management plans. Second, that mandates from the State can significantly impact a city's priority regarding which programs and policies to implement, particularly when talking about the volume of material versus the weight of materials. Finally, that landfill management can dwarf any number of other motivations for implementing plastic pollution bans.

Eliminating non-recyclable materials from the waste stream limits materials that are used in high volume but have short life spans that end up sitting in landfills forever (Interviewees 5, 9). Many cities have policies that establish standards and procedures for reducing plastic waste that often fit into the city's zero waste goals, plans, and strategies. Variations on the statement that these materials, "constitute a significant portion of the waste stream," and that policies, "pertaining to plastic...products are a [vital] component...to reduce the amount of disposal waste" is repeated throughout a number of cities' documents as a driving factor for implementing bans.

5.2.2 Diffusion

As stated in Chapter 3, policy diffusion has four main components: learning, economic competition, imitation and, coercion, all of which are present in plastic pollution policy in California. The next section will go over how these emerged in the data.

Learning

Evans (2017) outlines four ways in which learning can be exhibited: copying, emulation, hybridization, and inspiration as explained in Chapter 3.1. Copying, which the literature states is usually the least common form of learning, seems to be highly prevalent in the policy documents. Ordinance language is often repeated almost word for word. Reuse of language saves "reinvention of the wheel" (Interviewee 5) and city attorneys who draft the language will look at approved ordinances when writing (Interviewee 1). Moreover, agencies will work together and share ordinance language (Interviewee 5) and the State is known to have model ordinances as part of other programs making it easier for cities to implement programs (CalRecycle, 2020a). Geographical regions that have clusters of similar plastic product bans (see Appendix A), such as the Bay Area, also have regional associations¹⁸ where active coordination and idea-sharing occur making learning more formal.

¹⁸ Example: The Northern California Recycling Association (NCRA) has 300 active member organizations. Its mission includes promoting reusable products, advocating for "highest and best use" of materials, supporting federal, state, and local government policies, and encouraging the exchange of information, among others (*Mission to Vision*, 2016).

Six Interviewees (Interviewees 2, 4, 5, 7, 9, 10) implied that they look to two specific cities as the standard for progressive policy against plastic waste. Both are large cities located in the Bay Area that are seen as, “more successful environmental jurisdictions” (Interviewee 10) and that the Bay Area is a “pipe dream” of what policies they could have. Emulation in this regard can only go so far in actual policy implementation since ordinances need to be enforceable and not solely aspirational (Interviewee 1).

Hybridization seems to be less pervasive than the literature suggests in this context. The idea that cities would take ideas from multiple settings and fit them within their setting is not seen as the case for motivations of implementing these policies. Where it can be seen is in the enforcement and stringency of policies. Through the data collection, it became clear that the unique set up of each community very much influences how programs are implemented and enforced based on the contextual factors discussed in Section 5.3.1. Interviewee 9 reinforces this idea:

“When other communities have gone first it just provides an amazing blueprint for the things that you know will work for your community and what may not, and then you can even innovate from there. But then at least you got some really great baselines and some amazing time frames to have measured and to look to as what other communities have done (Interviewee 9).”

Interviewee 5 inferred that there is a precedent in California to use bans as a means for managing troublesome waste. Hazardous wastes and tires are banned from landfills in California. So those materials needed other systems in place for proper disposal. Using landfill bans as inspiration, it could be said that cities then applied banning specific products further up the value chain to stop them at their source. Interviewee 6 said that the State used a similar method when drafting the California Circular Economy Bill and Pollution Reduction Act¹⁹ (hereafter referred to as the California Circular Economy Bill) by looking at previously implemented producer responsibility programs in the state to create one for plastic waste.

In the case of plastic pollution policy in California, the results align with the literature regarding the temporal condition outlined in Table 3. Policy documents were from 1989-2019, revealing that some cities were able to look at models and lessons learned over a long-time span. Proximity also appeared important, with Interviewees stating, “We look at many different ordinances especially across California because it’s easier to look at a California business or...jurisdiction mandate...because it’s a lot more apples to apples (Interviewee 9).” Furthermore, policy documents named specific California cities or the number of California cities that enacted similar legislation.

Economic Competition

It was not directly evident that economic competition between cities who had or did not have, similar product bans was a contributing factor to diffusion. One Interviewee pointed out that it can be confusing for consumers when cities in close proximity to each other have different regulations (Interviewee 4), but they did not mention the economic impact of those regulations, like businesses moving from one city to another.

¹⁹ Also known as SB 54/AB 1080, these sister bills were proposed but not adopted during the 2019 legislative session. These bills would “impose a comprehensive regulatory scheme on producers, retailers, and wholesalers of single-use packaging...and priority single-use products...[and] require producers...(1) to source reduce, to the maximum extent feasible, single-use packaging and priority single-use products, and (2) to ensure that all single-use packaging and priority single-use products that are manufactured...[or] are offered for sale, sold, distributed, or imported in or into California are recyclable or compostable (Solid waste: packaging and products, Cal. Assemb. B. 1080, 2019).” They are currently being amended.

However, indirectly, the use and maintenance of facilities was brought up by two of the Interviewees as a potential example of economic competition. Interviewee 8 stated that market forces were a main driver for maximizing landfill operations. They need other jurisdictions to use their facility because it's a form of tax revenue. Therefore, enticing companies and agencies to utilize their landfill is important economically. According to the Interviewee, banning specific materials will not make the landfill more economically competitive to its neighbors. It could be hypothesized that landfills with additional restrictions or material bans would be less appealing since companies would have to be more vigilant about what they were disposing of. As well, this Interviewee also brought up the need for the right materials to be disposed of in their landfill to maximize space. So, it could also be hypothesized that bans on lightweight plastic materials that are not able to be recycled could benefit this agency by maximizing landfill space.

Interviewee 9 has a very different city set up. They are currently working on implementing a plastic product ban, and do not allow other agencies or private companies to use their landfill or other facilities. Their economic incentive to implement bans is to keep as much material out of the landfill as possible so that it can be open, longer. If their landfill closes, then they will need to start paying to dispose of their materials elsewhere. Therefore, the city believes plastic product bans are beneficial because it keeps it out of the city managed landfill and recycling center.

Imitation

The concept of imitation is said to be more about who is being imitated rather than what is being imitated (Evans, 2017). In this regard, it is not apparent that imitation is an explicit form of policy diffusion in the California context. While some of the policy documents list specific cities or the number of other cities who have similar regulations as justification for the ordinance, the objective seems to be showcasing those other nearby cities have enacted similar policies.

Cities seen as environmental leaders and policy entrepreneurs seem essential in whose policy would be imitated. It is unclear how large, urban centers, like the Bay Area, originally gained the inspiration to enact product bans themselves, but it is obvious that cities may aspire to their level of environmental progressiveness. One Interviewee brought up the Bay Area as an example of a high standard for environmental policy:

“Of course we look at other cities, but again sometimes it's irrelevant. We always roll our eyes about the Bay Area...we almost can't look at the Bay Area. We do as a pipe dream to see what they're doing. They have resources we don't have...there's no point getting frustrated about it...(Interviewee 10).”

Three cities designated themselves as leaders in progressive sustainability policies or zero waste goals. There is a perception among the Interviewees that larger cities are the ones who have the staff and financial resources to be progressive (Interviewees 2, 10). Yet, the three cities that designate themselves as leaders have populations as small as 15,500 and as large as 883,000. This does not match with the literature that larger cities are the ones most likely to be imitated, nor does it align with the Interviewees' perceptions that only larger cities are better staffed. Smaller cities may have fewer regulated businesses and may not need a substantial amount of resources to enforce plastic product bans.

Coercion

Coercion is defined by its top-down nature of imposing regulations on lower levels of government and is the only vertical form of diffusion. While the State of California has two plastic product bans in place for plastic bags and plastic straws, most of the local ordinances

cite other non-plastic related State, county, and federal mandates as justification for the policies.

Local agencies are tasked with implementing, enforcing, and reporting on a wide range of State-imposed environmental regulations. These mandates are typically unfunded, meaning they need to be implemented and enforced with no additional money from the State. Several Interviewees brought up the difficulty of managing the wide range of unfunded mandates they are responsible for. Some of the mandates specifically brought up by the Interviewees, that influence plastic pollution can be seen in Appendix E.

State laws are typically less stringent and provide a minimum baseline that agencies can make stricter through local ordinances. The State's regulations can create policies for those who cannot pass local ordinances due to a number of contextual factors. One Interviewee stated that State law pre-empts all local ordinances, meaning agencies cannot be stricter than the State (Interviewee 1), but this is not always the case. The State regulation for plastic bags outlines in Article 5, Preemption, Section 42287, that no local ordinances can be implemented after implementation of the State law "relating to reusable grocery bags, single-use carryout bags, or recycled paper bags." However, if ordinances were implemented prior to the State regulation, they can stay in place as is.

5.3 RQ2: Expected Effects

The next section outlines the main expected effects of plastic product bans brought up in the data which are consumer behavior change, increased recyclability, litter reduction, and vertical diffusion. Then the main contextual factors that influence policy implementation and policy success are categorized into internal and external factors which include a breakdown of alternatives as an important contextual factor. Finally, how success is determined by local agencies and perceived by industry is reviewed.

Consumer behavior change

The underlying goal of local plastic product bans is to initiate behavior change for residents and businesses within the community. It is essential to get buy-in from consumers and businesses to be able to implement and run new systems such as new compost programs if compostable alternatives are replacing single-use plastics (Interviewee 9). All of this contributes to a cultural shift that is believed to lead towards more conscious consumerism and awareness (Interviewee 10, 11). For Interviewee 9, there is a hope that consumer education and awareness on the problems with all single-use disposables will encourage consumers to "vote with [their] wallet" at establishments that provide reusables in lieu of single-use. For industry, consumers are important fixtures in waste management, and it is the consumers' responsibility to participate in the system to for it to work.

Better Recycling

The link between bans and better recycling is not always clear. It is best summed up by the conflict between *recyclable* and *recycled*. Cities are faced with products that industry promotes as recyclable, despite many plastic products not being collected in local recycling programs due to a lack of market or because of the operational issues they cause, such as plastic bags jamming machinery or polystyrene being blown around in the wind in open-air sorting facilities. Interviewee 6 recognizes that there's a multi-tier approach to reducing waste by first ensuring that materials are actually recycled into new products and not just collected as recycling. Eliminating unnecessary materials comes next because "recycling isn't going to get us out of this like we thought (Interviewee 9)." Two Interviewees (Interviewees 1, 7) strongly believed that one way to ensure recyclability is to limit the types of plastics allowed to be

produced to resin codes that are highly valuable. Limiting the types of plastic produced would also limit contamination and eliminate the low-value plastics that have no market (Interviewees 7, 8). Mandating recycled content in products would also drive demand for producers to make end of life materials valuable (Interviewees 6, 9).

“...Even if we are successful in getting producers to use more recycled content, we’re not going to be at the level where we can only rely on that...(Interviewee 6).”

Industry obviously has a vested interest in maintaining the status quo when it comes to plastic production, distribution, use, and disposal. The American Chemistry Council calls for, “expanding systems and infrastructure to collect waste and increase recycling,” and that, “manufacturers can create packaging that is fully recyclable but have little control over whether the material actually gets recycled (Shestek, 2019).” Finally adding, “success can only be achieved if all stakeholders, including local government and waste and recycling industry share in the responsibility...(Killinger 2019).” This sustains the pattern of industry placing responsibility for the end of life management on local agencies and the waste/recycling industry despite their calls for collaboration.

The analysis showed that industry places blame on the State and local agencies for failing recycling infrastructure and that both private and public resources need to go into the system to fix it. Simultaneously, they argue that if a city chooses not to recycle specific products that have systems in place to recycle, then it can cause underutilization of existing infrastructure. Stating further that consumers will recycle, “given the opportunity (San Francisco Food Service and Packaging Waste Reduction Ordinance, 2016).” This perpetuates the rhetoric that industry creates products that are recyclable and its local agencies and the waste industry who are not following through.

