

2017

The Potential and Limits of Extended Producer Responsibility: A Comparative Analysis Study

Jessica Bass

Claremont McKenna College

Recommended Citation

Bass, Jessica, "The Potential and Limits of Extended Producer Responsibility: A Comparative Analysis Study" (2017). *CMC Senior Theses*. 1693.

http://scholarship.claremont.edu/cmc_theses/1693

This Open Access Senior Thesis is brought to you by Scholarship@Claremont. It has been accepted for inclusion in this collection by an authorized administrator. For more information, please contact scholarship@cuc.claremont.edu.

Claremont McKenna College

**The Potential and Limits of
Extended Producer Responsibility:
A Comparative Analysis Study**

submitted to
Professor William Ascher

by
Jessica Bass

for
Senior Thesis
Fall 2016 and Spring 2017
April 24, 2017

Abstract

Solid waste disposal weighs heavily upon our society at \$205 billion dollars per year, and upon the environment at an estimated 3.5 million tons per day (Hoornweg, Bhada-Tata, and Kennedy 2013). The burden and risk that remain at the end of a product's life suggest a need for policy measures to help align the experiences of different actors throughout a product's lifecycle with the social and environmental costs that they incur.

This thesis draws on the concept of product stewardship and its focus on incorporating all of the actors in a product's lifecycle into steps to take responsibility for waste management. Extended Producer Responsibility (EPR) recognizes the producer's distinct potential to consider and drive change in waste management. Producers often serve like mediators between the design and use phases of a product's lifecycle. Through EPR policies, the producer takes on the costs of ensuring safe end-of-life waste disposal. In this way, EPR can be expected to help relieve the public of some of the costs of waste disposal, and to support consideration of social and environmental impacts that a product may incur.

This thesis examines EPR policy adoption and effectiveness in order to understand its ability to meet its theoretical expectations. Exploring the consideration and implementation of EPR policy measures, and particularly a case study of these policies in California, this thesis identifies several emerging challenges and trends that define openness to, and the success of, EPR. EPR policy proposals often encounter resistance that limits their strength and reach. In order to realize the full potential benefits of EPR, regulatory bodies will need to wholeheartedly support competition and enforcement to preserve the incentives within these policies. This thesis suggests that EPR still holds strong potential to bring together the social, environmental, and economic costs of waste management, both in theory and in practice, and offers broad recommendations for efforts to support this alignment.

Acknowledgments

This research would not have been possible without the relentless guidance, patience, and support that I received from friends, family, mentors, and experts in this field. This thesis is the culmination of the information and skills that I have learned throughout my education and my experiences. Words cannot express my gratitude to all of the teachers and mentors that have guided me and helped me grow personally and academically. You continue to inspire me and help bring out the best in me.

Thank you, especially, to my reader, Professor Bill Ascher. It has been an honor to have the chance to work directly with you each week. Thank you for your trust in me, and for your patient guidance that allowed me to explore but kept me on the right path. I am so grateful to have had you as a guide throughout my time at CMC.

Over the past year, I have been overwhelmed by support from friends, even though they were often in the very same boat. Thank you so much for the times that you took on an extra burden in order to allow me additional time to work. Thank you for all of the incredible memories so far, and the promise of many more to come.

Finally, thank you so much to my family. Thank you for working so hard to provide me with so many opportunities to learn and explore. Thank you for your confidence in me, allowing me to venture on my own but then also lending your open ears and helping hands when I needed support. You inspire me in every way. Please know that I will always be there to support you, in turn.

While this has been an incredible experience for me, I will continue to focus on making it count for others and carrying on all that each of you has done for me. From the bottom of my heart, thank you.

Table of Contents

Chapter 1: Introduction: The Distribution of Costs throughout the Product Lifecycle.....	1
The Issue	1
Policy Instruments	14
Chapter 2: The Context for a Shift in Responsibility for Waste	29
History and Background of EPR Policy	29
International Consideration of EPR Policy	29
Adapting EPR Policy within the United States.....	33
Case Study: California	36
Chapter 3: Trends in Consideration and Implementation of EPR	50
General Trends in EPR Policy	50
Trends in the United States	61
EPR Policy in California.....	66
Chapter 4: Challenges to the Implementation and Success of EPR.....	77
The Stringency and Potential of Regulations:.....	77
Obstacles to Successful EPR Policies	80
Challenges in light of EPR Policy Structure	87
Chapter 5: Conditioning Factors and Recommendations for the Future of EPR	96
EPR on the Global Stage.....	96
EPR in the United States.....	111
EPR Policy Moving Forward in California.....	112
Conclusion	120
References	122

Chapter 1: Introduction: The Distribution of Costs throughout the Product Lifecycle

To halt the decline of an ecosystem,
it is necessary to think like an ecosystem.

— *Douglas P. Wheeler*, EPA Journal, *September-October 1990*

The Issue

Waste Generation and Its Costs

The average person produces approximately 2.6 to 3.2 pounds of solid waste each day, and global, per capita household hazardous wastes exceed 0.9 pounds per day (Hoorweg and Bhada-Tata 2012; Chandrappa and Das 2012). The total quantity of solid waste hauled away from businesses, restaurants, manufacturing centers, and homes exceeds six million tons per day, and requires a line of full garbage trucks that would be over 3100 miles in length (The World Bank 2013). However, these numbers fail to reflect the environmental impacts of the natural resources that are harvested for products to be made, and the hundreds of years it may take before these resources are reintegrated into the natural environment. Each of the phases within these products' lifecycles, from extraction to manufacture, transport, use, and final disposal, takes a significant toll on the environment. Ensuring that waste is disposed of safely is critical for the health of individuals and the global ecosystem. Yet, the high level of investment needed to build and operate waste management systems, and the disconnect between product prices and the environmental costs of their manufacture and use, suggest the need for policies that help evenly distribute the costs and consequences of waste, in the long run. A future of sustainable waste management will

require collaboration and support on the part of all parties that contribute to the global waste stream.

As the world's population continues to increase and demand for food and goods rises in turn, waste management plays an increasingly critical role—in public health, safety, and the economy; in protecting the environment; and in the distribution of limited resources. If current rates of economic development and population growth continue throughout the remainder of the century, global waste generation is forecasted to triple, with more than eleven-million tons of trash sent to its final destination, each day (Hoornweg 2013). Unfortunately, the burden of waste management presents high costs both in the short- and long-run. This is especially the case for developing countries, where solid waste management services may absorb 20 to 50 percent of the municipal budgets (The World Bank 2016). While the immediate costs of planning, carrying out, and maintaining the infrastructure to safely and efficiently handle waste are very large, the consequences of not doing so can be severe. In low- to middle-income countries, the costs of uncontrolled waste may negatively impact society and the economy by five to ten times more per capita than the equivalent cost of secure waste management (UNEP 2015, 269). As waste piles up it can clog pipes, produce landslides, and harbor disease; as it degrades in an unsecured location, small particles pollute water and air, and hazardous chemicals can be released. The potential economic and environmental impacts of this, in addition to the negative health consequences suffered, can be significant to communities of any size or standing.

Solid waste may pose a threat if it is left uncollected, or if improper disposal occurs. As rates of consumption continue to rise in many parts of the world, cities are unable to keep up with the demand for and high costs of waste management efforts. While waste collection in middle-income countries ranges from approximately 50 to 80 percent coverage, less developed countries

are often only able to serve 30 to 60 percent of households (UN-HABITAT 2010, 14). Waste that remains uncollected is not only unpleasant, but it may also be dangerous. Accumulated solid wastes can cause a domino effect that impairs other sanitation infrastructure, blocking drains and producing floods, and serving as a breeding ground for vermin and other disease vectors. In 2011, seasonal rains in Accra, Ghana swept so much uncollected waste into the drain system that the city flooded. More than 17,000 homes were destroyed, and 43,000 were damaged. The flood and exposed sewage also created breeding grounds for disease that was later tied to more than one hundred cases of cholera (UNEP 2015, 3).

Uncontrolled municipal or industrial waste disposal in the form of dumping or burning can also have a significant impact on the local environment and public health. In some cases, like that of Quezon City in the Philippines where an uncontrolled dumpsite collapsed and caused a landslide that buried nearly three hundred people, a failure to provide safe waste management infrastructure is responsible for these risks (UNEP 2015, 6). In other cases, manufacturers or individuals may illegally overlook waste disposal regulations due to a lack of information or the need to avoid extra costs and inconveniences. Between 2001 and 2005, the United States Centers for Disease Control and Prevention received 37,000 reports of instances in which hazardous substances were disposed of improperly (CDC 2005). These mistakes in hazardous waste disposal resulted in a variety of injuries ranging from respiratory irritation to impairment of the central nervous system, and property damages. The risks associated with all forms of waste management demonstrate the clear need to design and support incentive structures and educational efforts to protect the public's and the broader ecosystem's health.

Waste management, itself, also poses significant threats to the environment. These negative impacts may be associated with informal or poorly structured waste management systems,

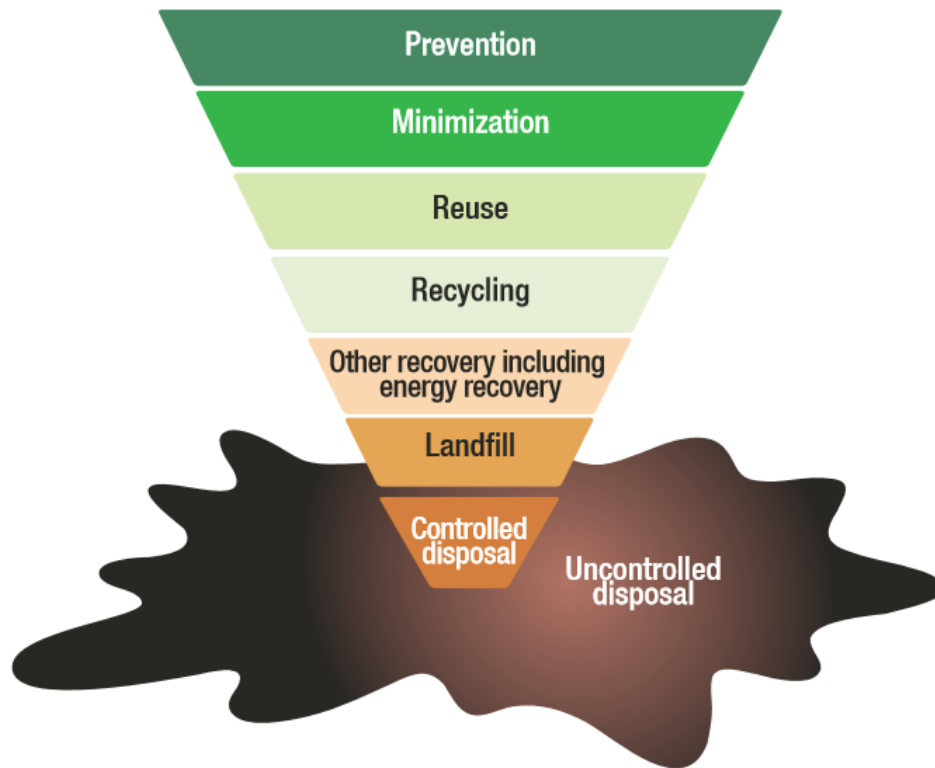
or they may simply be the cumulative consequences of standard waste management operations on a large scale. Solid waste that is dumped or burned illegally can weigh heavily on the environment in the form of black carbon dioxide. Entire ecosystems may suffer when species frequently become tangled in or consume small plastic pieces that were disposed of improperly. While standards and agreements at the international, national, and local levels help to reduce the negative environmental impacts of waste disposal, landfills and incineration may still pose a direct threat to ecosystems through land clearing, hazardous air pollutants, and water contamination.