The need for in-state solutions in response to limited access to overseas markets had one Interviewee make a bold claim that State regulators should relax some existing air quality standards to allow industry to build compounding facilities in less populated areas of the State (Interviewee 8). While there is a call to grow domestic markets and infrastructure to alleviate the reliance on overseas facilities, it is not evident that relaxing existing environmental policies and standards is a widely held belief among recycling circles. It is noteworthy that the Interviewee who proposed this idea is in a jurisdiction that does not currently have source reduction policies in place and believes strongly in market mechanisms.

Litter & Source Reduction

As to be expected, most cities named decreasing litter as a main goal for product bans. However, from the researchers perspective, based on the number of policy documents that listed single-use biodegradable materials as suitable alternatives, the expected effect of the ordinance is that if, or more likely when, the material gets into the environment it will degrade as opposed to persisting indefinitely making a more hands-off approach to management than plastic litter demands. This would potentially lead to less staff time and financial resources needed to clean up the environment, but not necessarily a decrease litter entirely.

Source reduction was named as a motivation for implementing plastic product bans as a means for “turning off the tap” (Interviewee 2) and included increased use of reusable over single-use disposable products. The goal is to reduce materials that are high in volume, non-recyclable, and easy to eliminate because they provide low levels of convenience or have suitable alternatives (Interviewee 9, 10). Source reduction should work in tandem with recycling to reduce what is not recyclable or currently recycled and eliminate excess materials

at the source (Interviewee 6). Source reduction may then serve as a more effective means of reducing litter.

Vertical diffusion and inspiration

When trying to understand the interplay between state and local policy or vertical diffusion, Interviewees responded that it can go both ways from the local to the state level and from the state down to the local level. The local agencies interviewed had a consistent perception that state regulation regarding plastic pollution was in fact influenced by local policies because local policies give, "...the state more comfort to pass stronger regulation...(Interviewee 1)" and that there, "probably wouldn't [be] a statewide [plastic bag] ban if you hadn't gotten the local ones first (Interviewee 2)." Ultimately believing that "the state doesn't do law by itself (Interviewee 9)," and, "there always seems to be a tipping point reached at a local level before it happens at a state level (Interviewee 5)." Two Interviewees (Interviewees 1, 9) stated explicitly that the goal of local policies was to support a Statewide ban. In a special news report, the Mayor of the City of Pasadena said this is regards to a newly passed polystyrene ordinance:

"The expectation is that if enough cities continue to adopt these kinds of ordinances sooner or later the State will climb on board (Pollack et al., 2020)."

The Interviewee from the State doesn't necessarily agree saying that, "we're very aware of [what local agencies are doing] but that doesn't necessarily impact our bill drafting..." adding that they do get input from local stakeholders on bills, but the collective action of local agencies is less influential. However, they went on to say that local policies do help get industry on board with State regulations so that they don't have to fight a patchwork of local ordinances.

Despite what the Interviewee proposed about the influence local agencies have, analysis documents for the State's Plastic Bag Ban and the Plastic Straw legislation cite local regulations as part of the background on implementation with one writing the State regulation, "does not pre-empt existing ordinances; however, it does provide uniformity moving forward by pre-empting any local ordinance adopted after...2014 (*Solid waste: single-use carryout bags, Senate Floor Bill Analysis, Cal. S. B. 270, 2014*)." This suggests that vertical policy diffusion may occur through a form of bottom-up coercion. Having a number of local agencies implementing similar policies does strengthen the argument for statewide policy, if not triggering its initial implementation, to begin with.

5.3.1 Contextual factors

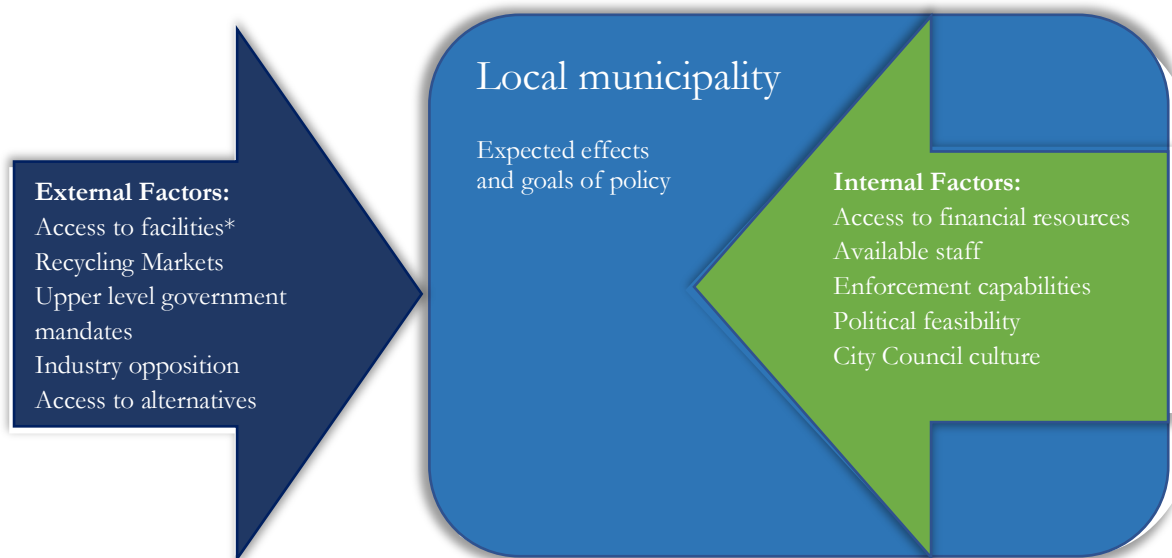
Policy enforcement, access to alternatives, and political feasibility were all mentioned in the literature as contextual factors that influence policy implementation. All three appear in the data alongside a number of other factors that fit within internal and external themes as presented in Figure 8. Internal factors are those that are within the control of the city and specific to each cities context while external factors are typically beyond the reach of influence of an individual city.

Internal factors include access to financial resources to hire personnel or conduct outreach to the community about the new bans. The availability of staff can affect enforcement capabilities like the number of enforcement officers available to write citations or notify the public. Similarly, how the violations section of the ordinance is written determines what course of action staff can take when they find a violation e.g. only provide notice of non-compliance, give a fine, or a combination thereof. The political feasibility of a policy takes into account how the city prioritizes issues and the culture of the City Council. City Councils were

named by several Interviewees (Interviewees 1, 9, 10) as pivotal in directing city staff on which issues to tackle which was dependent on if they are more progressive, risk-averse or lean politically conservative. Ultimately, Interviewees said that the prioritization of the City Council is driven by constituents or the policy’s favorability in the community.

Interviewees 1, 8, 9, and 10 mentioned that they want to be seen as business-friendly and support the thriving restaurant and retail environments within their cities. Not only do businesses pay taxes that financially support cities (Interviewee 9) but they increase the quality of life for residents. Even if bans are cumbersome to businesses, Interviewee 10 emphasizes that bans equally impact businesses across the city. Even if some businesses are impacted more than others because of their business models, they are not being singled out or disadvantaged from other similar businesses within the city.

External factors include whether there is access to facilities to dispose of approved plastic alternatives. Interviewees 2 and 9 mentioned that if they mandated alternatives that would still end up in a landfill, it would not be a better outcome environmentally and would cost businesses more money. Additionally, the volatility of the recycling market and county, state, and federal mandates were brought up by most Interviewees. Opposition from the plastics industry or manufacturing that utilizes plastics was also mentioned. Interviewee 7 provides their own story of a food processing company and its industry association threatening to pull all of its meat products from the jurisdiction if a polystyrene ban was passed asserting that they wouldn’t be able to comply with the agencies requirements for alternatives in time. However, upon visiting the facility, the Interviewee saw that the food processor is, in fact, complying with other similar ordinances across the state and is already providing alternative packaging to much larger markets. Understanding the major stakeholders and working with them to enable the change is important for policy success (Interviewee 7).



*Access to facilities can be an internal or external factor depending on if a city operates its own facilities. In the collected data, it was mostly discussed as an external factor.

Figure 8: Internal and external factors that affect policy implementation (Source: Author's own compilation)

Alternatives

Almost all of the ordinances name what alternatives are allowable, but there is a high level of inconsistency in combinations of acceptable materials as shown in Table 7. Acceptable alternatives are generally non-plastic and newer materials.

Table 7: Combinations of acceptable alternatives presented in product ban ordinances in California

Set of defined alternatives in policy documents
Biodegradable, compostable
Biodegradable, compostable, recyclable
Biodegradable, recyclable, reusable
Biodegradable, recyclable, returnable
Bioplastic, non-plastic
Compostable, recyclable
Compostable, reusable
Compostable, recyclable, reusable
Recyclable, returnable
Recyclable, reusable

Source: Author's own compilation

The definitions of acceptable materials can usually be found in the policy document. The documents that do not define acceptable alternatives will often just define what is not accepted. “Biodegradable” is sometimes defined as meaning “compostable” which is then defined separately. In some instances, biodegradable is simply defined as “the ability of a material to decompose into elements normally found within a reasonably short period of time after disposal,” through the action of bacteria or other organisms. This is often the definition if “compostable” is not also defined separately.

Interviewee 4 also mentioned specifically the need for products to be marine-degradable which was defined in their ordinance as “designed to biodegrade under the marine environmental conditions of aerobic marine waters or anaerobic marine sediments in less than 120 days. Products predominantly made with plastics, either petroleum or biologically based, shall not be considered marine degradable.”

“Compostable” usually refers to a product being able to degrade to become a “usable compost” in a timely manner. Sometimes the definition references being able to break down in a composting program or facility or through “aerobic treatment of organic material.” Policy documents sometimes note that biodegradable and compostable are to be defined against the American Society for Testing and Materials (ASTM) standards for both terms²⁰. In definitions for compostable, specifications for labelling bioplastics as ASTM compostable or non-ASTM compostable are sometimes mentioned so that processors can distinguish between different bioplastics.

At least five cities address bioplastics specifically in their ordinances, all of which have been implemented since 2018. The main issue brought up in regard to bioplastics is the lack of

²⁰ ASTM “Standards D6400 or D6868 for biodegradable and compostable plastics, as those standards may be amended. D6400 is the specification for plastics designed for compostability in municipal or industrial aerobic composting facilities. D6868 is the specification for aerobic compostability of plastics used as coatings on a compostable substrate (*South San Francisco Expanded Polystyrene Ordinance*).”

certification that they will biodegrade in a marine or natural environment, and that there are no compost facilities that are willing to take them. Additionally, the Santa Monica ordinance points out that the look and feel of bioplastics are very similar to petroleum-based plastics making it difficult for consumers to know where to properly dispose of them. The report continues “bioplastic that end up in recycling and composting bins are separated and sent to landfills.” Interviewee 9 highlights further challenges with bioplastics. First, it is difficult for recycling facility workers to tell the difference between bio-based and petrol-based plastics when sorting materials. Second, that the industrial compost facilities do not want bioplastics because they take longer to breakdown, add little nutrients to compost, and can potentially be harboring harmful chemicals.

“Recyclable” is defined in a number of ways with a spectrum of how detailed ordinances get for what is acceptable recycling. For some cities, it is defined by what their contracted waste haulers will accept as recyclable materials. For others, it is defined through specific resin codes or specified types of plastics (e.g. polyethylene terephthalate [PET] or high-density polyethylene (HDPE), etc.). Many cities refer to recyclability as what is “feasibly recycled by municipal programs” or available collection services in the city. Some ordinances go as far as to say that acceptable recycling is glass, tin and metal cans, cardboard containers, and specific types of plastic. Ordinances may also define “recyclable food packaging” which can include “glass, cans, cardboard, paper or other items which can be recycled, salvaged, composted, processed or marketed by other means other than landfilling or burning...(Laguna Beach Expanded Polystyrene Ordinance)”.

“Returnable” is mostly used within the definition of “reusable”. Calabasas defines returnable as “food or beverage containers capable of being returned to the distributor for reuse.” While reusable is often defined as being used repeatedly by the same food vendor or customer. Berkeley’s progressive law defines reusable as: “manufactured of durable materials and that is specifically designed and manufactured to be washed and sanitized and to be used repeatedly over an extended period of time and is safe for washing and sanitizing...”. Acceptable materials for reusable containers, such as glass, porcelain, ceramic, and metal are sometimes included in the ordinance. In a few instances, durable plastic is also included on the list. Reusable containers can be used on-premises or returnable by consumers if brought back to the original food vendor. Of all acceptable materials, there is the least encouragement of reusables as an alternative.