Waste disposal is also a key factor in global climate change. The 2007 International Panel on Climate Change report suggests that waste disposal makes up approximately three percent of global greenhouse gas emissions (Metz et al. 2007, 27). The processes of waste collection and material recovery demand high quantities of fuel for vehicles and as a source of electricity, and release large quantities of carbon dioxide. Landfills produce up to twelve percent of global methane emissions (EPA 2015). While some sites are able to capture and burn these gases to generate electricity, this process is not practical everywhere, and does not fully compensate for the emissions that are produced (Metz et al. 2007, 601).

Recycling and reuse are important means of decreasing the environmental and economic costs of waste. However, these processes also have significant, negative impacts on the environment. For this reason, careful resource management and conservation are critical aspects of the modern waste management system. The Waste Management Hierarchy, constructed by scientists at the Basel Convention, offers a general standard of the most to least optimal means of managing waste in order to minimize negative impacts on the environment (UNEP 2015, 31). Figure 1.1, below, depicts the Waste Management Hierarchy. The Hierarchy prioritizes “Prevention” of waste production and resource use, continuing down the ranks to “Uncontrolled

disposal”. These practices are weighed based on their general influence on the resources and energy needed for production, and those left at the end of a product’s life. One way that industries may be able to incorporate preventative change is by increasing product lifespan or products’ ability to fill multiple roles. This may also minimize the need for, and costs associated with, waste disposal.

Figure 1.1 The Waste Management Hierarchy



Source: UNEP 2015, 31.

The Waste Management Hierarchy depicts the general order of priority (from highest at the top to lowest at the bottom) for carrying out waste management efforts in order to minimize environmental impact.

In addition to preventative efforts, manufacturers may also be able to reuse components or make use of recycled materials in order to produce goods. The use of recycled materials can help overcome the additional time and energy required for waste to break down, and for suppliers to re-harvest these resources. The impacts of reduction and reuse rather than harvest of virgin natural resources may vary based on the product type and the nature of its disposal. Paper recycling and reuse, for example, may allow forests to continue to grow and sequester carbon and support a local ecosystem. Paper reuse also reduces the required energy inputs in the production process by as much as 50 percent. The impact is similar for glass (a 35 percent reduction in production energy), steel (50 percent), plastics (70 percent), and aluminum (90 percent) (UNEP 2015, 14). The IPCC predicts that improving the efficiency of waste and resource management may mitigate as much as 15 to 20 percent global greenhouse gas emissions that contribute to climate change (Edenhofer et al. 2014, 24).

As these environmental costs and benefits are accounted for, focus on prevention prior to disposal continues to grow alongside efforts to ensure a safe means of managing the waste that remains at the end of products' usable lives. While the Waste Management Hierarchy presents generalized priorities surrounding waste management, it is important to note that its focus is limited to environmental impact. These priorities may not hold true when accounting for the social or public health costs of waste management. The Hierarchy also fails to account for challenges related to initial waste collection and storage, which are essential for any form of waste management later down the line. Many communities continue to lack access to waste management services, therefore the Hierarchy may seem out of reach to them, and their waste management plans should focus on other challenges, instead (UNEP 2015, 31).

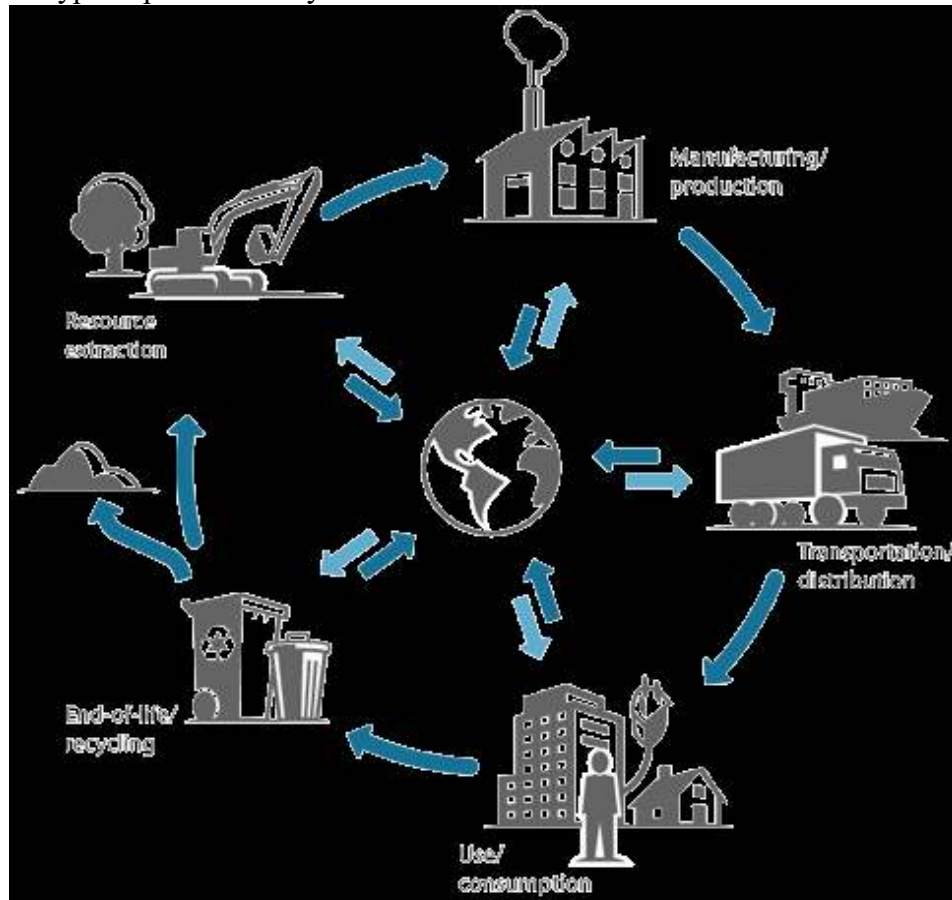
Consideration of the environmental, economic, social, and political implications of resource use and product development continues to expand and inspire many new perspectives and areas of research related to waste management. Since the 1960s, when major environmental concerns were first addressed at the international level, waste management has significantly improved in many parts of the world (UNEP 2015, 7). However, waste that cannot or should not be disposed of in a landfill continues to present a challenge, especially in light of the increasing accessibility of electronics and other products that may contain rare or hazardous components. While early waste management efforts focused on proper disposal of products once they reached their end-of-life, today, most emphasize the need to consider the impacts of production with respect to prevention and minimization, in addition to end-of-life recycling and reuse. In this way, the focus on environmental and public health concerns related to waste disposal has expanded into a broader embrace of waste and resource management efforts (UNEP 2015, 7).

Policymakers and producers are also shifting to a more holistic consideration of full product “lifecycles” from manufacture, to use, and as waste, within large industrial “ecosystems”. Fields such as Industrial Ecology carry out Life Cycle Assessments and Material and Energy Flows Analysis to design and evaluate production and disposal efforts that work in harmony with the cycles and patterns of nature (Yale University Center for Industrial Ecology 2014). Figure 1.2, below, shows the five main stages that a product goes through, from Resource Extraction to End-of-life (waste), or Recycling. The initial stages, from resource extraction through consumption, are considered “upstream” (prevention or minimization) efforts. Waste management focuses on those “downstream” from production, including recycling or end-of-life disposal.

The arrows pointing to and from the Earth and each stage in this diagram represent the exchange of energy and resources as the product progresses from one phase to another. While not

explicitly shown, the exchanges at and between each phase also produce forms of energy and resource waste, some of which is lost and some that can be captured and reused. A product's lifecycle may come full circle and start again, or the losses that accumulate may be so much that the product or materials cannot be reused.

Figure 1.2 A typical product lifecycle



Source: Hydro-Québec 2017.