Multiple Interviewees (Interviewees 2, 4, 9, 10, 11) brought up reusable alternatives as the best option to mitigate plastic pollution. Interviewee 4’s city is trying to follow the waste hierarchy²¹ by promoting reuse over recyclable or compostable products. They want single-use materials to be marine-degradable as the second option so that they break down in their compost facility or in the marine environment. They are a highly trafficked coastal community. Interviewee 9 stated that reusables are going to be key when converting restaurants away from single-use plastic products because if the goal is source reduction, “reusing is never trash. That’s a sure thing!” Interviewee 10 feels that it’s not so much that plastic is the issue as the single-use culture to begin with stating if products are reusable or washable, even if they’re plastic, it gets the community off of the reliance on single-use materials altogether. Interviewee 11 acknowledges that more research needs to be done to prove a “culture of reuse and refill” as a better alternative and that new systems need to be created to make refillable and reusable

²¹ The waste hierarchy as set by the USEPA outlines an approach to managing materials at the end of their life for best use. At the top of the hierarchy is source reduction & reuse, followed by recycling/composting, energy recovery, and finally treatment/disposal (US EPA, n.d.).

containers a mainstream alternative. The need for full life cycle thinking when it comes to single-use plastics versus alternatives is a high priority for Interviewee 2 as well.

Cities mandating the use of alternative products can expand the market for these alternative materials. How quickly these manufacturers can scale up their production and whether or not the alternatives are actually “more environmentally friendly” is up for discussion and in need of additional research. Interviewee 3, who runs a single-use plastic-alternative company recognizes that businesses have to spend a little more money to get an “eco-friendlier” product but that their customers are finding it “worth it”. The company’s main goal is to get on the state’s approved distribution list which would show their product is compliant with state regulations. They are not worried about ramping up production as demand for their product grows. However, when pushed on their products end of life disposal the Interviewee stated that the product will “organically decompose” in a landfill if customers do not have access to industrial composting or backyard composting facilities. The benefit of using their alternative is that if it ends up in the environment as litter the product would decompose as opposed to persisting indefinitely or breaking down into microplastics. Contrariwise, a large manufacturer of both paper and plastic bags said in a newspaper article that New York State will need four billion paper bags, over 50% of production capacity, to cover their new plastic bag ban, which will affect the US’ entire supply (Milman, 2020). With eight states depending on reusable and paper bags to replace plastic, supply issues are an important consideration.

Interviewee 9 understands that it is important for single-use non-plastic alternatives to provide the same level of performance to businesses as their plastic counterparts. To get restaurants and businesses on board recommended or mandated alternatives need to meet performance and quality specifications. The Interviewee stressed that it is very important to have a complete understanding of how the products will be treated at the end of their life. It would be unfair and questionably less environmental if restaurants are mandated to switch to more expensive alternatives that are not accepted in recycling facilities or industrial composting facilities and are still going to the landfill.

“[This is the] biggest stopper, because it’s really easy to ban something. It’s really easy to be against something. But what are you for? What can you recommend (Interviewee 9)?”

They go on to say it would be detrimental to the aims of the program to come out in favor of a product and then find out that it isn’t as recyclable or compostable as originally thought. The need for suitable end of life management is echoed by Interviewee 2 who maintained that one of the reasons their city has not implemented a polystyrene ban is because they, “didn’t even have a positive thing to advocate, you can encourage the alternatives, that’s great, but if they all ended up in the landfill anyway, it’s a lot less attractive story (Interviewee 2).” This overlaps with industries skepticism that alternatives are environmentally sounder than their plastic products, especially when a life cycle assessment is conducted. Industry advocates that plastic is lightweight and causes fewer emissions than heavier alternatives and is therefore overall more environmental.

The State’s role outlined in the policy documents is to define certain terms such as “biodegradable” or “compostable” to decrease false advertising claims. This is especially needed for bioplastics and biodegradable plastics which were originally advertised as able to be composted but are not accepted in many industrial compost facilities. Bioplastics and biodegradable plastics often end up in recycling centers but cannot be recycled with traditional petroleum-based plastic products. In the 2014 report *Biobased and Degradable Plastics: Understanding New Packaging Materials and their Management in California*, CalRecycle (2014) not only defines biodegradable and compostable but also studies the technological and economic

feasibility for end of life treatment of these products within the current waste infrastructure. Their ultimate conclusion is that the ability to include these new alternatives into the existing system has lagged. It is difficult for end of life treatment to keep up with the innovation of new products when intertwined with a complex recycling market.

“What is clear is that it is in the best interest of California’s economy, environment, and public health to prevent plastic waste – petrochemical or otherwise – from reaching the natural environment (CalRecycle, 2014, p. 91).”

This report was published before China’s National Sword program meaning any dependence on end of life treatment of alternative non-plastic products will most likely need to be done domestically which was not taken into account in the report’s findings.

Interestingly, the California Circular Economy Bill does not define any of the above-mentioned terms in the bill text itself, but in Section 42052, does direct CalRecycle to, “develop criteria to determine whether the packaging or priority single-use products are reusable, recyclable, or compostable (Solid waste: packaging and products, Cal. Assemb. B. 1080, Legislative Council’s Digest, 2019).” The text continues that local governments, solid waste facilities, recycling facilities, and composting facilities would provide input to help develop the criteria. However, the bill does define “source reduction” as:

“...transitioning single-use packaging...to refillable or reusable packaging or a reusable product. [It] does not include replacing a recyclable or compostable material with a nonrecyclable or noncompostable material or a material that is less likely to be recycled or composted and does not include a shift from a non-plastic material that currently is recyclable or compostable to plastic material (Solid waste: packaging and products, Cal. Assemb. B. 1080, Section 42042 (9), 2019).”

The California Circular Economy bill clearly considers both end processors and a more holistic viewpoint of alternatives, which shows the State is working towards a more harmonized approach to materials management.

5.3.2 Determining Success

Well defined criteria and adequate enforcement were the two key aspects for determining the success of bans. Interviewees mentioned a few criteria used to determine effectiveness in either other jurisdictions or their own. Interviewees told anecdotal and visual accounts of fewer plastic bags flying around the landfill (Interviewee 4) or less of the banned material being found during beach cleanups (Interviewee 1) as determinants of success. However, when looking at beach cleanup data for plastic bags there was an 11% increase one year after implementation of the statewide plastic bag ban (*California Coastal Cleanup Day History*, 2019), making the observations difficult to rely on to truly determine effectiveness.

When asked how they determined the effectiveness of the policy, Interviewee 10 said they were unsure, and they mostly tracked their interactions with affected businesses. Implying that the more businesses they interacted with, the more likely behavior change would take place and the business would be in compliance. In this case, if the criteria are the number of businesses that staff has communicated with, there may be reasonable metrics to determine if the program is successful. Interviewees 2, 7, and 9 also mentioned compliance by retailers as indicators in their single-use or polystyrene bans. It could be reasonable to believe that the number of businesses in compliance would translate to a significant reduction in the use of single-use plastics such as cutlery, or polystyrene take out containers. The higher number of compliant businesses, the lower the number of banned materials being offered and potentially

ending up in the environment. Nevertheless, if each agency is calculating different metrics, then it is difficult to determine the broad success of local bans.

Interviewee 4 reported that a main indicator of compliance by retailers in their single-use plastics ban is the number of complaints they receive from consumers saying it is, "...kind of on the public to let city staff know when applicable businesses are not in compliance..." Noting that at the start of the ban there was a high level of complaints but that it has fallen over time.

"I think within 24 to 36 months there's only going to be a handful of folks who aren't compliant and it's going to be easier to take care of enforcement at that time it's that initial push when the ordinance goes into effect that's difficult (Interviewee 4)."

Enforcement and monitoring were also important in determining the success of plastic bans on a local level. Generally, the availability of staff and financial resources were noted as the biggest barriers to adequate enforcement. Interviewee's 1 and 4 both mentioned that consumers in their cities aid in enforcing ordinances:

"We also have a few really passionate members of the public who are reaching out to the businesses and encouraging them to follow the single-use plastic ordinance (Interviewee 1)."

"...a lot of these are kind of on the public to let city staff know when applicable businesses aren't in compliance...there's usually not a lot of staff dedicated to enforce[ing] these ordinances so it takes a longer time to get full compliance because [of] a lack of enforcement (Interviewee 4)."

Interviewee 7 who runs a joint powers authority said that that agency is more of a monitoring agent and notifies the partner agency if they find a business is not in compliance. They went on that actually going through with enforcement would mean they failed at their job because their job is to "talk people into doing things and listening." Meaning their role is more of an education and persuasive role (carrot) over an enforcing role (stick). Interviewee 10's city also takes a softer approach to compliance providing assistance businesses to help them reach compliance. They very seldomly need to go through with writing citations for non-compliant businesses.

"...We want to work with businesses before you cite²² them. So we really try to. We too want to build relationships with businesses, and this can be an ongoing thing to get people into compliance and help them do better rather than just hating us (Interviewee 10)."

"I don't want to be the sheriff; I want to be the partner (Interviewee 9)."

Industry calls out the reactive nature of these policies and questions lawmakers long term planning. In their view, litter reduction and lack of recycling are not solved by banning their products. In a response letter to San Francisco's polystyrene ban amendment, a lawyer writing on behalf of the Expanded Polystyrene Alliance questions if the city has legal standing for the ordinance if there is no, "rational relationship to its goals." Continuing that the "ordinance achieves only the *appearance* that the city is advancing its objectives," and concluding that the, "proposed ordinance is legally suspect." Industry continually acknowledges that source reduction is key but that the availability, improvement, and expansion of recycling is a better

²² The interview is referring to writing a citation, or warning, to the business. Citations can have fees attached or can simply be a warning letter.

solution. To improve the system and meet any future legislative goals, they will need more time than pending regulations allow for.

“The most important thing you can do at this time is to challenge your status quo...Don’t disregard our testimony simply because we represent industry. Yes, we have a vested interest, but our industry has spent significant time and resources evaluating our environmental performance and we speak with a clear conscience in our appeal for you to make a fact-based decision on this ban proposal (San Francisco Food Service and Packaging Waste Reduction Ordinance, 2016).”

5.4 RQ3: Motivating Harmonization

The State sees its role as filling in holes and gaps in regulations as opposed to replacing existing state regulations. This is a more reactive approach to combining and reconfiguring regulations and programs using existing regulatory laws and frameworks. Meaning the type of harmonization the State most often defaults to is that of creating **rules and regulations** with **structures** in place to support new laws.

When asked what the role of the State should be, several Interviewees called for the State to hold producers responsible. The proposed California Circular Economy Bill places responsibility for plastic waste and pollution on producers to set up systems for recyclability and source reduction. This use of the **general principle** that the “polluter pays” is another kind of harmonization. While not currently being deployed for plastic, this principle is in place for other waste programs implemented by the State. The use of rules and regulations, structures, and general principles all connect to the justification to implement plastics policies as noted in Figure 9.

It has been shown that clear criteria and enforcement are needed to know if a policy is successful. It is arguably necessary to also have clear policy objectives to determine what the criteria are aiming to evaluate. CalRecycle, the state agency responsible for waste and recycling programs, does have a universal goal of 75% diversion of material from landfill. This goal is calculated on the weight of materials and monitored through extensive reporting and waste characterization studies.

“[The] 75% diversion goal, unfortunately, that is just a goal in statute and the key difference...is that under that goal, CalRecycle doesn't have any enforcement power. They're not able to create any regulations to get us towards that goal...(Interviewee 6).”

CalRecycle’s website outlines the programs, objectives, and status of this goal with the most recent AB 341 Report to the Legislature (2015). This document outlines five strategies and three focus areas and seems to cover the final type of harmonization, general policy objectives. However, this goal and document cover much more than plastic waste. One of several identified “problematic wastes” highlighted in the report is “fiber/resin: commodity recyclables” which incorporates all recyclable commodities including plastics. More specifically to plastic, the report covers problems associated with the increase of single-use plastic beverage containers. The “concepts” identified in relation to plastic to help achieve the 75% diversion goal are to increase financial incentives and grants to expand recycling infrastructure, increase manufacturing capacity for recycled feedstock, and increase consumer education.