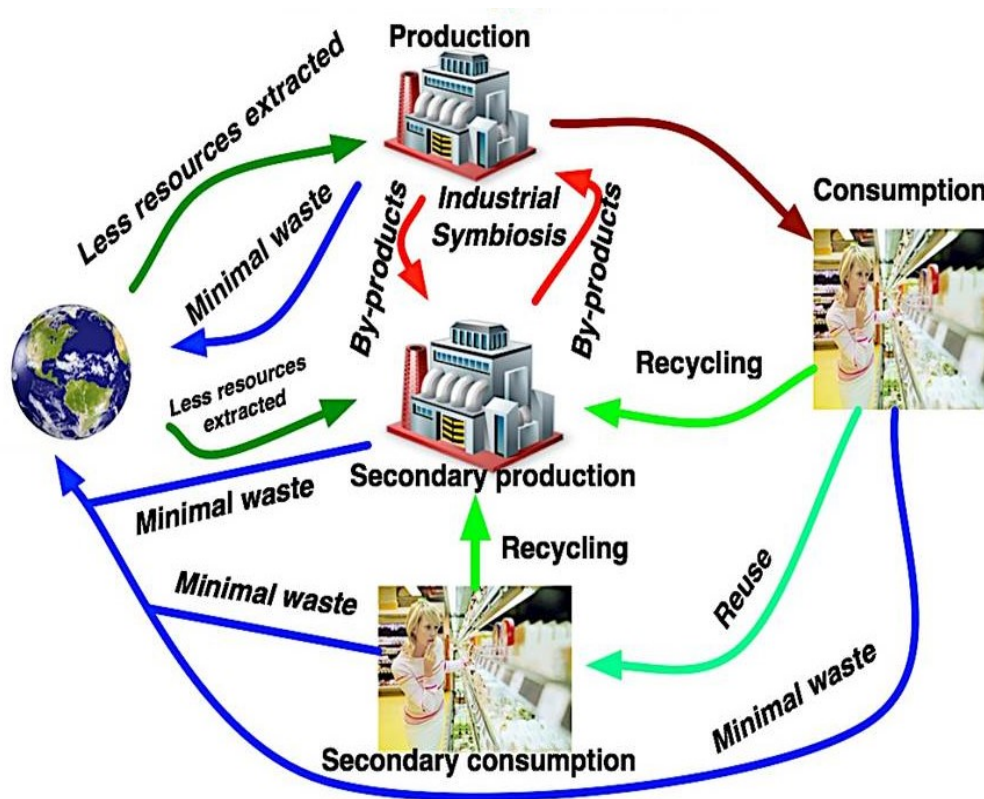
As a product passes through each phase of its lifecycle there is potential for losses of energy and resources. The actors within each phase of the product's lifecycle play an important role in its efficiency as a whole.

It is important to note that product lifecycles are often far more complex than those detailed in Figure 1.2. Products may pass through many more stages, including some more than once.

Various components within a product may also be composed of different resources and go through their own manufacturing, transportation, and disposal processes.

Industrial Ecology focuses on mapping these complex exchanges, and minimizing the amount of waste produced in and between each phase, for each part. Within this industrial ecosystem, every actor strives to maximize efficiency by minimizing wastes and directing any resources it does not need to another party who is able to use them. Figure 1.3 offers a diagram of the exchange and conservation of resources throughout the phases of a product's lifecycle.

Figure 1.3 Industrial Ecology processes



Source: Halog 2015.

Within the industrial ecosystem, the by-products from one actor's work are captured and given as resources to another actor. This reduces the amount of resources that has to be extracted in order to fulfill these two orders and leaves behind "minimal waste".

This focus on the upstream inputs and downstream impacts of a product's lifecycle can help bridge the gaps between waste production and resource management. This is especially important as waste is inextricably linked to a number of global challenges including climate change, poverty, health, food security, and resource scarcity (UNEP 2015, 7). Its social, environmental, and economic impacts make it a core part of the triple bottom line in a sustainable society. Waste and resource management are key aspects of the sustainable development movement.

Allocating Responsibility for Waste

Waste may be generated by a variety of sources. However, the financial and environmental costs of resource depletion and waste disposal are rarely explicitly identified, much less distributed among those whose demand contributes to these negative impacts. A future of sustainable waste management will require the embrace of socially and environmentally conscientious efforts throughout product lifecycles in order to prevent damages caused by product manufacturing, use, or disposal. To accomplish this, regulators may consider how the costs of waste generation and management should be expressed and distributed among some of the major actors who depend on this system, such as consumers, sellers, waste management bodies, and producers. Each of the actors throughout a product's lifecycle holds a different capacity to influence the social, environmental, and financial aspects of a product's end-of-life disposal, and faces distinct costs of doing so. Consideration of these primary actors and their respective costs may help define the ways in which responsibilities may be distributed to allow them to lead efforts to overcome the financial and infrastructural challenges that are associated with waste today.

Customers. Customers sit at the heart of a product's lifecycle; they are focus of its design scheme and the ones who experience much of a product's active life between the stages of

assembly and disposal.¹ However, customers typically possess limited information regarding a product's broader lifecycle, and have demonstrated little willingness and ability to act in a way that prioritizes conscientious waste disposal. This is especially the case when special recycling or disposal sites are inconvenient to access or present additional costs to the consumer (Saphores et al. 2006).

In today's globalized economy, customers are often far removed from the environmental and infrastructural costs of the products that they use. The environmental footprint of a product seems to become hidden away as that product and its components are assembled and as it changes hands prior to and following its use. In this way, consumers have limited ability to evaluate or alter their purchasing decisions out of concern for the environment. A lack of access to information may also restrict their ability to signal to manufacturers the value of minimizing the environmental impacts of products (Lund 1994, iv). Product disposal fees and educational efforts may help customers internalize an understanding of the environmental costs of products, and may inspire behavioral change that helps reduce the high demands on waste management systems. However, their potential to drive change throughout the product lifecycle may be limited, therefore these approaches may be most effective as a complement to other policy measures.

Sellers. Sellers are the intermediaries between customers and producers. They may be locally- or internationally-based, and may operate primarily in the store or online; they may also be independent or manufacturer owned, which influences their level of autonomy. In these roles, sellers may not hold a specific ethical responsibility for addressing environmental concerns if they are not directly contributing to problems of disposal or issues of limited resource use. However,

¹ Some products may be taken back and refurbished, then returned to use. The consumer may hold a different role within a refurbished product's lifecycle, and may also be expected to return items in a way that allows for them to be restored and used again.

sellers have a distinct opportunity to help address these challenges. As the point of purchase, sellers may be able to inform customers about the external environmental costs and benefits of products, or offer guidance or incentives for safe disposal. Occasionally, they also help facilitate these efforts by carrying out deposit-refund systems, serving as a point of collection for end-of-life product recovery, or ensuring compliance by selling only from producers that comply with product stewardship requirements. While sellers are generally unable to make direct changes to product design, they may pass information regarding the financial or environmental viability of products on to producers, either directly, or through their procurement decisions. The nature of these efforts may depend on a seller's relationship with manufacturers, and the organizational structure. Work to address these environmental and health issues may also demonstrate a commitment to corporate social responsibility, which can offer benefits in the form of positive publicity. Sellers who facilitate these processes may also receive increased revenue from the product take-back service they provide or from material recycling (Biddle 1993).

Waste Management Entities. Waste management entities may be public or private, and serve to collect trash, recyclable items, or other goods that require disposal. They are often organized or employed in an effort to protect residents' or customers' health and enjoyment, and secondarily for environmental preservation or concern. Funding, building, and maintaining waste management infrastructure and services require a significant investment. For this reason, waste management entities may face constraints in their capacity to efficiently collect and dispose of a variety of types of waste, recyclable, and potentially hazardous materials.

Waste management bodies are often far removed from both production and demand for products, and have a relatively weak influence on the incentive to support upstream producer responsibility. This suggests that their role as waste managers may not be well aligned with the

need to internalize costs to drive sustainable resource use and waste management. It is important to note that the pricing structure that waste management entities establish may occasionally influence the quantity and the composition of waste that customers produce. However, price may not be a foolproof means of reducing waste if customers choose to dispose of waste improperly rather than pay more.

Producers. A variety of actors may design or manufacture different components of a product. In this context, the “producer” of an item will be understood on the basis that this actor has access to information regarding a product’s lifecycle and is in a position to internalize the need for sustainable resource use and waste management. In following with the OECD’s definition in its *Extended Producer Responsibility: A Guidance Manual for Governments* (2001, 12), the producer may often be recognized as the brand owner or manufacturer of a product. However, the defining attributes of this title tie back to that actor’s ability to internalize upstream and downstream feedback, and the authority to actively lead a response.

Many producers demonstrate their willingness to take customer values into account through their embrace of corporate social responsibility and social and environmental justice considerations. In this way, they may take on additional responsibilities or change the design of their product in order to improve their corporate image and align with customer values. Producers may also be open to voluntarily accepting these responsibilities or leading product design improvements if it may reduce the need for or costs of compliance with formal, and possibly more stringent, waste management legislation related to their product.

As the intermediary between the initial resource inputs and the final products that customers demand, producers often both receive economic feedback and are a position from which they can lead design changes. In this light, policy proposals have increasingly looked toward

producers with hope that, if they face the costs of the waste associated with a product both before and after it leaves their hands, then they may be able to influence other actors throughout that product's lifecycle. In this way, rather than strictly taking on all of the costs of waste by themselves, producers may distribute these costs so as to create incentives to reduce the quantity of waste produced and the social, environmental, and economic costs that it incurs.

As policy measures are put in place in an effort to redistribute the burden of waste management and drive a change in related behavior, it is important to acknowledge that these costs are generally, ultimately borne by consumers. Consumers may see this additional cost if it takes the form of a visible fee. Alternatively, producers may choose to integrate this fee into the price of the product, itself. This decision may be dictated by policy requirements, or by the price elasticity of the market for that product. Ultimately, the price that a customer pays for safe product disposal may be very similar, if they would otherwise have to pay for special recycling services or contribute to public waste management funds. However, the benefits of such a policy may come primarily from the potential for increased convenience and likelihood of safe disposal, and any change in behavior that may be driven by these visible costs.

Policy Instruments

Introduction

Over the past half century, policymakers and the general public have grown increasingly aware of the hazards of pollution and waste generation, and have taken action to shape policies that will mitigate the financial and public health burdens that these may pose. However, the world population continues to climb and become more interconnected, and the amount of global waste produced has continued to grow (OECD 2016, 9). There are several factors that may be contributing to this perpetuated problem. First, as customers are often relatively removed from

the consequences of their purchasing habits, there may not be an incentive for consumers to take social or environmental considerations into account at the time of their purchase, or to make extra efforts or take on costs in order to dispose of items in a socially optimal manner. Second, following from limited consumer action, producers may also face few reasons to design their products in order to address environmental concerns. A lack of adequate infrastructure to collect or treat waste products in the most efficient manner may also contribute to these failures to inspire environmentally conscious design and disposal. However, this infrastructure can be very expensive to set up, and recycling or disposal operations are not always inherently profitable, and therefore may require additional funding or policy mechanisms to provide support.

There is a clear need for action in order to remove these negative incentives and ensure that they do not become any worse. Such action may include education, for instance through labeling or informational campaigns that are planned by non-profit organizations or organized in response to policy mandates. These issues might also be addressed through policies that establish incentives and bans for certain products. These measures may target “upstream” actors who interact with the product prior to consumer use, or they may be focused on end-of-life product disposal. However, as the global marketplace has become increasingly interconnected, there has been growing support for policies and perspectives that can offer an incentive that may be passed along in order to drive mutually-reinforcing change in many different actors throughout a product’s lifecycle.