Recycling is still proposed by the State as the main avenue for managing plastic waste. The report is from 2015 which was before the implementation of China’s National Sword program, the website has been updated as recently as February 2020. Consequently, as none of the policy documents mention the 75% diversion goal as justification for banning specific plastic products, it can be inferred that the local policies do not directly correlate with this

state goal. Additionally, as referenced by Interviewee 2, the lightweight nature of most plastic products does not necessarily support the weight-based metrics the goal relies on. If plastic product bans do not directly support the States waste diversion goal, how then should bans be determined successful on a statewide level?

The report outlines source reduction strategies “such as voluntary industry and nongovernmental initiatives related to zero waste and alternatives to packaging in the statewide approach.” Obviously, this strategy has been adjusted as the California Circular Economy Bill mandates industry to practice source reduction which demonstrates how plastic policy has shifted so dramatically in the last five years.

“This means packaging producers and brand owners need to work more closely with recyclers and the manufacturers using recovered materials...It will be challenging to achieve meaningful source reduction and recovery of fibers and resins on a statewide level without collaborative initiatives aimed at reducing the negative life cycle impacts associated with packaging. There is no one-size-fits-all solution (CalRecycle, 2015).”

When initially asked how the State could better address plastic pollution, most Interviewees answered with specific programs they thought the State should implement (e.g. public procurement of recycled content materials, minimum recycled content standards of products, or an EPR program). A harmonized **policy objective** was not brought explicitly up by the Interviewees. In follow up communications when asked if California would benefit from a statewide goal or plan for plastics. Interviewees still mostly focused on upstream programs they believe the State needs to truly address plastics which alleviate the current trend of plastics being managed downstream within local agencies purview (Interviewee 9). Interviewee 1 generally stated that “a statewide plan...moving away from or better management of plastic is the best approach.” Interviewees 2 and 9 believe that market-based approaches such as minimum content standards, public procurement, or EPR programs for plastics are the best legislative actions the State can take because it drives demand.

“If you don’t have an end market [for plastics], you don’t have a recycling program, you have a collection program. You’re not accomplishing anything. You have to ask what would establish a market that would pull the waste materials through the system (Interviewee 2)?”

They go on that producers should be encouraged to innovate to close loops by deciding what to redesign and what to phase out (Interviewee 2). Interviewee 9 agrees that businesses will figure out how to implement policies, but they want to operate under low levels of uncertainty and consistency. Both Interviewees believe the State’s role is to ensure a level playing field for businesses and to increase demand through recycled content standards and purchasing requirements thereby creating a market that businesses will feel confident in investing in.

Interviewee 9 best summarizes what several Interviewees hope for which is the desire for the State to provide more support by taking on producers. As the main actors managing materials at the end of their life it is local agencies who have to come up with solutions for management which is often time and money they do not have.

“We are forced to go into battle with a knife when it’s a gunfight. We need to get the head of the snake and go after manufacturing...At a local level, we’re treading water and trying to stay afloat. We need higher-level policy (Interviewee 9).”

The variety of motivations in the policy documents specific to plastics consumption and the variety of available policy solutions exemplify the need for harmonized solutions on and between the local and state level. When asked if there was a plan at the State level to enact a

comprehensive plan for plastics management Interviewee 6 commented that the California Circular Economy Bill has a mechanism in place to review existing programs every few years to establish if they are still necessary. Adding that eventually the programs centered on plastic management could be combined into one program.

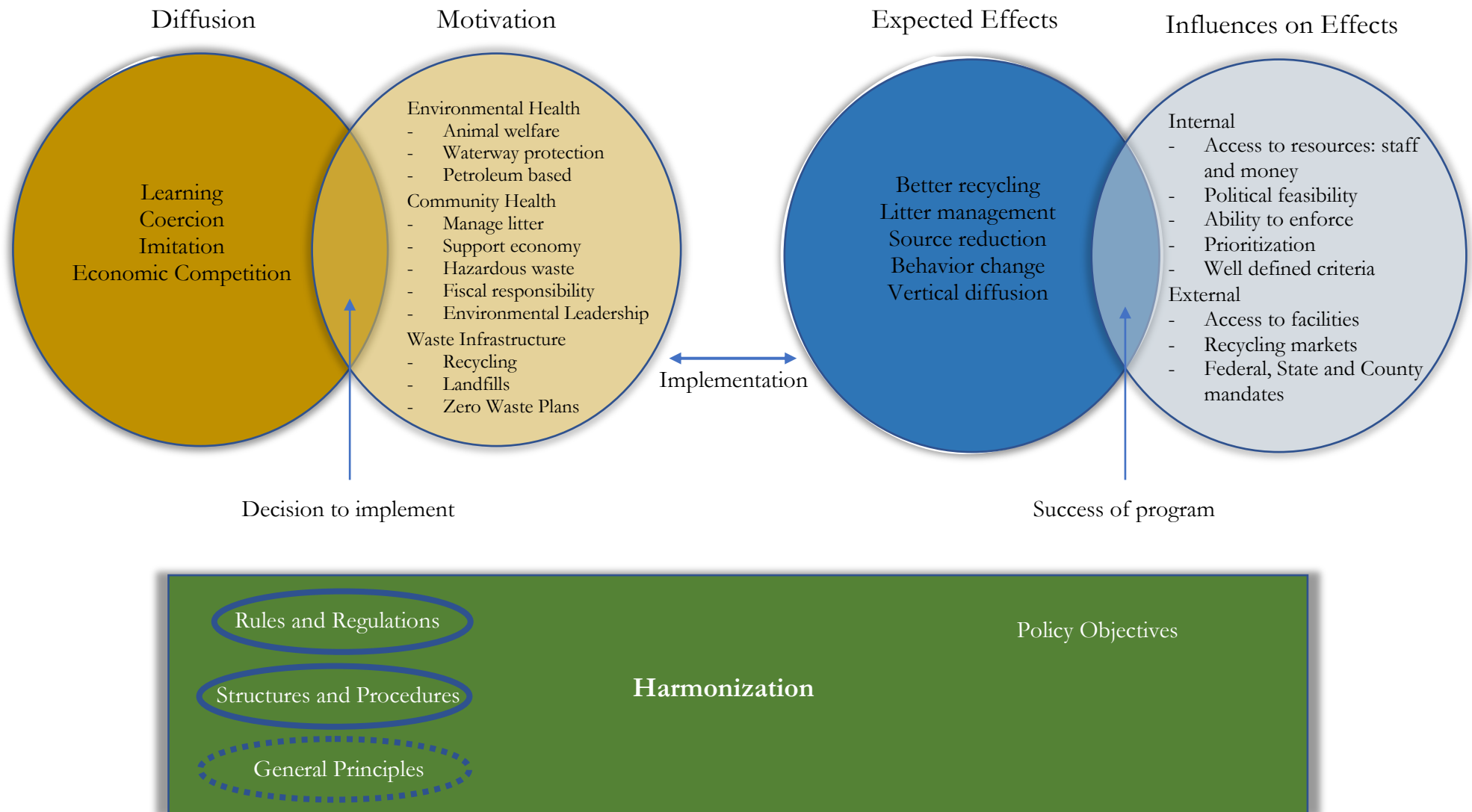


Figure 9: Updated analytical framework which now includes collected and analyzed data. Also highlighted are the types of harmonization revealed to be the current strategies used by the State. General principles are not currently employed for plastics but was mentioned in the collected data as a future type of harmonization.

6 Discussion

The next chapter discusses the main findings in the results and rationalizes the creation of a comprehensive, statewide plastics strategy that encourages the harmonization of policy objectives between the local and state levels of government. After which, a framework is outlined to showcase what would be included in the strategy and thoughts on further research needed.

6.1 Bans at the local level

If cities continue choosing bans as part of their plastics management strategy then it is important to discuss if they are the right policy tool to achieve their policy goals. It is evident that local municipalities are going to continue fighting plastic waste and pollution in their communities while baring the costs of collecting and sorting costs, enforcing large scale cultural change, and in some cases selling recyclable plastics. However, without a defined metric to monitor and enforce bans, it is unclear if this is a useful tool in managing plastics over the long term.

Diffusion among local agencies is strongly driven by the concept of learning. The key to diffusion via learning is to communicate what criteria are used for evaluating policy effectiveness whether it's through collection totals, the number of businesses who are in compliance, or keeping track of registered complaints. This way other cities can know how success is defined and decrease the likelihood of repeating untested or unsuccessful policies many times before lessons are learned. It should not be necessary that regulation only is enacted with perfect information but the risk of operating under misinformation should be diminished as much as possible to not have to funnel additional resources into the re-education of those being mandated. City management may also lose the political will to be progressive if the community loses trust in its ability to effectively govern.

The literature states that bans are typically easy to sanction because they are simple to communicate and fairly easy to implement (Dauvergne, 2018b; Knoblauch et al., 2018; Lifset, 2003; J. Romer, 2007). However, the literature does not seem to take into account the acceptance of bans by those who are being mandated, such as local businesses, and their influence on city management. If city management is weary of a dissatisfied business community they may be less likely to initiate progressive policies. Interviewees 1, 7, 9, and 10 stressed the importance of communicating with local businesses the reasons for the ban and how to implement it with minimal disruption to their operations. To get full cooperation, outreach and education are needed to incentivize compliance without having to employ harsher actions such as violation notices or sanctions.

Plastic bans are mainly deployed as a method for litter management as evidenced by the large number of agencies who mention litter in their policy documents and the Interviewees. Notably, the two Interviewees who have not enacted a plastic product ban did not mention plastic litter as an issue in their city. Litter management is prioritized for local economies where aesthetic is important, but a majority listed marine pollution as a driving factor for controlling litter. The literature shows that most marine pollution is not coming from California's coastline but coastlines that import plastic recyclables. The issue of a community's plastic waste then becomes greater than the litter within their own boundaries and boils down to the conflict between plastic collected to be *recycled* versus plastic that is thought to be *recyclable* in theory but not being turned into feedstock in reality.

The second most recurring motivation was the lack of a recycling market for some plastic materials such as polystyrene. The pace at which new plastic materials are being developed and the volume of plastic material entering the market will make it unfeasible to individually ban each plastic material that lacks an economically viable market. To set a precedent for banning materials one at a time may pick off “low hanging fruit” but it also sets a pattern of banning current and future low-value plastic materials one at a time that is too slow to keep up with the development of new plastics.

The literature that addresses global plastic waste makes a distinction between motivations for the Global North and the Global South attributing global problematizations to the former and more localized problematizations to the latter on a national scale. However, when focused on local agencies in California motivations cited both local issues, such as litter and stormwater management, and global issues, such as marine pollution and animal welfare. This is contradictory to the North/South dichotomy presented by Clapp and Swanston (2009), showcasing another layer of complexity when managing plastic waste on multiple levels of governance with limited coordination. The successful presentation of the plastics problem as both a local and global issue may help explain why governance entrepreneurs have successfully defined an anti-plastic norm to city management and consumers.

It was found in the literature review that governance entrepreneurs will consult each other as a means of strengthening norms. Progressive, local cities act as governance entrepreneurs in California as shown by the high level of copying found in ordinances. Cities know other communities will look to them for ideas and follow them, so they initiate plastics policies as a means of establishing new norms. However, the challenges presented around the chemical PFAS highlight the risk of being a governance entrepreneur. San Francisco promoted the use of uncoated fiberboard as a winning alternative to polystyrene as part of its 2016 ordinance. After putting it into their compost they learned it contained PFAS, which is a “forever chemical”. However, this also provides an example of the benefit of local policy diffusing through learning. Berkeley’s 2019 single-use food ware and litter reduction ordinance specifically states that disposable food ware must be free of “intentionally added fluorinated chemicals,” which includes PFAS. When cities act in tandem as governance entrepreneurs, they are able to push new policies and learn from each other quickly to continue momentum.