Product Stewardship and Extended Responsibility Policy

The concept of *product stewardship* embraces all actors that are involved with a product, and supports the notion that each should take responsibility for minimizing the consequences of their interaction with that product (Product Stewardship Institute 2016b). In this way, the policy may allow for flexibility with respect to the distribution of the burden of waste management.

Typically, in order to meet a product stewardship policy's objectives, one or more actors involved in a product's lifecycle will propose a plan to improve collection and treatment of a product at its end-of-life. This often involves the use of informational or market-based instruments. In this way, product stewardship policies may play an important role in reducing the costs that municipalities or the government may bear when providing waste management services. They may also help guide customers to consider the public and environmental health implications of their purchases. However, product stewardship requirements generally do not provide a substantial incentive to reduce consumption. Furthermore, producers often receive limited feedback regarding the impact their product design may have on other lifecycle management costs. In this way, product stewardship policies may not inspire producers to re-design products in order to minimize their environmental impacts (Nicol and Thompson 2007, 4).

These limitations have inspired consideration of policies that shift the burden of waste management in a way that the producer will be able to enact change and receive feedback throughout the product lifecycle. Many of these policies have focused on producers in order to distribute the consequences of their efforts more evenly, and to raise expectations for product stewardship. This approach is known as Extended Producer Responsibility (EPR), and it is most commonly defined as "an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle" (OECD 2001, 9).

It is important to acknowledge that the nature and extent of the obligations that are expected of producers in EPR may vary. Some policymakers and analysts may not distinguish between the financial and operational obligations that producers face in EPR and other product stewardship policies, while others suggest that EPR policies must require that producers take on the highest share of their product's end-of-life recycling or disposal costs. Policy scientists also debate the

extent to which EPR policy may encompass upstream, as well as downstream, regulations (Lifset et al. 2013, 162).

In the context of this thesis, EPR can be understood to include only those policies in which producers embrace at least a majority of the financial responsibility for their product’s collection and disposal. EPR policy may or may not include upstream regulations such as material choice or toxics reduction, as well. Further, the actor that is recognized as a “producer” and is thus subject to EPR regulations can be recognized based on its ability to internalize and respond to upstream and downstream feedback throughout a product’s lifecycle. In following from the OECD’s 2001 *Guidance Manual* (as described previously), this actor is most often the brand owner or importer or a product. Table 1.1 (below) clarifies the distinction between EPR policies and other forms of product stewardship.

Table 1.1 A comparison of EPR and Other forms of Product Stewardship

Extended Producer Responsibility (EPR)	Other Product Stewardship
<ul style="list-style-type: none"> • Cost of end-of-life management borne by Producers 	<ul style="list-style-type: none"> • Cost typically shared throughout the product chain
<ul style="list-style-type: none"> • Costs may be incorporated into pricing, but not a charge that is tracked separately 	<ul style="list-style-type: none"> • Little to no cost to manufacturers or retailers
<ul style="list-style-type: none"> • Internalized costs incentivize greener design 	<ul style="list-style-type: none"> • No financial incentive for greener design

Source: Adapted from Sanborn and Kobold 2016.

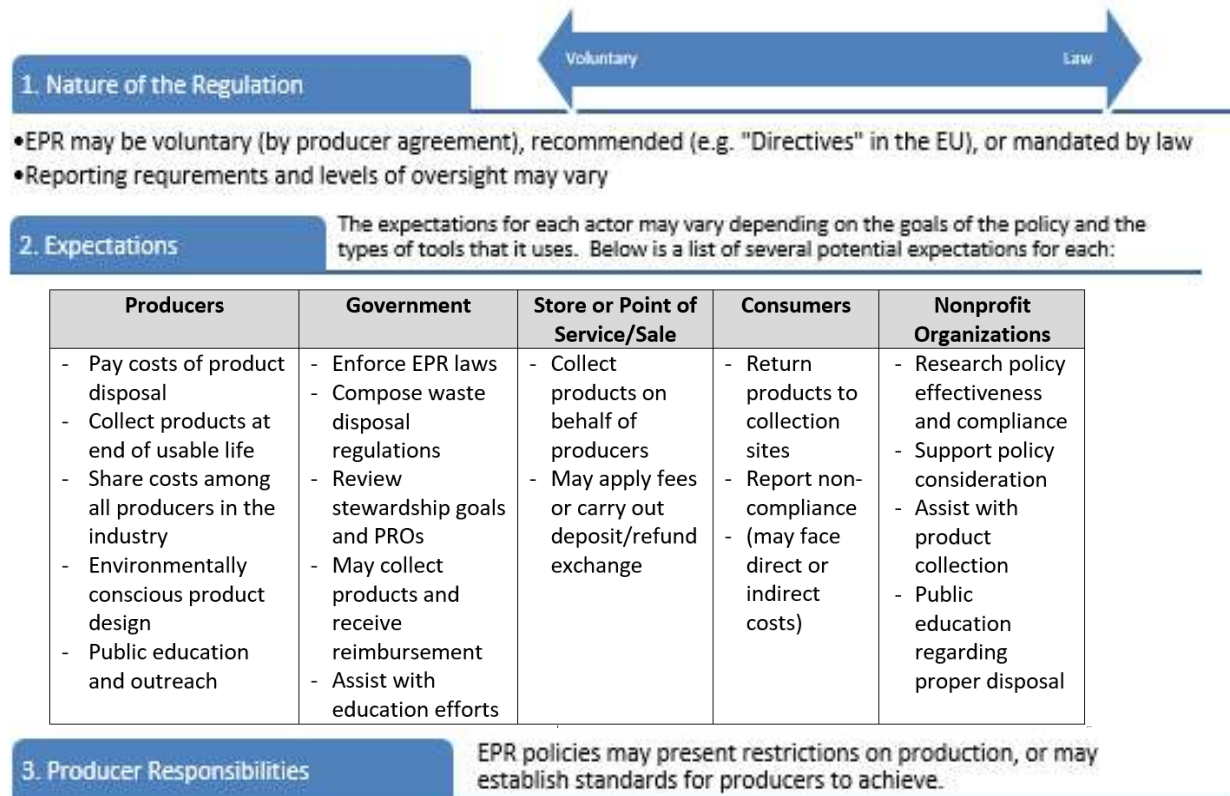
In the nearly three decades since EPR policy was identified, EPR has been implemented in a variety of settings, with more than 380 policies known to be in operation today (OECD 2014). Governments around the world have turned toward EPR as a waste management policy for a number of reasons. First, EPR is a single plan that aims to achieve prevention by inspiring both

design for the environment (DfE), and end-of-life resource recovery. Theoretical research into the outcomes of EPR policy suggests that many policy instruments focus on just one these two objectives, however there is no known alternative that is able to combine and satisfy both (OECD 2005, 12). EPR policy encourages interdependence in order to efficiently achieve the objectives that it lays out. This may help reduce transaction costs and administrative or regulatory expenses for the overseeing bodies. Second, in carrying out these efforts, EPR may relieve governments of some of their responsibilities related to waste. This shift of the burdens of waste management may include requirements that producers pay for or carry out waste collection, or both. In this way, EPR may support the collection of products that require special disposal or recycling, and that would otherwise be challenging to keep separate and safe.

Forms and Tools

The incentive and enforcement mechanisms, means of collection and community outreach, and ways of financing end-of-life waste management through EPR vary based on the nature of the product, industry, and other policies that may already be in place. EPR policies may range from voluntary agreements to national laws or international recommendations, and may make use of different economic instruments in order to achieve their goals. Figure 1.4 presents an overview of the structures and responsibilities that an EPR policy may include. As the scope and the nature of the actors involved ranges, the expectations that each is held to may vary.

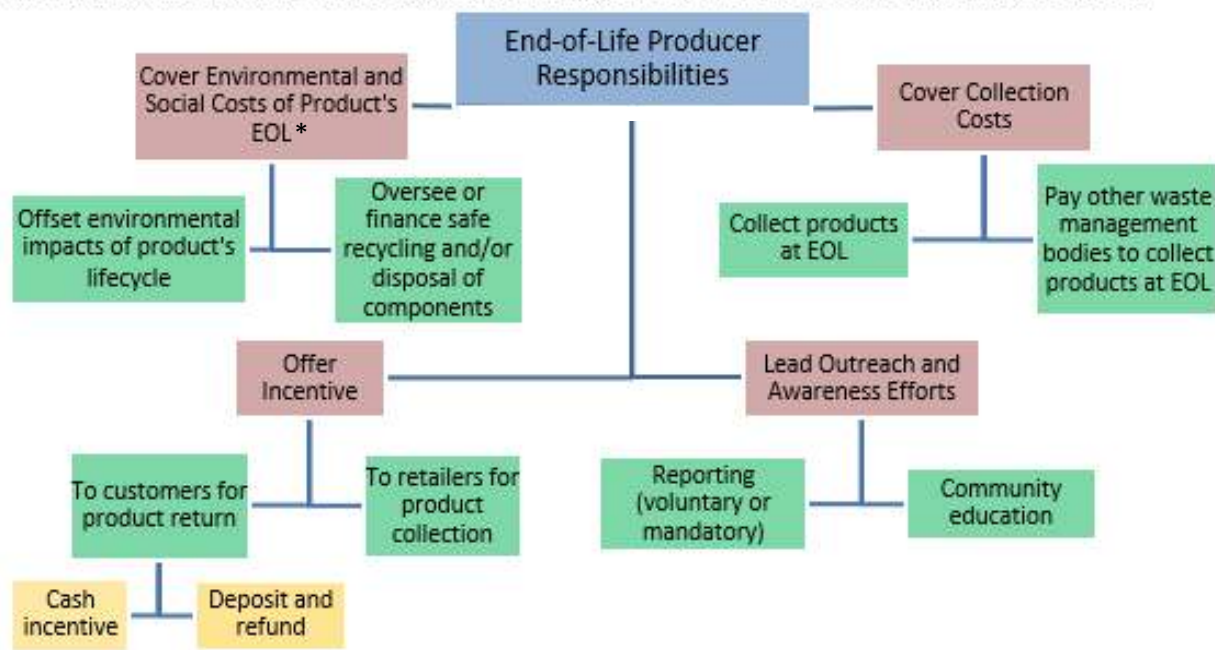
Figure 1.4 Forms and tools of EPR Policy



Restrictions on Production:

- A. Ban, or restriction against use of certain components
 - B. Quota, restricting the quantity of a product that can be produced
- or

A set **performance standard** or **responsibility** for carrying out certain aspects of end-of-life product disposal



* EOL is used to represent "end-of-life"

EPR regulations may range in strength. The first level of Figure 1.4 depicts the range of forms that EPR regulations may take. Producers and industries may draft voluntary agreements to embrace EPR, often as preemptive efforts to delay more stringent or expensive EPR laws. However, EPR policy in the United States has followed a clear pattern, advancing from voluntary agreements to city, county, and state laws, in recent years (Nash and Bosso 2013). International policies, for instance Directives for EU Member States, often lack credible authority to enforce EPR policies. As a result, full policy measures are often the most effective, when it is possible to negotiate in favor of them.