New information can be positive or negative depending on the stakeholder group stance on an issue. The PFAS example can be viewed as a major blow to the anti-plastic movement if it supports industry’s position that non-plastic alternatives are not necessarily more environmentally sound than their plastic counterparts. Or, it can be used as a learning opportunity that is essential for successful policy development. Sharing new information showcases the necessity of local agencies to experiment and serve as policy laboratories. Experiments allow other local agencies and the State to learn and improve future policies.

Relaying the necessity of a ban to a consumer is vital but can be difficult especially when the definition of bans is nuanced. Interviewee 4’s city depends on consumers to report non-complying businesses and uses the rate of complaints as their metric for determining the success of their single-use plastics ban. Inconsistency in definitions of “bans” or acceptable alternatives can confuse consumers and businesses and muddle how the policy is accepted or perceived. A uniform understanding of bans is needed to generate support and enable consumer-based enforcement.

Some Interviewees believe consumers have never been better informed on the complexities of plastics and its detriment to the environment. Interviewees identified viral images of

wildlife devastation, National Sword, and the media attention on cracks in recycling systems as creating the “perfect storm” for movement against plastic waste. As Interviewee 11 pointed out, “the transition [has] started...we [have] so much momentum with cities starting to change the culture...”. While the plastics industry continues to fight bans and regulation, most of the Interviewees feel the movement is moving in a positive direction²³.

It is the belief of the Interviewees who have local bans that this behavior is a step towards more holistic conscious consumerism. Literature suggests policy that depends on consumers changing their behavior over the long term may be minimally effective since consumers are less likely to transfer that behavior to other aspects of their lives (Stafford & Jones, 2019). If plastic product bans were effective in changing consumer behavior the trend of implementing bans on additional products would not be necessary. For example, a city with a local plastic bag ban should not have to implement bans on any other plastic products like straws or cutlery. But that is not the case. Thirteen cities have enacted more than one ordinance banning specific plastic products, and 15 have banned polystyrene or single-use plastic items since the Statewide plastic bag ban went into effect. So it is unclear how much transferability there is in consumer behavior in this context. This indicated that governments may need to continue to regulate reactively as specific issues around plastic become more prominent in the public domain if action isn’t taken at the State level.

The challenge of plastic product bans as the main form of plastic pollution policy is that it is too narrowly focused. Interviewees mentioned that bans go after the lowest hanging fruit in terms of regulating plastics, but which “fruit” is addressed is based on a large group of stakeholders with competing priorities and demands. The hope of initiating mass behavior changes as a goal for implementing bans can blind local governance entrepreneurs into a false sense of effectively minimizing plastic waste. Bans cannot be a stand-alone solution; they must be part of a much larger strategy that addresses stakeholders at all points of the value chain.

It is not to say that local plastic product bans are not an honorable attempt at mitigating plastic waste and plastic pollution. However, the urgency of the problem and the attention it has received from both the public and upper-level politicians has created an opportunity for shaping a more system-wide approach.

6.1.1 The importance of Alternatives

Repeatedly throughout the literature and data collection, the importance of alternative non-plastic single-use products was repeated as an essential component for making bans work. Yet the solution that these non-plastic alternatives provide is mostly to decrease plastic litter that persists in the environment. They do not address, and potentially can exacerbate, issues around recyclability and compostability, especially considering that the conversation regarding viable end processors is not as ubiquitous as that of alternatives.

In a comprehensive plastics mitigation policy, end processors for non-plastic alternatives are crucial. If plant or paper-based alternatives go to a landfill because industrial compost facilities will not take them or are not available, the organic material will decompose in the

²³ All Interviewees mentioned that the impact of COVID-19 on the momentum of the movement has been hugely detrimental. They cited both the re-prioritization of local governments and consumers and the fear of contamination as setting back the movement “years.” Of note, the State and many cities temporarily repealed plastic bag bans and fees as a measure to reduce contact and ensure public safety. Interviewees 9 and 11 fear this will dismantle any work done to promote the use and sanitation of reusables.

landfill creating methane gas contributing to climate change. Moreover, one of California's most prescriptive waste legislations SB 1383 Short-Lived Climate Pollutants (SLCP): Organic Waste Methane Emissions Reductions (hereafter referred to as SB 1383), aims to ultimately stop all organic material from being sent to landfill. Meaning that non-plastic single-use alternatives will need either a recycling processor or compost facility to accept them.

Ultimately, end processors are the ones who decide if a material is accepted, thereby dictating the definition of "recyclability" or "compostability". This discretion may explain why definitions in the policy documents are vague or differ from city to city. The head of the California Product Stewardship Council (CPSC)²⁴ said in a news report interview, that recycling is, "as clear as mud. This whole program is not harmonized, every city is doing its own program. It's just kind of a free for all and the public right now is really...so frustrated right now they're just going to stop (Pollack et al., 2020)." Without a uniform definition of what is accepted, cities cannot simply copy one another. They need to take into account what their local processor is willing to accept to come up with an environmentally sound policy. They then need to communicate that policy to their constituents. Interviewee 9 believes that the State has the ability to create a consistent and statewide message around what is recyclable. A coherent recycling message can support local agencies as they manage end of life materials.

As innovation occurs for new single-use alternatives it will be important that consideration of the end of life treatment be included in the design and production so that cities do not have to face a similar scenario of having to manage a non-recyclable, non-compostable material. Interviewee 3 did not seem to have a holistic understanding of how their non-plastic alternative would be environmentally impactful if not composted. While their main goal was to prevent plastic litter, it is hard to ignore that a large portion of their product will most likely be landfilled and contribute to other pressing environmental issues such as climate change.

It is surprising that only 20% of policy documents promoted multi-use or reusable as alternatives to single-use plastics. As mentioned previously, Interviewees 2, 4, 9, 10, and 11 all made statements that reusables were a better alternative to single-use products regardless of material type. Interviewee 4, often cited as a leading progressive city, has included in their new single-use plastics ordinance outreach materials that, "reusable is the best option, and then marine-degradable is the second-best option." Interviewee's 2 and 9 called for an even greater cultural shift away from take away/to-go culture. Both called for a market-based instrument, like a fee, on all disposables as a way to discourage and reduce single-use consumption in a nation that likes to eat on the go. A future study on Berkeley's 2019 ordinance which mandates a fee on disposable cups will show the impact a market-based fee can have when implemented alongside other forms of policy such as their disposable food ware and polystyrene bans.

6.2 Harmonization

As outlined in Section 3.3, there are several relevant justifications for harmonizing policy including limiting externalities, limiting the leakage of products into or out of systems, and

²⁴ "A network of local governments, NGOs, businesses, and individuals supporting policies and projects where producers share in the responsibility for managing problem products at their end of life. CPSC is California's thought leader and expert on Product Stewardship and the Extended Producer Responsibility (EPR) movement (CPSC, 2020)."

enabling industrial and political economies of scale. Proof of these justifications can be found in the interviews. For instance, urban areas are not siloed in their decision making. People move in and out of municipalities daily and do not always have a sense that cities have different rules regarding plastic product bans (Interviewee 4). Furthermore, street and storm system infrastructure are all contiguous parts of a larger system, meaning regulations in one jurisdiction can affect those in another. Commuters or the wind do not discriminate if one city bans polystyrene take-away containers and another does not. People and natural forces can move plastic products across city boundaries potentially forcing cities to still spend money on clean up even if they have banned specific troublesome products. This **leakage** of products out of systems can maintain costs for cities that have attempted to decrease spending on managing waste and litter.

These justifications are mainly true for urban areas where multiple cities are in close proximity to each other e.g. the Bay Area or Los Angeles Metro Area. Rural areas are less likely to have large populations moving across community lines with differing regulations or intertwined infrastructure so these justifications for harmonization may be less relevant to them. However, rural areas or smaller communities may have different justifications. Less populated or rural communities may have fewer staff, financial resources, or the political will, for progressive programs (Interviewees 1, 2, 9) and may depend on upper levels of government who do have resources, like the State, to enact policies. The literature calls this justification for harmonization **political economies of scale** where the resources of a higher level of government are employed.

Local communities can coordinate regionally to harmonize their policy to decrease leakage. However, as explained previously, the internal context within each municipality can cause slight but significant alterations to the same type of policy. These slight differences, such as acceptable alternatives, can cause confusion for industry who prefer consistent policies to operate their business (Interviewee 9). Therefore, while regional coordination occurs and is possible, a statewide policy may be preferred by industry and businesses who operate in multiple jurisdictions.

Challenges

Even though California is one state, it's regionally very diverse. Communities can differ in values and environmental progressiveness depending on what region of the State they reside in. Even communities within close proximity can have highly contentious views on government intervention and environmental protection. Interviewee 7 showed concern that the area is, "deeply divided and there is a great swatch of people who completely disagree," on banning plastic products such as plastic bags. Therefore, a main, but not insurmountable, challenge with harmonization on a statewide level is that the "one size fits all" model is less able to account for the diversity among communities.

Several Interviewees remarked that it's easier for industry to lobby the state in the capital versus spreading their resources fighting hundreds of small towns. This can lead to more watered-down versions of regulation as the State needs to negotiate with industry. Especially since the "California Effect" means that what happens at a State level may affect a company's production in the rest of the country. However, the benefit for industry is that they have one set of rules to follow instead of having to accommodate a wide range of policies. An example of this are polystyrene bans. Polystyrene bans may, or may not, include meat packaging which can affect local meat processors who have to adjust their packaging for different markets around the State (Interviewee 7). If this policy were consistent around

the State, then this particular meat processor would have a single type of packaging to run on their equipment which would be more efficient and cost-effective.

Another concern of having additional mandates from the State level is summed up by Interviewee 8 who fears that California is, “regulating businesses out of the state” and to encourage the necessary industry investments needed for recycling and waste management the State should loosen regulations, not tighten them. This is loosely echoed by Interviewee 10 who talks about regulations effect on small businesses:

“[Regulation can] hold back small businesses or make [running] small businesses more difficult, which is already pretty expensive and difficult in the State of California. Generally...environmental initiatives require more cost, more time, more staff. For the most part, they kind of have that long term, long run, ‘you’ll save money’...in the long term. But, people aren’t thinking 20 years down the road, [city council] think[s] we have to support local businesses now...(Interviewee 10).”

Interviewee 9 disagrees. They point out that businesses appreciate regulations that remove uncertainty and provide consistency. They go on to say that businesses react negatively to constant streams of change and short timelines that make it difficult for them to plan ahead. So, a highly reactive, unharmonized approach to plastics regulation may receive a lot of pushback from local businesses and industry as they have to navigate both local and state-mandated programs. This can create animosity between local agencies and their business community as local agencies act as the enforcing agent for multiple levels of government and become the source of ever-evolving policy.

6.3 California’s Plastics Playbook

Plastics need to be managed more intentionally. Despite the consumer perception that all plastics are equally recyclable, the high volume of consumption and the variety of polymers make it technically and economically difficult for many agencies to justify recycling all plastics. Local agencies’ that attempt to reduce consumption have used product bans as the main policy mechanism to solve multiple issues attributed to plastic waste. The inconsistent definition of bans between communities and different criteria used to measure impact has led to differing definitions of success.

One way the State can support local agencies is to create a comprehensive and coordinated strategy specific to plastics management and mitigation that goes beyond banning individual plastic products. In lieu of another State mandated program, a “plastics playbook” would provide cohesive guidance and aid agencies in developing local policies within a greater policy plan. It could guide policymaking at multiple levels of government, account for legislation already in place, and assess existing programs and gaps at each stage of the plastics value chain. The playbook would aim to limit purely “feel-good,” reactive policy on the local level in pursuit of longer-term policy objectives.

A statewide strategy for plastics would fall under the umbrella of the 75% diversion goal and fit within the precedent for coercive policy diffusion in California. The playbook would utilize the available resources at the State level and their birds-eye view to strategically think through what tools and assistance are needed to help contribute to the 75% goal. They could also study how policy interaction creates potential barriers that may prevent the State’s goals from moving forward. This would not be a far reach outside of the existing relationship between the State and local communities and therefore may be a highly acceptable form of harmonization.

The development of a statewide strategy would include many types of stakeholders. However, as it would not be a legislative mandate, but a set of unified policy aims, it could be based on realistic and idealistic goals that would be less prone to “watering-down” by the plastics industry. For example, the California Circular Economy Bill was amended to include more than just plastic packaging material to become “material neutral” after pressure by plastics industry lobbyists. The language that expanded the materials considered under the bill moved the American Forest & Paper Association and the Glass Packaging Institute from neutral to opposed.

“There’s no glass garbage patch in the Pacific Ocean. The glass container industry does not want to be part of a regulatory scheme to create a circular economy...for a package that’s already a circular package (Mike Robson via Rosengren, 2019).”

Additional amendments to concede to industry included not banning products but implementing a fee and creating recycling benchmarks. In contrast, a comprehensive strategy could align policy goals and plans without itself being subject to vast influence by private actors. It could help industry prepare for changes providing time to innovate to meet new benchmarks or create new systems as needed.

The playbook would ideally limit the dependence on consumer behavior change as the sole means of management. Plastic pollution mitigation strategies cannot exclusively depend on consumer or local food vendor behavior to change to be impactful. As discussed in Section 2.5, the State needs to take action at earlier stages of the plastics value chain to regulate plastics manufacturers and producers. Actions for materials, qualities, or chemicals that the State can regulate higher up the value chain would mean less pressure on local enforcement, fewer actors to regulate, and less dependence on the whims of consumers.

Conversely, local policies are a good barometer for what residents want and care about. Residents may feel that access to local politics is easier, more personal, and less complicated than upper levels of government. Knowing this, State level legislators can use local policies as a predictor for upcoming norm-changes and use that to support new regulations or the development of the plastics playbook.

6.4 A statewide framework

This thesis aimed to understand what roles bans play in mitigating plastic pollution on a local level, what the anticipated effects are, and ultimately if there is a need for policy harmonization on the State level. The case for a harmonized plastics playbook has been made. Below is the groundwork for the plastics playbook that could guide State actors and others in developing a comprehensive strategy for mitigating plastic pollution and plastic waste. It is based on the European Union’s²⁵ *A European Strategy for Plastics in a Circular Economy* (European Commission COM(2018)28 Final) and adapted to fit the data analysis for the California context.

6.4.1 Goals

The goals that surfaced in the analysis are not all going to be achieved via bans. The components of the framework need to work in tandem to address different problems plastic

²⁵ The EU and State of California have an existing working relationship from cooperating on climate action and carbon markets so it is not unfounded to use the EU’s Plastics Strategy as a jumping-off point for California’s Plastics Playbook (*EU and California to step up cooperation on carbon markets*, 2018).

waste and pollution create. Also, these goals and solutions address different types of plastic and their management along different points of the plastics value chain.

The first goal is *to limit leakage into the environment*. This is mostly accomplished via reducing beach and marine litter as well as litter that ends up in storm drains. Existing organizations already have a statewide beach cleanup and monitoring system that would be useful in this endeavor. For example when determining how to address different kinds of common beach litter in the EU, a report by consulting firm Eunomia (2018) first identified the top ten litter items by using combined data from over 600 monitoring programs, clean-up campaigns, and research projects as a starting point to identify the items that need to be addressed the most urgently. By using and analyzing existing data to determine the top ten items, they were able to cover 78% of the plastic littering EU’s beaches. Common beach litter may have similar materials or qualities that make it more prone to becoming litter or unable to be disposed of through recycling. By assessing what materials are most common, strategies can be applied, such as bans or quality standards, to try and limit these products statewide. In California, the data to address this goal is collected by a number of NGOs who host beach clean-ups, the National Oceanic and Atmospheric Administration, and the California Coastal Commission. Leveraging this existing data would be an important step in determining how to address each type of litter.

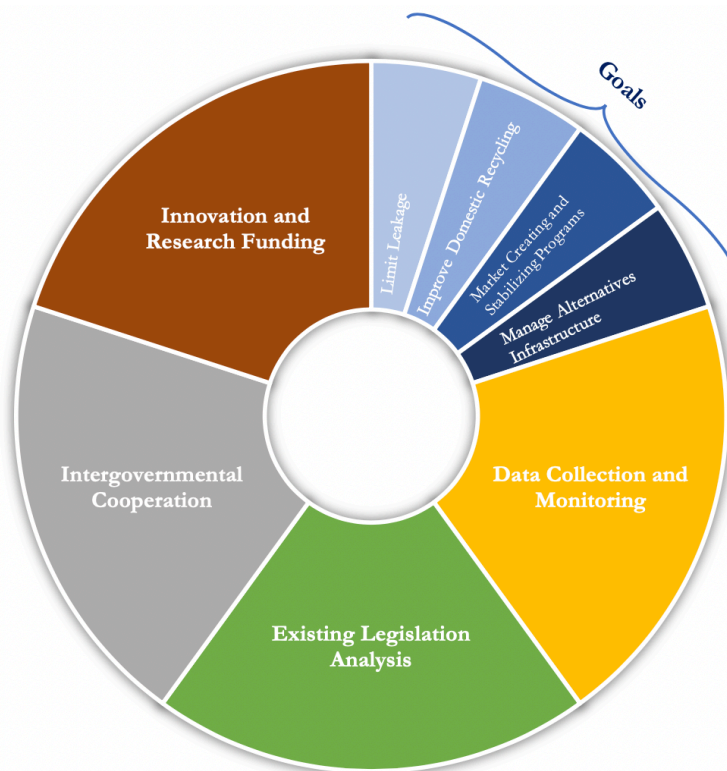


Figure 10: Components of California's Plastics Playbook

Limiting plastic leaking into the environment is two-fold, the first goal addresses litter coming from California directly. The second goal is to *improve the recycling value chain domestically* which would limit leakage of California’s plastic from other countries. As shown in Chapter 2, this goal needs to be addressed at the State level. Ensuring that plastics are recycled will require a much greater level of cooperation between producers and end of life managers which should be facilitated by the State. Expanding domestic infrastructure will require a

critical analysis of the barriers to that expansion. There are existing regulations outside of CalRecycle's authority that will require interagency cooperation on a State level to move forward. Additionally, the State legislature has already begun thinking through how to improve recycling infrastructure with a number of pending legislations. If a long-term strategy were used to support these pending bills, industry may be more favorable as they could plan for changes and feel comfortable investing in new infrastructure.

In support of goal two, goal three would be passing a number of *market creation and stabilizing programs* for plastics and place responsibility for management further up the supply chain. Programs like public procurement, recycling content standards, and extended producer responsibility push for the design and creation of truly recyclable products and allow market forces to phase out more troublesome plastics. Extending producer responsibility can create more assurances that high-quality materials are being produced to create a more circular system. California has a number of producer stewardship programs in place for things like mattresses, paint, and carpet so it would not be unreasonable to include plastic products and packaging in a producer responsibility program. California regulators can learn from other EPR programs that are in place as far as determining metrics and monitoring. Consumers are still needed to actively participate in EPR programs but encouraging the use or restricting production to only high-value plastic material would limit wish-cycling²⁶ and resources needed for local agencies to educate the public about how to best dispose of specific plastic waste. In addition to an EPR program, interviewees cited recycled-content procurement mandates (Interviewees 1, 2, 4) and recycled-content standards (Interviewees 2, 9) as helping create the demand for recycled content needed to stabilize the market.

All of these programs would incentivize and mandate that industry create and produce products that can enter back into the plastics value-chain in an economically feasible way, putting the onus on producers to find or create end markets for their products (Interviewee 9). The goal would be to also reduce unnecessary production of non-recyclable plastics (Interviewee 6). All of these programs would decrease the burden on public agencies to handle the constant evolution of plastic materials showing up in their collection systems.

The necessity of viable alternatives for some plastic products will mean that assessing and expanding *infrastructure to manage alternatives* will be an essential part of a holistic management system. As noted by several Interviewees, plastic alternatives ending up in landfills are questionable in their overall environmental advantage. CalRecycle already attempts to track where all waste materials end up and has a clear picture of existing waste management facilities. It would not be a far stretch for CalRecycle to assess where plastic alternatives are likely to end up based on the available infrastructure. Regional scale systems for reusables also fall under this goal. Joint power authorities, urban areas, regional associations and counties can use their existing structures and networks to pilot systems that encourage source reduction through reuse programs. Continuing community and city sized experimentation will be key in innovating new systems and leading cities can pioneer these experiments. It may be possible for pilot projects to earn community support or even funding to test their ideas if they are in support of a unified State goal.

²⁶ "Wish-cycling is the practice of tossing questionable items in the recycling bin, hoping they can be recycled (*Wish-Cycling*, n.d.)." Wish-cycling is cited as one of the main culprits for contaminated recycling streams, especially for plastics.

6.4.2 Data collection and monitoring

Another feature of the playbook would be to standardize what metrics would be useful in determining policy. Currently, there is not a set criteria or metric to determine if plastic pollution policies are working. Without standardized goals or metrics around plastic use it will remain difficult to assess if local policies are successful in relation to one another or if they are contributing to mitigating the global plastic pollution crisis as a whole.

Centralized data monitoring will be essential in assessing if waste programs are successful. CalRecycle already has a centralized reporting system but improvements and adjustments can be made to make it more accurate and user friendly. Interviewees commented that without consistency in reporting local agencies and waste haulers have to report a variety of metrics through multiple forms. Investing in a centralized data collection system would benefit communication between levels of government, between departments at the State level, NGOs and waste haulers as they work to mitigate plastic pollution. As part of a plastics strategy, it will be important to carefully think through how data is collected and what data would be meaningful to assess progress without putting an additional burden on local agencies.

6.4.3 Analyze existing State regulations

Assessing how existing regulations, directly and indirectly, impact plastics will be a necessary component of the playbook (see Appendix F for examples). Stormwater mandates, recycling and waste regulations, chemical regulations, and even air regulations interact with each other so it will be important the State studies this interaction as it tries to expand its domestic recycling infrastructure. There is a need to study policy cohesion to determine what legislative barriers will need to be overcome to encourage a complete systems approach to plastics management. Policy coherence can be defined as an “overall state of mutual consistency among different policies” to produce stability and reduce the likelihood of ineffective policies (Voyer et al., 2020). According to Voyer, Farmery, Kajlich et. al (2020) policy coherence relies on the coordination of policies and networks that need to be mindful and work together to achieve policy goals. Therefore, agencies responsible for other regulations and other programs will all need to work together to form an effective strategy.

For instance, as mentioned at the beginning of this chapter, SB 1383 addresses organics collection and calls for extensive expansion of domestic organics infrastructure. If banned plastic materials are to be replaced with compostable or biodegradable alternatives, it will be important to understand how that would create an influx of material to organics processors if those processors willingly accept the material, and if not, where it will go or what materials would be accepted.

If compostable alternatives are heavier than their plastic counterparts and those materials are not accepted by industrial compost facilities then there is a conflict between the plastics bans that promote the use of compostable materials, the 75% diversion goal which is calculated based on weight, and SB 1383, which aims to eliminate organics from landfills. Another consideration is the amount State and local actors will have spent planning and operating facilities that solve one problem (food waste) but do not cohesively align with another (plastics waste).

6.4.4 Intergovernmental Cooperation

Analyzing policy harmonization and policy coherence can help determine at which levels of government differing policies will need to occur. As explained in Chapter 2.4, different

aspects of the plastics value chain are best addressed at different levels of government. Local agencies are seen as more accessible by consumers and small businesses and will still be instrumental in educating the public on changes. By having a unified message, communities can pool and share outreach resources, while the State focuses on producers and increasing infrastructure capacity in cooperation with industry players. More defined roles can be successful in managing large scale problems because it allows each level of government to focus on what they are best suited to accomplish.

6.4.5 Funding for innovation

There is a need for research on viable non-plastic alternatives and capacity at facilities to handle both plastic and non-plastic materials. Funding streams to aide in innovation and improvements either through the State or private actors will be needed to help achieve the playbooks' stated policy goals. Likewise, funding for research on policy coherence and mixing types of policies can expand capacity and strengthen the playbooks' legitimacy. Funding can potentially come from the EPR program or fees on disposable products.