Figure 1.4 also presents many of the roles that different actors may play while carrying out EPR policies. The expectations vary, and may be mixed and matched to accommodate each place and policy. However, EPR regulations are distinct from other forms of product stewardship in that the producer is fully responsible for covering the costs and achieving the policy objectives and any oversight expenses. Other forms of product stewardship may re-distribute these costs among different actors.

The final section of this figure describes responsibilities that are specific to producers. EPR policies may establish specific limits on producers, or it may provide them with specific responsibilities or standards to achieve in the means that works best for them. Producers often make use of economic incentives to allocate responsibility further down the line.

EPR policy objectives are often carried out through four types of policy instruments, including product take back, economic and market-based instruments such as a tax or a deposit/refund system, regulations or standards, and education to increase public awareness (OECD 2014). The ways in which each of these is carried out depends upon how the product is produced and used, the nature of the industry that it is a part of, the type of regulations that it is

required to meet, and the existing waste management system in the policy area. The OECD's *Extended Producer Responsibility: Updated Guidance Manual for Efficient Waste Management* (2016) describes that these instruments may be implemented individually, or combined:

Product Take-Back. The system for collecting waste at the end of its usable life may take a variety of forms. On one hand, product take-back may occur at the site of the purchase through customer returns and exchanges. Products may also be gathered as part of the general waste collection system, if producers help cover the costs associated with their product's recovery. Some industries may choose to arrange their own means of collecting products at the end of their usable life, or will pay a company to do so. Other industries choose to work together to fund and organize collection of their product. They may create a Producer Responsibility Organization (PRO) to oversee an industry-wide, collaborative effort to take back products, and to design new products and lead community outreach initiatives with these goals in mind.

Economic and Market-Based Instruments. EPR costs may come directly from producers' profits, or producers may choose to pass these on to consumers. Producers might feel these costs directly in the form of material use taxes. Alternatively, consumers may end up supporting these efforts through deposit-refund systems or advanced disposal fees that help internalize the impacts of using that product. The degree to which these costs are passed on to customers may vary based on the nature of the industry in that area.

Regulations and Performance Standards. While some forms of EPR will require product collection and disposal, they may also establish standards for product contents or operations such as energy efficiency, or a ban on potentially hazardous metals. The actors that are impacted by these standards may choose to address these challenges in the way that they find most efficient.

Accompanying Information-Based Instruments. EPR may involve producer-organized, end-user education, outreach, or empowerment efforts. These may also involve public reporting or product labeling for safety, or efforts to raise awareness about proper disposal and potentially harmful components within products.

Supportive Actors

Support for EPR regulations may stem from a variety of sources, both within and outside of government. Nonprofit organizations, producer responsibility organizations and complementary policies have played especially important roles supporting EPR.

Nonprofit organizations. Nonprofit organizations focused broadly on the environment, public safety, and health, or specifically on product stewardship, may support EPR through research and the promotion of best practices, community education and outreach, and collection efforts. At the national level, the Product Stewardship Institute is a notable nonprofit supporter of EPR that facilitates information sharing and conducts policy analysis (Product Stewardship Institute 2016d). In California, the California Product Stewardship Council brings together local governments, business leaders, and nonprofit organizations to consider opportunities to integrate producer responsibility into waste management policy (California Product Stewardship Council 2015).

Nonprofit organizations may also offer support for waste reduction and safe disposal efforts through community education and collection programs, and by sharing best practices. While policymakers may conduct careful research to consider potential products for EPR policies, it can be challenging to bring new policies into line with the structures that are already in place in the government and among industries and communities. In this way, nonprofit organizations have

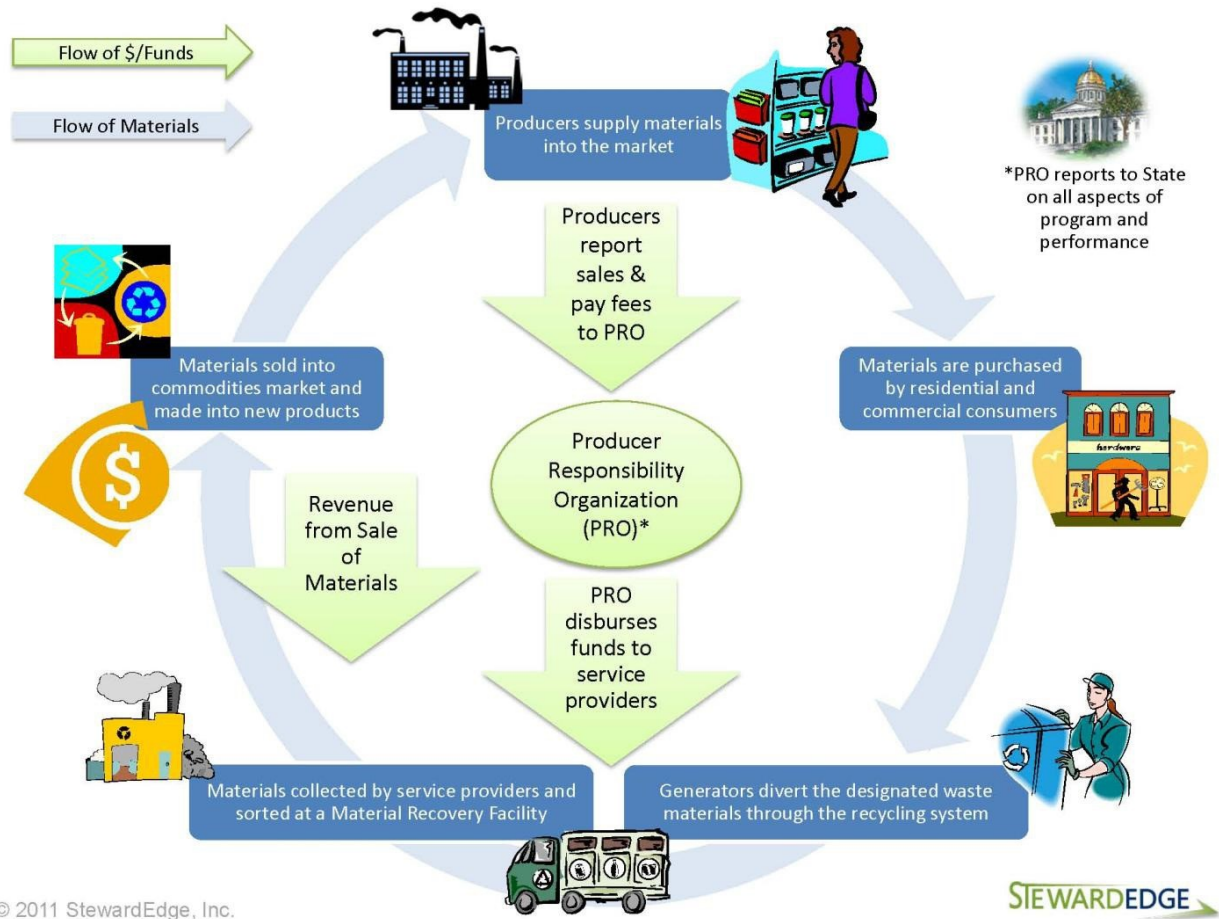
played an important role, stepping up to organize or finance safe product disposal efforts when a product stewardship policy has not come through.

Producer Responsibility Organizations. Producer Responsibility Organizations (PROs) are some of the most important regulatory and administrative bodies that have taken shape to complement EPR policies over the past two decades. PROs typically consist of one or more producers in an industry who have chosen to work together and address the financial and organizational aspects of end-of-life waste collection and recycling of their products. They may come in a variety of sizes and compositions, and may be locally based or industry wide. PROs are most often non-profit organizations, but they may also be for-profit firms or quasi-governmental non-profit organizations, and, on rare occasions, they are government agencies (OECD 2016, 28). Producers may create or contract with PROs in order to fulfill their product stewardship obligations. Through joint organizational and collection efforts, PROs also hold the potential to reduce transaction costs and offer producers a strong and unified position at the negotiation table. In this way, producers may go through PROs in order to propose collection goals and to track and report upon the industry's achievements. Figure 1.5 depicts the role that PROs may play as they interact with other actors throughout the product lifecycle.

Sharing resources to organize and carry out end-of-life product disposal efforts through PROs also holds potential to help reduce overhead costs, and to support research and development toward more environmentally conscious product improvements. Yet, depending on the nature of the industry and the regulations, some producers may face a competitive disadvantage by shifting a portion of their focus and their funds toward product disposal efforts through PROs. This is especially the case if there is weak enforcement that may allow “free-riding” producers to accept others' payments as covering the costs of collecting their own goods. From another perspective,

some producers may see EPR as an important social duty, in line with the movement toward Corporate Social Responsibility.

Figure 1.5 The role of a Producer Responsibility Organization (PRO) within the product lifecycle



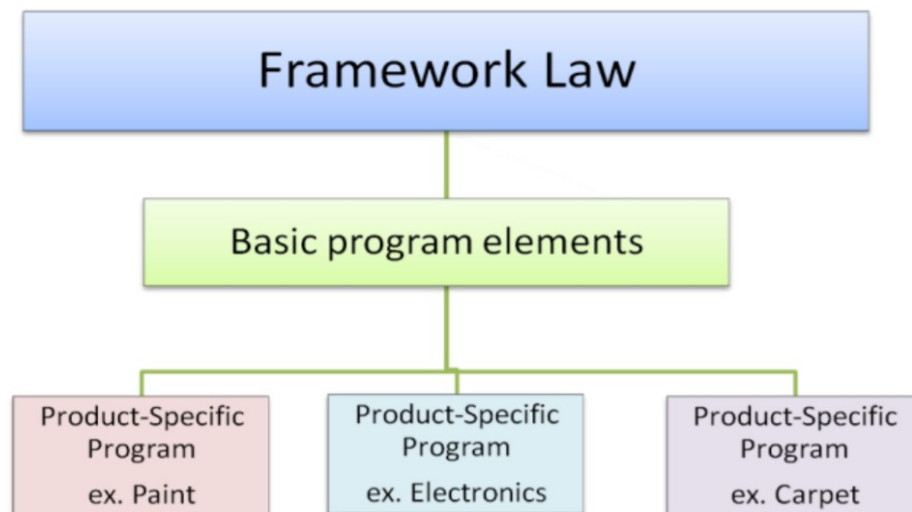
Source: StewardEdge 2011.

Producer Responsibility Organizations might be entrusted with negotiating and carrying out some aspects of a producer's EPR obligations. In doing this, they may facilitate the exchange of funds and materials throughout the product lifecycle.

Supportive Policy Measures

EPR framework legislation may help a state or country establish a standard process for proposing and carrying out EPR laws (Figure 1.6). EPR frameworks may grant authority for overseeing EPR policies, create standard pathways for EPR consideration, and systematize policy goals and reporting requirements. This comprehensive framework is typically based on previous experience with EPR policies in a certain location. It can support information sharing and collaborative efforts that improve the efficiency and impact of EPR policies, overall. At the same time, a general framework is flexible enough that policy efforts can be customized to address unique industry and policy needs, and allow for stakeholder and public input (Product Stewardship Institute 2010).

Figure 1.6 The structure of EPR Framework policy



Source: Product Stewardship Institute 2010.

Support for EPR policy may also come from outside sources such as other policy measures, or regulatory agencies with an overlapping mandate. Initiatives such as the EPA's 2015 Safer Choice Label that has been placed on 2,000 products can help provide recognition for producers that choose to embrace DfE (EPA 2016b). Without such complementary initiatives, efforts to support DfE might otherwise go largely unrecognized by consumers who may be unable to observe a change in the end-of-life impacts of products. EPR policy holds potential to help guide activities that support compliance with other national health and environmental standards (EPA 2016b). The prospect of complementary efforts and mutual benefits is an important attribute of EPR.

Potential Challenges, Alternatives, and Paths Forward

As policy measures are considered as a means of shifting the costs surrounding waste management, it will be important to analyze the trends within these proposals in order to identify where the burden of a policy ought to fall in order to support continued competition and inspire the most impactful possible results. EPR may take a wide range of forms and may be customized in order to address a wide range of needs. In some cases, however, full producer responsibility may not be most efficient means of building an incentive structure or addressing a waste management issue. Distinguishing between the different forms that product stewardship and EPR policies may take, and the conditions under which these may or may not work, will be important in order to implement these policies in the most effective way possible in the future. There are a number of challenges, both inherent to and external of the policy, which may limit its effectiveness.

It is important to note that a shift in the roles that actors within a product's lifecycle may play can leave some actors at a disadvantage relative to others. For instance, if a producer's efforts to address public and environmental health concerns impact product quality, prices, or their profit margin in a way that consumers do not value equally, then that producer may face a disadvantage

relative to others who are not as conscientious. This is especially true at the international level, as both products and waste are exchanged in trade, and as environmental policies vary. Smaller producers that take on these adjustments may also be subject to proportionately higher costs and greater disadvantages in administering either design changes or waste collection efforts.

As some industries and parts of the world may not share an interest in reducing resource use and accepting waste management responsibilities, it can be a challenge to balance efforts in a way that protects shared values of health and the environment while not imposing disproportionate or undue risk on any actors. Thus, it will be important to ensure that any policy measures are implemented in a way that the burden can be distributed evenly among all relevant producers, and enforced so as to prevent any actor from receiving an advantage for non-compliance. It will also be important to account for and be able to adapt to the broader effects that a shift of responsibility may have on the complex relationships between different actors involved in waste management.

Alongside the many EPR projects that have been implemented in California and around the world, there are many places that lack the infrastructure either to safely dispose of a specific product, or to carry out waste management, in general. For this reason, conservation of resources and efforts to shift the burden of improved waste management have been identified as priorities on the international political stage. Waste management is a documented and widely understood “basic human right” (UNEP 2015, 2). As the international community considers its priorities and commitments for the decades to come, waste management and resource management have earned a firm place in seventeen of the Post-2015 Sustainable Development Goals, and in protecting the livelihoods of individuals and ecosystems around the world (UNEP 2015, 8). However, structuring and funding these initiatives will present a significant challenge for policymakers, and all those who hold a stake in waste management efforts, to address as soon as possible.

Understanding of Extended Producer Responsibility and its potential to fill assist in this process is still growing. The following chapters will examine the background, trends, and foreseeable future of EPR with a close look at some of the EPR policies that have been implemented in California so far. This will involve, first, a broad look at the history and structure surrounding EPR policies, considering if and how they are supported, and whether or not they have been passed, and worked, and why.

Chapter 2: The Context for a Shift in Responsibility for Waste

History and Background of EPR Policy

The concept of EPR was first formally identified in the early 1990s as Dr. Thomas Lindqvist, a scholar from Lund University, observed the rise of a group of policy measures that focused on shifting some of the responsibilities associated with waste management on to producers. These policy measures, he noted, had potential to drive a unique incentive both for more environmentally friendly design and improved resources and infrastructure with which to manage waste (Lindqvist 2000, ii). While many governing bodies had implemented policies that created a similar incentive for either product design change or reduced disposal cost in the past, Lindqvist's recognition of the mutually reinforcing potential of these two policies combined as EPR constituted a shift in thought.

Today, some scholars suggest that EPR can be a philosophical approach on par with the *polluter pays principle*, as much as a group of policy measures that shift some of the costs of waste management onto producers (Lifset 2013, 164). This thesis focuses on the ways in which governments have shaped EPR policies and incorporated this approach into their existing waste management efforts, as well as the results of these efforts.

International Consideration of EPR Policy

EPR policy was first enacted in Europe during the early 1990s (OECD 2014, 4). In the two and a half decades that have passed, the policy has gradually expanded at the EU level through Directives, and even further through national and local policy initiatives. The increasing prevalence of the EPR framework in Europe, and policy evaluation and guidance offered by the Organisation for Economic Co-operation and Development (OECD), have supported EPR policy

consideration around the world (OECD 2013, 3). Today, EPR policy measures have been enacted to some degree on almost every continent, although the reach and structure of each varies. While most OECD states have embraced EPR to help manage electronics, end-of-life vehicles, batteries, and packaging, these policies are still in their early stages in South America, Africa, and Asia (OECD 2014, 5).

In 2008, the EU outlined its goal for Member States to identify high impact or cost intensive product lines within its waste stream and “take legislative or non-legislative measures to ensure that any natural or legal person who professionally develops, manufactures, processes, treats, sells or imports products (producer of the product) has extended producer responsibility” (Official Journal of the European Union 2008). In the years since the EU Waste Framework Directive 2008/98 was passed, all 28 EU Member States have enacted at least four EPR policies (OECD 2016, 25). While these core policies were customized and adopted by each country individually, the product lines and policy structure were suggested at a Union-wide level through the Battery, Packaging, End-of-Life Vehicles, and Waste Electric and Electronic Equipment Directives (OECD 2016, 25). Some Member States have chosen to adopt only these four policies, while others have enacted many local and national EPR policies for other product lines.

While EPR policies among EU Member States vary in their structure and expectations, even for similar product lines, a few distinct trends have emerged. In industries affected by EPR policies, producers have often turned toward or found groups to jointly organize and finance collection of their products at the end of their usable life (Bio IS 2014, 10). These groups have come to be known as Producer Responsibility Organizations (PROs). The specific cost of carrying out these policies and the extent of the burden placed on producers varies depending on the nature of the product and the policy in place. The European Commission’s 2014 review of EPR programs

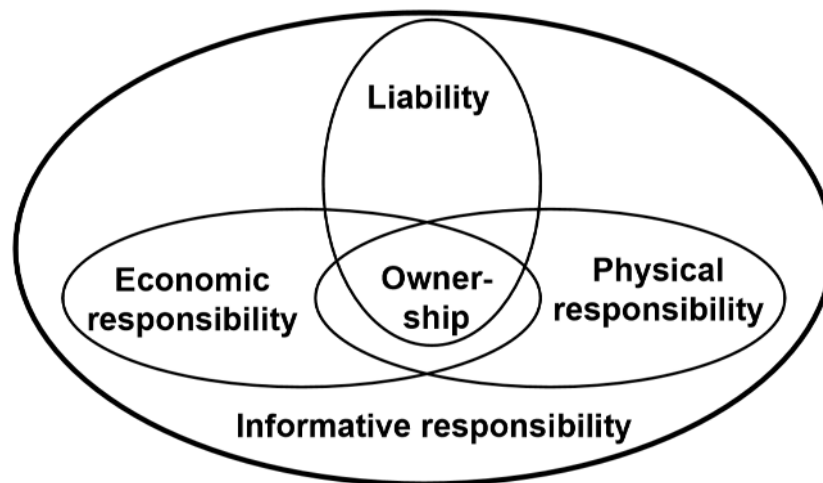
in the EU suggested there has not been a clear trend between the structure or cost of policies in Member States, and the level of success of these policies (Bio IS 2014). Differences in the types of products that various state policies embrace (especially with respect to electronics), and limited data collection and accessibility, make it hard to recognize and compare the most effective practices, and overall trends of EPR in the EU.

The policies implemented in the EU have served as an inspiration and a model for the embrace of EPR around the world. In Latin America, many states are considering their first EPR policies, but they are only partially implemented at this point. Many of the waste management challenges that EPR is able to address are led by voluntary industry initiatives in this region (OECD 2014, 5). In Asia, EPR policies have been considered and implemented to varying degrees in different countries. While Japan and the Republic of Korea have established strong national frameworks to incorporate EPR policies into the government's current waste management efforts, the EPR initiatives that have been proposed in Malaysia and Thailand rely on voluntary producer participation. Regulations in Indonesia, India, and China, are still in a fledgling state (OECD 2014, 5). A similar situation is occurring in Africa, where South Africa has taken the lead in its enactment of EPR policies, but other countries have been slow to follow suit.