6.5 Beyond California's borders

External validity assesses the extent research results are transferable to other contexts, in qualitative studies, this is often referred to as transferability. The challenges of external validity that are applicable to this study include selection bias and history. The sample of cities used in the study stayed within the State of California which may have different multi-level governance structures than other states in the US. Likewise, the historical precedent California has for enacting progressive environmental policies and its reputation as a leader in this area likely has some influence on the results (Bhandari, 2020). With these challenges in mind, there are still aspects of transferability for this research.

While each state in the US may have slightly different vertical governance structures, the framework takes into account the relationship between governance levels by assessing the internal and external contextual factors and could be adjusted to slightly different contexts. Therefore, the analytical framework used to assess the motivations and effects of plastic bans could be transferable to other states.

Likewise, the transferability of the playbook is also applicable as it accounts for local contexts and calls for an assessment of policy cohesion at the state level. Since California first enacted the plastic bag ban in 2016, seven other states in the US have enacted plastic bag bans. The most recent being the State of New York, who in March 2020, banned all plastic bags making it even stricter than California's law. As plastic pollution policy begins diffusing state to state, endorsing a more comprehensive regulatory strategy could have even greater implications for the US as a whole. California is uniquely positioned as an environmental thought leader with relatively sizable state resources for conducting thorough and innovative environmental policies. This means that a plastics playbook that is as comprehensive as possible could be a welcome resource for other states who would not have the capacity or political will to do so on their own.

6.6 Reflections on Methods & Limitations

There are limitations on using interviews as a main source of data collection. The literature allows for a small number of interviews to reach data saturation, in theory. However, the research design called for a variety of actors to be interviewed and accounted for a total number of interviews overall, not a minimum number of interviewees in each stakeholder group. When conducting an interdisciplinary study that assesses multiple viewpoints, this

distinction is crucial. A minimum number of interviews in each group would have provided a more substantial data set.

There is a level of comfort needed to conduct effective interviews. Experience with keeping interviewees focused and asking more probing and thought-provoking questions through semi-structured interviews may be a factor in the types of answers given. To reduce the influence of the researchers' experience level on the data collection, the policy documents were able to enrich the data quality. Likewise, the ability to follow up with interviewees allowed for additional probing and poignant questions to be asked. The additional data sources as a means of decreasing research bias or influence further supports the need of triangulation in qualitative data collection.

The value of studying motivations on a practical level remains uncertain. "Copying" is the main form of learning and would arguably negate the need for studying motivations on a mass scale if a large number of ordinances reuse similar language. However, discovering that motivations do not always align with anticipated effects may be relevant in how policy is drafted in the future. For example, bans are used as justification for managing persistent litter and do not always improve the recyclability of the waste stream if viable alternatives do not exist. However, litter management and recyclability are often cited together as motivations for plastic product bans.

Harmonization was a valuable lens in which to analyze the relationship between local and state policies. It provided an understanding of how the vertical relationship of government impacts the implementation and success of the policy. However, on a practical level, policy coherence may have provided a more applicable perspective for practitioners as it aims to understand the interaction between policies that are already in place and more directly impacts policy decisions.

6.7 Further Research

Further research needs to be done to assess what existing policies are going to, directly and indirectly, impact a holistic, system-wide plastics policy. This is the first step in analyzing policy cohesion on a State level. Once a set of relevant policies are determined, how these policies interact will need to be evaluated with actions to mitigate conflicts and barriers for success.

Mapping of existing resources, information, and data within CalRecycle may prove that much of the information needed to inform the plastics playbook already exists. Evaluating what is available will reduce the resources and time needed to be drafting a comprehensive strategy. Similarly, stakeholder mapping will help understand which actors have access to what resources like data and funding. Engaging the main players would create a coalition to work on to draft a playbook and receive input from actors across the plastics value chain.

Finally, as the EU's Plastics Strategy is relatively new, studying its implementation, effects on various actors, mechanisms for evaluation, and definitions of success may help provide lessons learned to inform California's plastics strategy.

7 Conclusion

Plastics are produced more than any other man-made material and has been credited with changing the chemical and physical composition of the terrestrial and marine environment. The globalization of the anti-plastic norm has been led in part by the successful campaigns of governance entrepreneurs highlighting both the local and global problematizations associated with mismanaged plastic waste across the globe.

When used appropriately and managed effectively at the end of life, plastic has many benefits to society. However, the rate at which the material is made and consumed, and the variety of uses it is manufactured for on the consumer market has made recycling impractical as the sole form of management. This has forced local cities to employ a variety of other policy tools to be used including bans of plastic products. The urgency around plastic pollution cannot wait for the normal pace of norm-development to stimulate policy change but that does not mean reactive and fragmented policy is the only course of action.

California has a history of management at multiple levels of government and is an environmental pioneer in the US. It has a high rate of local plastic bans and was the first state to ban plastic bags. Its population size and global economic standing make it an internationally recognizable player and the “California effect” means that policies enacted on a state level can have far-reaching implications for the rest of the US.

RQ1: What are the motivations for local municipalities in California to implement plastic product bans and how has it contributed to policy diffusion at the local level?

California has a precedent for local agencies enacting their own progressive policies and it does not appear they are going to slow down their efforts when it comes to mitigating plastic pollution and waste. The motivations for local policy implementation are mostly aligned under themes of environmental health, community health, and waste infrastructure. One of the more controversial motivations being to pressure the State to act. Motivations aimed to solve both local and global problematizations of plastic waste in California were found, which did not align with the literature review’s findings that countries in the Global North focus on the global perspective of plastic. The perception that California has a more robust waste infrastructure and therefore did not have the same level of local issues did not account for the dependence on outsourcing plastic waste to countries in the Global South. The need for more robust policies to increase domestic recycling infrastructure led to the reemergence of bans as a means of management in the wake of increased plastic use and plastic variety. Thus, leading to an increase in plastic product bans diffusing at the local level.

RQ2: What are the expected effects of local plastic pollution bans? What factors influence the expected effects of plastic pollution bans?

There are a wide range of expected effects from local polystyrene and single-use plastic bans. Local agencies have the most influence over their constituents, so a main goal is to influence consumer behavior, followed by reducing litter in their communities to promote an aesthetically pleasing environment and save money on cleanup costs. The most surprising anticipated effect is trying to influence state legislators to act and affect policy from the bottom up. The internal context of each local city does play a major role in how policies are implemented and enforced. Additionally, a number of external factors outside of the city’s control, such as access to facilities to manage non-plastic alternatives, also influences implementation. Contextual influences and varying anticipated effects make it difficult to

determine the collective effects of policy conducted on a local level highlighting the importance of establishing criteria for evaluating effectiveness.

RQ3: How can the motivations and expected effects inform a more harmonized approach to plastic pollution in California?

The variety of motivations and anticipated effects do inform the need for a more harmonized policy plan to unite the patchwork of plastics policies in California and better quantify impact. The State's current use of harmonized rules and structures have been effective in managing other kinds of troublesome waste and should be applied more specifically to plastic regulation. The State can use its resources and influence to create a unified policy objective that can guide policymakers at all levels to ensure tangible impacts are being made, not just symbolic ones. A statewide "plastics playbook" can address the entire value chain of plastics production by assigning roles for each level of government. The playbook would define metrics to measure success so that local programs can ensure they're effective in addressing the global plastic problem and its local impacts. Drafting a comprehensive, coordinated, and cohesive plastics mitigation strategy can guide actors at all levels of government towards a harmonized policy goal.

The momentum around reducing troublesome plastic needs to be led by coordinated change at multiple levels of governance. Local and state actors can justify the creation of a statewide strategy by using the data collected in this study to inform the need for a more comprehensive strategy for plastic mitigation. As CalRecycle and state legislatures move forward with drafting and implementing emergency bills to help improve recycling infrastructure in the wake of National Sword, they should also begin to think through the interaction of new and existing policies as long-term planning is an important element of a comprehensive strategy.

Local agencies should take this analysis as impetus to better articulate what the expected effects of plastic policies are and think through effective and meaningful ways to evaluate if a policy is achieving those goals. More tangibly, local agencies should take away the need to include end of life processor availability in their assessment of alternatives and include, or amend, the promotion of reusables in new and existing policies.

The plastics issue is global and transcends national boundaries. The urgency of the plastic pollution and waste problem has outgrown the current trend of banning troublesome products one by one and calls for a more comprehensive, coordinated, and cohesive policy strategy. As a beacon for environmental progress, California is uniquely positioned to create an inclusive, long-term plan that could become a blueprint for other states in the US to follow.

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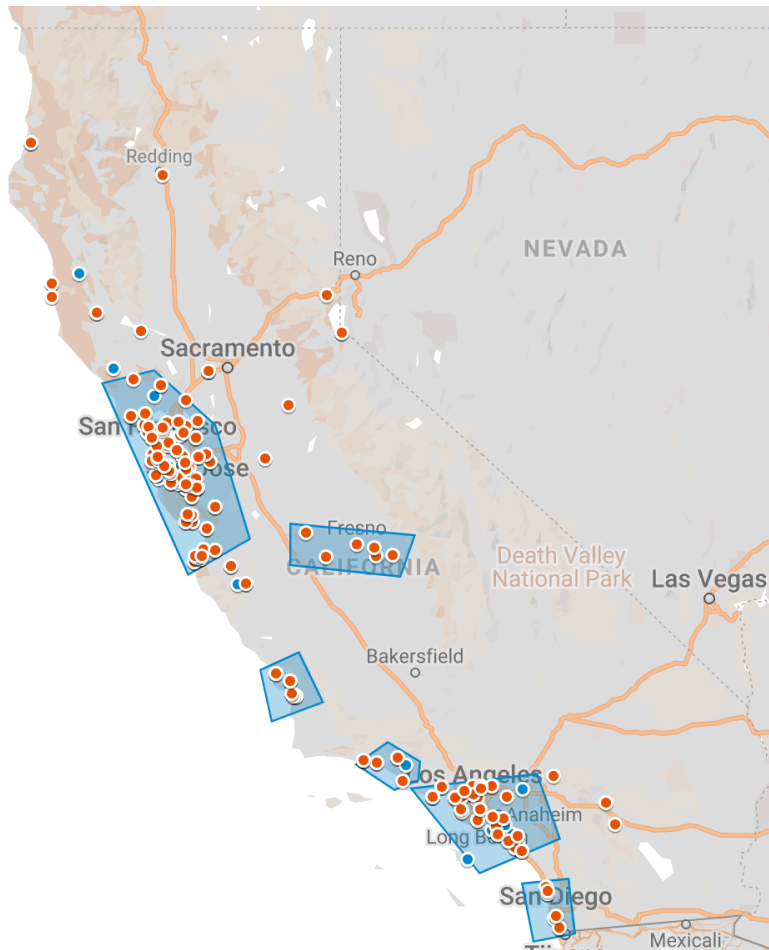
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Appendix

Appendix A: Cluster Sampling Method for Agencies with Plastic Ban



When the 168 agencies who have implemented regulation are mapped out geographically, six clusters emerge. The two largest clusters are in the Los Angeles/Orange County area, and the San Francisco Bay area. To increase likelihood that someone involved in the decision making and execution of the policy would still be available to interview the list was further narrowed to cities that have adopted either polystyrene and/or single-use plastics ordinances since 2015 which limited the list to 36 agencies.

The average size of a city in California in 2019 was 69,132 and the mode was 30,844 residents. Additional parameters for city selection included reaching out to cities with less than 400,00 residents and more than 10,000 residents which eliminated the eight largest cities and 107 smallest cities in the state since they were less representative of most city size and structures. Using geography and city size to stratify the sample helped limit some of the bias prone to cluster sampling (Blaikie & Priest, 2019).

Appendix B: Sample Interview Protocol

This is an abridged interview protocol. Some questions were slightly modified depending on the actor being interviewed. Often, Interviewees answered question areas without much prompting.

- Background
 - How does your agency handle or manage plastic waste?
- Motivations
 - Why did your city choose to take this course of action?
- Diffusion
 - What research, planning or due diligence did your city do to prepare for the policy?
- Expected Effects
 - What was the expectation or goal from the policy once implemented?
 - What were the challenges for implementation?
- Harmonization
 - What is the State's role in managing plastic waste?
 - What steps need to be taken next?