The question of where responsibility ought to fall. As EPR expands on the international stage, regulation of producers may raise important questions regarding the amount of information and influence that producers are expected to have throughout their product chain. Both products and their components may be made or disposed of by different groups, around the world. This chain of delegated responsibilities may limit access to information and oversight. This may vary based on the region and the industry, and thereby influence what ought to be the extent of liability with respect to tort law.

Lindhqvist (2000) recognizes liability as a standard quality of “ownership”, and asserts that, in most cases, the producer can be considered one actor who bears responsibility under tort law. Lindhqvist diagrams the different forms of responsibility that a manufacturer holds within EPR in Figure 2.1, reproduced below. According to his theory, if a manufacturer maintains “ownership” of its product throughout its lifecycle, it must accept informative, economic, and physical responsibility, as well as liability for environmental damages related to its product (Lindhqvist 2000, iii).

Figure 2.1 Lindhqvist's forms of manufacturer responsibility in EPR



Source: Lindhqvist 2000, iii.

Lindhqvist’s distribution of manufacturer responsibility implies that the producer holds a well-rounded obligation, across the full product lifecycle. As this expands onto the global stage, it may imply a responsibility to consider the social and environmental justice implications of some aspects of production and disposal, as well.

Adapting EPR Policy within the United States

The Need

The amount of municipal solid waste, or “garbage”, generated in the United States continues to rise slightly each year. Most recent estimates suggest domestic waste production increased by three million tons, or one percent, between 2012 and 2013 (EPA 2015, 3). Recycling rates showed a slight decrease overall, from 34.5 to 34.3 percent in the same time period (EPA 2015, 3). However, some products that are highly durable or potentially dangerous and require special disposal efforts, have demonstrated different trends.

Durable goods, which include appliances, furniture, tires, electronics, carpets, and lead-acid automotive batteries, among other things, compose an estimated 20.3 percent of all municipal solid waste in the United States. While these goods may be made of different materials, they are often bulky and should be handled separately and never mixed with other solid wastes in their disposal. In 2013, only 9.3 of 51.6 million tons of the components of durable goods collected was recyclable (EPA 2015, 60). This suggests there is significant need for more in-depth research surrounding technologies and incentives that encourage both product durability and recyclability in order to ensure that these products are disposed of in a safe and cost-effective manner.

Durable goods, alongside many hazardous waste products, are strong candidates for EPR policies because producer take-back efforts can relieve the government of relatively large administrative, collection, and disposal responsibilities and ensure safe end-of-life recycling or treatment. Furthermore, the notable impacts of the EPA’s efforts with respect to some products has also reflected favorably on continued investment in resources and infrastructure to improve the ease of accessibility and awareness of specific items that require disposal. From 2012 to 2013, many of the sectors that the EPA has focused on and invested heavily in, such as yard trimmings,

electronics, and food, saw improvements in material recycling rates (EPA 2015). Consumer electronics recovery, for example, rose by approximately 9.8 percent over the course of the year (EPA 2015, 2).² This progress has supported continued consideration of policy measures such as EPR in order to address products that pose significant costs or environmental or public health risks.

The Waste Management Policy Context

EPR policy was proposed in the United States largely following from the success of EPR policies in Europe, and research and guidance led by the OECD. However, in the United States, EPR has expanded along its own distinct path. This has, in part, been due to resistance and fears of causing a competitive disadvantage to industries. In another part, its progress has primarily been limited to the state and local levels because the U.S. structure for waste management is relatively decentralized (Hickle 2014, 56-57).

The United States Environmental Protection Agency (EPA) develops and enforces national regulations related to manufacturing, industrial, and household solid and hazardous waste management. Guided by the goals of safety, waste mitigation, and environmental protection, the 1976 Resource Conservation and Recovery Act (RCRA) grants the EPA the authority to regulate waste management and cleanup through policy and enforcement efforts (EPA 2016c). In this way, the EPA and the federal government have implemented several national level policies that focus on waste management for safety and health. RCRA encourages states to create and oversee their own solid and hazardous waste management systems in order to comply with federal solid waste and standards. Manufacturers, consumers, and intermediaries that possess or use products containing hazardous wastes must adhere to RCRA regulations (or more stringent state-level

² Some of this increase may also be due to more accessible and better data on electronics recycling, as well as changes in end-of-life collection trends.

policies) for documentation, storage, treatment, and recycling or disposal throughout their lifecycle. (EPA 2016c).

While the federal government has implemented policies that require tracking or collection and treatment of some products in order to protect public and environmental health, it has not distinguished these stewardship requirements from EPR. EPR policies would mandate that producers, in particular, take on the costs associated with the end-of-life of their product. So far, full EPR has not received legislative support at the national level, with the exception of minor changes to remove any bars to state-level EPR policies (Nash and Bosso 2013, 175). In this light, the lack of a standard distinction between product stewardship and EPR is a lingering challenge that sometimes complicates communication and analysis regarding EPR.

Structure for EPR Policies

Between 1991 and 2011, U.S. states implemented over 70 EPR laws, 40 of which were enacted between 2008 and 2011, alone (Nash and Bosso 2013, 175). Thirty-two states have passed at least one EPR law as of 2016 (Product Stewardship Institute 2016f). Some states such as Vermont, Maine, and California, stand out in their implementation of seven to eight EPR laws. Yet, it is notable that other states that have historically placed low priority on many environmental initiatives, including Utah and South Carolina, have also passed EPR policies. This wide range in the extent to which states have embraced EPR suggests that EPR is still in its early stages in the United States, and there may be room and energy for this policy to grow (Nash and Bosso 2013, 175).

EPR has taken a variety of forms in order to suit different products and locations, and to work alongside existing policies. In some states, producers are required to submit their plans to comply with EPR requirements so that they can be reviewed by state environmental agencies. On

the other hand, EPR policy may simply pose a broad requirement that producers finance and carry out safe collection and disposal. While some EPR policies mandate a minimum collection rate, others require that producers provide customers and contractors with incentives for turning in a product at the end of its life, and some policies do not mandate any incentives to maximize collection (Nash and Bosso 2013).

As awareness and the prevalence of EPR policies expanded, in 2007 many advocates for EPR in the United States began to turn toward consideration of state-level EPR Framework policies. Over the next three years, they drafted framework legislation focused on creating a foundation to support EPR policy consideration and efficiency in six states. However, currently only one framework proposal has been passed into law in the United States, in the state of Maine. Many states seem to be wary of such comprehensive and detailed policies to support EPR. The Maine Revised Statutes Annotated, Title 38, chapter 18 (38 MRSA §1771- 1775) framework law was only passed with significant modifications, so that it effectively offers criteria for product selection, rather than a guide for allocating producer responsibility (Maine Department of Environmental Protection 2011; Nash and Bosso 2013, 182).

Case Study: California

The Need

In 2014, California sent approximately 12 million tons of waste directly to the landfills, followed by an additional 19 million tons processed at transfer stations and material recovery facilities (CalRecycle 2016d, 13). This was an increase of one million tons in comparison to previous year, while California's per-capita recycling rate has remained at approximately 50 percent from 2009 to its most recent count in 2014 (CalRecycle 2016c, 15).

While California has faced several challenges that have limited its ability to improve its waste and recycling rates, its legislators have continued to set ambitious goals in an effort to inspire progress. In 2011, State Assembly Bill 341 established a statewide goal for 75 percent of solid waste captured to be recyclable, compostable, or reusable by 2020. The state's ability to achieve this goal depends heavily on CalRecycle's development of the infrastructure needed to support a large quantity and wide range of products, as well as active participation from end-users, and source reduction (CalRecycle 2016c, 1-2).

One of CalRecycle's five priorities for achieving this target 75 percent diversion rate is "promoting extended producer responsibility" (CalRecycle 2016c, 15). Approximately 0.5 of the 37 million tons of material that Californians recycled and composted in 2014 was collected through individual disposal programs for hazardous wastes such as oil, paint, and covered electronics (CalRecycle 2016c, 1). This tonnage demonstrates a notable demand for, and cost relevance of, the safe disposal of products at their end-of-life through policies like EPR. Moving forward, California continues to invest in more detailed reporting from recycling and composting facilities in accordance with Assembly Bill 901 (2015), in order to track and accommodate the demands of the growing and changing recycling market.

The Structure of Waste Policy

In California, the Department of Resources Recycling and Recovery (CalRecycle) and the Department of Toxic Substances Control (DTSC) respectively oversee state-level solid and hazardous waste management and policy. These departments are subject both to state and national waste management standards, and will work to ensure compliance with a focus on public and environmental health. As branches of the California EPA, both CalRecycle and DTSC receive a budget composed of federal and state tax dollars. Using this budget, they may choose to cover

costs such as that of electronic waste collection and disposal, or other product stewardship regulations. Local governments and municipalities may also pass stricter policy measures in the areas that they govern and serve, if they feel it is necessary. CalRecycle and DTSC may support these initiatives through information sharing and grants. Policy measures to address waste management challenges may come from the public, retailers, industries, or nonprofit organizations at local levels, or it may come through action at the state level, where state agencies may choose to draft or support policy proposals (DTSC 2010).

EPR Policy Trends

In 1986, following from Oregon's successful implementation of a beverage recycling stewardship plan, California passed AB 202, the "Bottle Bill", a measure that placed a fixed customer deposit and producer fees on beverage containers, by type, in order to cover their recycling costs (CAW 2015). The Bottle Bill is distinct from EPR in that the customer pays for most of the costs of disposal, and the program uses uncollected deposits in order to fund its operational costs. Yet, the combination of incentives that the Bottle Bill has implemented have both inspired both increases in recycling and DfE improvements (CAW 2015).

Despite the Bottle Bill's many achievements, it was not until almost a decade later that California looked to formalize regulations that would shift the financial burden of safe tire disposal. Assembly Bill 2108 (1996) placed a mandatory, visible fee on each tire at the point of sale in order to cover the estimated cost of safe recycling (Senate Committee on Governmental Organization 1995-1996). This removed some impediments to the costs that the individual faces when recycling, but it left the state liable for covering tire handling and oversight expenses.

In 2002, the carpet and fiber industries, state and local governments, and nonprofits, came together to sign a nationwide Memorandum of Understanding for Carpet Stewardship in order to

help shift the burden of ensuring safe end-of-life carpet disposal. The Memorandum supported the voluntary creation of a third-party organization to help implement market-based incentives for recycling, reuse, and sustainable design of carpet (MOU Carpet 2002). Manufacturers could voluntarily adhere to this Memorandum with the help of the new organization, the Carpet America Recovery Effort (CARE), or they could conduct independent stewardship initiatives. This agreement engaged producers across the country in organizing safe end-of-life disposal of their products. However, it did not match today's definition of EPR, as producers were not required to take on the full cost burden of these policies (CalRecycle 2016a).