Appendix C: Interviewee Descriptions

Interviewees are ordered by date of completed interview:

Interviewee 1: City with plastic product ban in place

Interview 1, personal communication, phone, March 5, 2020.

Interview 1, personal communication, email, May 13, 2020

Interviewee 2: City without plastic product ban in place

Interview 2, personal communication, phone, March 6, 2020

Interview 2, personal communication, phone, May 13, 2020

Interviewee 3: Alternative plastic-product company

Interview 3, personal communication, phone, March 10, 2020

Interviewee 4: City with plastic product ban

Interview 4, personal communication, phone, March 11, 2020

Interviewee 5: Statewide industry Association

Interview 5, personal communication, phone, March 13, 2020

Interviewee 6: State of California

Interview 6, personal communication, phone, March 13, 2020

Interviewee 7: County with plastic product bans in place and currently researching additional products to ban

Interview 7, personal communication, phone, March 17, 2020

Interviewee 8: City without plastic product ban in place

Interview 8, personal communication, phone, March 19, 2020

Interviewee 9: City researching plastic product bans

Interview 9, personal communication, phone, March 23, 2020

Interview 9, personal communication, phone, May 15, 2020

Interviewee 10: City with plastic product ban in place

Interview 10, personal communication, phone, March 30, 2020

Interviewee 11: NGO

Interview 11, personal communication, phone, April 2, 2020

Appendix D: Policy Documents & Industry Position Papers

Below is a list of the city policy documents used in the analysis, followed by a list of the industry position papers used to formulate the industry response and reaction to plastic product bans.

City policy Documents

Agency	Expanded Polystyrene (EPS)/Polystyrene (PS) Ordinance	Single-use plastics (SUPs) Ordinance	Other
City of Alameda	X	X	
Albany	X		Frequently Asked Questions document
Aliso Viejo	X		
Arcata	X		
Arroyo Grande	X		
Avalon	X		
Belmont	X		Staff Report
Berkeley	X		Single-use food ware and litter
Burlingame	X		
Calabasas	X		Press Release
Campbell	X		
Capitola	X		
Carmel by the Sea			Food Packaging Ordinance
Carpinteria	X		
City of Los Angeles	X	Straws	
Concord	X		
Culver City	X		
Cupertino	X		
Daly City	X		
Dana Point	X		
Davis		Straws	Food Packaging
Del Mar	X	Straws	
Del Rey Oaks	X		
El Cerrito	X		
Emeryville			Eco Food-Ware Ordinance
Encinitas	X	X	
Fort Bragg	X		
Foster City	X		
Gonzales	X		
Greenfield	X		
Grover Beach	X		

Agency	Expanded Polystyrene (EPS)/Polystyrene (PS) Ordinance	Single-use plastics (SUPs) Ordinance	Other
Half Moon Bay	X		
Hayward	X		
Hercules	X		
Hermosa Beach	X		
Imperial Beach	X	X	
Lafayette	X		
Laguna Beach	X		
Laguna Woods	X		
Livermore	X		
Long Beach	X		
Los Altos	X		
Los Gatos	X		
Malibu	X	Straws	
Manhattan Beach	X		
Marina	X		
Martinez	X		
Menlo Park	X		
Millbrae	X		
Mill Valley			EPS Ordinance Flyer
Milpitas	X		
Monrovia	X		
Monterey	X		
Morgan Hill	X		
Morro Bay	X		
Mountain View	X		
Newport Beach	X		
Novato	X		
Ojai			Food Ware Ordinance
Pacific Grove	X	X	
Pacifica			Food Ware ordinance
Palo Alto	X		
Pasadena	X		
Pismo Beach	X		
Pittsburg	X		
Pleasanton	X		News Article
Rancho Cucamonga	X		
Redondo Beach			Press Release
Redwood City	X		
Richmond	X		
Salinas	X		
San Francisco	X	Straws	

Agency	Expanded Polystyrene (EPS)/Polystyrene (PS) Ordinance	Single-use plastics (SUPs) Ordinance	Other
San Leandro	X		
San Luis Obispo	X	Straws, bottles, caps	
San Mateo	X		
San Pablo	X		
San Bruno	X		
San Jose	X		
San Clemente	X		
San Leandro	X		
San Rafael	X		
Santa Barbra	X	X	
Santa Monica		X	Staff Report
Santa Clara	X		
Santa Cruz	X		
Sausalito	X		
Scotts Valley	X		
Seaside	X		
Solana Beach	X		
Sonoma	X		
South Lake Tahoe	X		
South Pasadena	X		
South San Francisco	X		
Sunnyvale	X		
Town of Colma			EPS Webpage
Truckee			SUP reduction report
Ukiah	X		
Union City	X	X	
Walnut Creek	X		
Watsonville	X		
West Hollywood	X		
Yountville	X		

Industry Position Papers

Industry	Position Letter
American Chemistry Council	CA Straw Legislation
American Chemistry Council	Change of position from oppose to neutral on SB 54/AB 1080
American Chemistry Council	Original Position letter on SB 54/AB 1080
CA Chamber of Commerce	Opposition letter to SB 54/ AB 1080 (March 2019)
CA Chamber of Commerce	Opposition letter to SB 54/ AB 1080 (July 2019)
CA Retailers Association	Opposition letter to SB 54/ AB 1080
CA Grocers Association	Change of position from oppose to support on SB 54/AB 1080
Grocery Manufacturers Association	Press Release regarding SB 54/AB 1080
Grocery Manufacturers Association	Op-ed
Produce Retailers Association	Op-ed
Recology	Op-ed
CA Senate	Bill Analysis document for SB 270 (plastic bag ban)
CA Senate	Bill Analysis document for SB 54 (Sept 6)
CA Senate	Bill Analysis document for SB 54 (Sept 11)
The following are response letters to San Francisco’s amendment and expansion of their EPS ordinance in 2016	
Small Business Commission Office, City and County San Francisco	Support letter
SF Environment	Support letter
EPS Industry Alliance	Oppose letter
ACH Foam Technologies	Oppose letter
Moore Recycling Associates Inc	Oppose letter
Foam Fabricators	Oppose letter
San Francisco Chamber of Commerce	Support letter
Tempo Precision Molded Foam	Oppose letter
Astrofoam Molding Company Inc	Oppose letter
Takashima U.S.A. Inc.	Oppose letter
Carlisle Construction Materials	Oppose letter
Arnold & Porter LLP, on behalf of the EPS Alliance	Oppose letter
Save the Bay	Support Letter
American Chemistry Council	Oppose letter
DOW Chemical Company	Wanted clarification that their brand “Styrofoam” should not be referred to specifically in the ordinance (this was corrected by the city to “EPS”).
The following were response letters to Grover Beach’s EPS ordinance	
EPS Alliance	Oppose letter
San Luis Obispo Integrated Waste Management Authority	Support letter

Appendix E: Thematic Coding Framework

Main Code	Sub code 1	Sub code 2	
Actors Affected	Any person, business or establishment		
	City Facilities & Staff		
	Contractors		
	Environmental Community		
	Events		
	Food Providers or Vendors		Fair vendors
			Farmers markets or stands
			Food trucks
			Grocery stores, deli's
			Nonprofits
			Pushcarts or street vendors
			Restaurants and cafés
			Take out vendors
	Haulers		
	Manufacturer		
	Retail		
Suppliers			
Wholesalers			
Alternatives	Affordable, Available, Environmentally preferable		
	Challenges	Bioplastics and compostable	
		False advertising	
		Bioplastics	
	Combinations of acceptable materials	Compostable, biodegradable	
		Compostable, recyclable	
		Compostable, recyclable, biodegradable	
		Compostable, reusable	
		Compostable, reusable, recyclable	
		Non-plastic	
		Returnable, recyclables	
		Returnable, recyclable, biodegradable	
		Returnable, recyclable, biodegradable, degradable	
		Reusable, recyclable	
	Reusable, recyclable biodegradable		
Encouragement of reusable food ware			
Expanding market for alternatives			
More sustainable choices			
Bans or restrictions	Prohibits non recyclables		

	Ban		
	Fee		
	Prohibited		
	Public procurement		
	Require		
	voluntary		
Coercion	State mandated		
	Stormwater permits		
	Strongly recommended		
Contextual factors	Access to resources		
	Alternatives and facilities		
	CEQA challenges		
	Enforcement		
	External Factors	Low recyclability/no market	
		Prop 218	
		Industry opposition	
	Political feasibility	Community pushback	
		Business (un)friendly	
		Inconvenience	
prioritization			
Diffusion	Existing regs – local		
	Existing regs – state		
	Horizontal		
	leadership		
	Learning		
	National level		
	vertical		
Economic competition	‘feel good’ messaging		
Enforcement	Behavior change		
Goals & Aims	Increase actual recycling rates		
	Increase producer responsibility		
	Low contamination of recycling		
	Reduce litter		
	Reduce production		
	Reduce waste - recycling		
	Reduce waste – source reduction		
	Vertical diffusion		
	Between existing regs		
	Countrywide		
Harmonization	Industry		
	Proximity		
	States responsibility		
Imitation			

Job loss		
Leadership		
learning		
Motivation	Animal life	Digestion/ingestion
		Endangered species
		Livestock
		Marine life and birds
	Cost reduction	Crew time
		Hauler Costs
		Landfill costs
		Lightweight material
		Litter clean up
		Maximize landfill operations
		Recycling costs
		Stormwater cleanup
	Economy and tourism	Beaches
	Landfill space	Capacity
		Cost
		Leaching
		Preservation of space
	Marine pollution	Habitat protection
		Protect all waterways
		Stormwater systems
		Water quality
	National Sword	
	Petroleum Based	
	Protect Environment	Contamination and degradation
		EPA
		“has duty to...”
		Human Health and Wellbeing
	Public Awareness	Educate
		Nudge
	Recycling	Difficult, impossible
		Encouragement of recyclable, compostable
		No local programs
Not economically feasible		
Reduce Hazardous waste		
Source Reduction	Establish standards and procedures	
	Reduce waste, disposal, volume...	
	Significant portion of waste stream	
	City goals	
Zero Waste		

Appendix F: Mandates that influence plastic regulation in California

Below is a sample of mandates that were mentioned in the data collection that influence plastics regulation. It is *not* an exhaustive list of regulations that may directly or indirectly influence plastic pollution regulations.

Policy	Description	Influence on plastic bans
California Environmental Quality Act (CEQA)	“generally requires state and local government agencies to inform decision makers and the public about the potential environmental impacts of proposed projects, and to reduce those environmental impacts to the extent feasible” (<i>CEQA: the California Environmental Quality Act</i> , 2020)	Almost every policy document mentions CEQA either needing to have one or that they used a nearby CEQA negative declaration. A negative declaration states that the project will not cause any adverse environmental impacts. An example is the cities near San Jose, CA adopted a negative declaration that resulted from San Jose’s environmental impact assessment.
Stormwater pollution	NPDES Permit Program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Examples of pollutants include, but are not limited to, rock, sand, dirt, and agricultural, industrial, and municipal waste discharged into waters of the United States (<i>Storm Water Program</i> , 2020).	Storm water is often considered a nuisance because it mobilizes pollutants such as motor oil and trash. In most cases, storm water flows directly to water bodies through sewer systems, contributing a major source of pollution to rivers, lakes, and the ocean. Storm water discharges in California are regulated through National Pollutant Discharge Elimination System (NPDES) permits.
Health Code Requirements	Existing local regulations to reduce cross contamination at grocery stores, delis and other food establishments.	Can restrict refillable or reusable containers that are not provided by the retail establishment or food vendor either because the health code prohibits it or because the business is uneducated about the allowance for these containers and afraid they will be in violation.
Proposition 218	“...ensure that all taxes and most charges on property owners are subject to voter approval. In addition, Proposition 218 seeks to curb some perceived abuses in the use of assessments and property-related fees, specifically the use of these revenue-raising tools to pay for general governmental services rather than property-related services (<i>Understanding Proposition 218</i> , 1996).” Defines a fee vs. a tax and states that, “the amount of the fee may not exceed the cost of the government to provide the service.”	Cities may find it easier to pass bans in lieu of fees or other market-based instruments because they are not potentially subjected to Prop 218 voting.