Unfortunately, several years later, the industry's carpet collection rates remained significantly below the targets that had been set in 2002. In response, the California passed Assembly Bill 2398 (2010), mandating landfill diversion and recycling of post-consumer carpet, and CARE embraced full producer responsibility for California's carpet disposal (CARE 2016).

The original Memorandum of Understanding for Carpet Stewardship, and (soon after) the 2002 Paint Product Stewardship Initiatives, were important footholds along the way to the product stewardship policies that the California carpet, paint, and several other producers, adhere to today. In February 2007, in response to safety, health, and environmental concerns especially related to products that cannot be disposed of in the standard waste stream, the California Integrated Waste Management Board (CIWMB, known today as CalRecycle) adopted Strategic Directive 5, recognizing producer responsibility as a "core value" of its work toward environmental sustainability (CIWMB 2007b, 3). By dedicating resources to drafting and analyzing policies that would support producer responsibility, CIWMB hoped this commitment to "cradle-to-cradle" lifecycle considerations would be passed on to producers as well (CIWMB 2007b, 4).

Over the course of the year that followed, the CIWMB's Strategic Policy Committee considered a variety of products and forms of producer responsibility in order to integrate these new goals into their policy efforts. The research that was conducted, infrastructure established, and decisions made in this time, have influenced the form and success of the EPR policies that exist in California today. The remainder of this section offers a description of this process as a context for understanding the types of needs that have driven California's existing EPR and other product stewardship policy structure, and the importance of overcoming the challenges that this structure faces, in order to adequately address these needs.

Product Selection

The product or product category that producer responsibility programs are focused toward has a significant influence on the structure, incentives, and impacts of that program. CIWMB developed a thorough, quantitative and qualitative, process in order to prioritize producer responsibility measures tailored toward specific products. In doing this, CIWMB and external sources such as the California Product Stewardship Council considered the lifecycle impacts of various product-specific policies, and compared the existing infrastructure and authority needed to make each of them possible (CIWMB 2007a, 3). It is important to note that industry groups were not included in this process, and the State did not have authority to enforce producer responsibility requirements at that time. For this reason, the review team took it upon itself to judge industry willingness to pursue voluntary efforts, indicated by existing programs, as it considered different product options (CIWMB 2007a, 10).

The Board identified nine criteria to evaluate its 42 potential products and product categories in two qualitative stages of filtering. These criteria included, at the primary level, the extent to which EPR would influence end-of-life impact, feasibility, and comparison with other

potential opportunities for collection. At the secondary level, they focused on stakeholder concern, an increasing or steady usage trend, lifecycle impacts and potential for lifecycle improvement, size and ability to neutralize waste, and means of ensuring CIWMB is the appropriate agency. After ranking each of the products, the Board identified five categories as potential candidates that were well suited for producer responsibility legislation, including major appliances, non-automotive batteries, electronics, mercury-containing lamps, and paint (CIWMB 2007a, 3-10).

Since its implementation of Strategic Directive 5: Producer Responsibility in 2007, California has emerged as a national leader with ten statewide and 139 local-level EPR or other product stewardship policies in place (Product Stewardship Institute 2016a, 2). California's statewide EPR policies were carefully selected and shaped over time depending on the nature of the product, costs and concerns associated with its end-of-life disposal, and relevant state and national regulations that were already in place. Many cities and counties have also passed their own EPR regulations in order to address more localized concerns. Despite this progress relative to other states in the United States, California's embrace of EPR pales with that of many other countries. This is, in part, due to the fact that many other countries such as Canada, Australia, and the European Union, have chosen to embrace an EPR Framework approach that can help standardize and simplify the process of passing and adhering to EPR regulations.

In 2011, California's CIWMB adopted an Extended Producer Responsibility Framework as its own guide for EPR. However, the Framework has not been passed into law at the state level. State level framework policy would have granted CalRecycle the authority to implement product stewardship measures without the need to pass through the state assembly (CalRecycle 2016b). The lack of sufficient support for EPR framework policy in California in part may stem from industry resistance toward a policy that may make it more commonplace to hold producers

accountable. In another part, it may also reflect the fact that EPR is still relatively new, and representatives may feel that some of the challenges related to the policy ought to be addressed before considering efforts to ease policy expansion.

This hesitation toward statewide EPR framework policy prevailed in many other states as well. Today, Maine is the only state that has passed a state-level EPR framework. The lack of a framework for EPR limits CalRecycle's ability to draft long-term plans for EPR, as policy proposals are still dependent upon legislative, rather than simply agency, approval. The same is true for policy amendments, as well. These conditions have led CalRecycle to take more of a backseat role in shaping and supporting policy measures. Many EPR and product stewardship policies in California today have been drafted and proposed by members of the community or nonprofit organizations, and are at the local rather than state level. However, CalRecycle works to standardize and guide EPR proposals through the structure that is offered by the agency-adopted framework, and through Product Stewardship Legislation Checklist (CalRecycle 2016a).

Support for EPR in California

Complementary policies. In California, producer responsibility programs often receive support from many different departments within CalEPA. This is important because policies within different departments often influence one another. One example of this is the CalEPA Air Resources Board's Emissions Reduction Factor estimate of the greenhouse gas emissions saved through EPR carpet recycling efforts (CalEPA Air Resources Board 2016). Additionally, the Department of Toxic Substances Control's Toxics in Production branch and Household Hazardous Waste programs supports the DfE and safe disposal aspects of EPR, arranging prevention and enforcement efforts relevant to inter-departmental goals.

Occasionally, balancing consideration of products that are priorities to other agencies can present a challenge. One current and dynamic example of this is the issue of improper disposal of pharmaceuticals. While water pollution from medications dumped down the drain is a cause for concern to many local organizations in California, when CIWMB considered pharmaceuticals relative to other products in 2007, they found that this was not a statewide solid waste management priority at the time (CIWMB 2007a, 11). As an agency, CalRecycle continues to strategically evaluate different forms of EPR and the challenges that it may help address, evaluating and planning its course of action on an annual basis at the very least (CalRecycle 2016b).

Enforcement. Enforcement of EPR or other product stewardship requirements is imperative in order to ensure that no firm that complies with regulations suffers from a disadvantage. In California, CalRecycle oversees EPR or other product stewardship enforcement at the state level, but allocates some aspects of statewide permitting, inspections, and regulation, to local governments (CalRecycle 2016d, 111). EPR or other product stewardship enforcement efforts may vary depending on the producer responsibilities that a policy mandates. Policies may require that CalRecycle review and approve product stewardship plans, expected financing rates, and goals. They may also focus on verifying compliance and achievement. Some policies require producers to offer a fixed incentive for each product collected or sold. Other policies set a standard collection or improvement rate, and they may allow producers to offer the incentives needed to achieve this goal.

CalRecycle's EPR Enforcement Team includes six staff who are dedicated to creating, integrating, and enforcing the state's EPR compliance standards and overseeing the regulatory efforts led by local organizations. CalRecycle's inspectors will conduct both research and field inspections in order to see that industry reports are accurate, and that they align with minimal

health, environmental, or other product safety standards (CalRecycle 2017e). The EPR Enforcement Team evaluates adherence to product disposal bans, and ensures that only EPR compliant producers are able to sell their products to California customers. In order to ensure that producers follow through on their EPR or other product stewardship requirements, CalRecycle may keep a publically available, running list of the compliant manufacturers whose products can be sold (CalRecycle 2015a, 32). They may also require that producers submit regular reports detailing their funding, product takeback, DfE, and education initiatives. The Enforcement Team conducts audits or inspections to verify that actual manufacturer costs, collection rates, product development, and community outreach efforts align with those detailed in producer reports.

Through these oversight efforts, CalRecycle's EPR Enforcement Team aims to help overcome a number of the challenges associated with allocating responsibility for products at their end-of-life. EPR places a financial burden and liability on producers, which can leave them at a disadvantage if others in the industry do not pay these costs and do not have incentives for DfE. Such an imbalance might be the result of leakage (possibly through dumping, illegal imports and exports, and second-hand or online sales), free riding (when producers benefit from but do not contribute their share of EPR efforts), or orphaned products (whose producers are no longer operating) (OECD 2016, 43-47).

EPR enforcement may include preemptive and/or reactive measures to mitigate potential imbalances in the burden of the policy. CalRecycle leads initiatives to support transparency and sharing information in order to minimize the cost of adhering to EPR policy requirements. The department may also assess financial penalties on non-compliant producers. Efforts to support competition and peer regulation between producers or PROs, and advanced payments, can help

reduce the chance that a producer faces a disadvantage in light of the policy, or that CalRecycle has to take on a large burden in a case of noncompliance (OECD 2016, 47).

California EPR Policies

Since its implementation of Strategic Directive 5: Producer Responsibility in 2007, California has emerged as a pioneer of EPR policy in the United States. California stands out as only one of three states to have passed three full EPR policies, alongside five product stewardship laws, and two policies that are somewhat in the middle (Sanborn and Kobold 2016). In addition to these statewide policies, many local governments have also passed their own EPR regulations in order to address their specific concerns, or overcome a lack of consensus at the state level. California boasts 139 EPR or other product stewardship policies to address a range of products at local levels (Product Stewardship Institute 2016f).

California's regulations of products exist along a spectrum (Figure 2.2, below) that requires producers to embrace varying degrees of responsibility. The nature of these policies is largely based on characteristics of the product, its sale and use, the industry that it is a part of, and the potential for DfE. It is important to note that, as a standard principle, CalRecycle frowns upon policy proposals that overshadow efforts that are already in place and seem to be working quite well. In this light, policy proposals mandating full EPR in California have primarily been shaped to address products that were not subject to producer disposal requirements prior to 2007.

Figure 2.2 The range of industry responsibility within EPR and Product Stewardship requirements



Source: Sanborn and Kobold 2016.

Three of the policies depicted in Figure 2.2, including bottles, tires, and e-waste, were passed prior to widespread consideration of EPR, and therefore they tend to lean more toward product stewardship regulations. On the other hand, mercury thermostats, agricultural pesticide containers, and recalled products were all passed in 2008 and support full EPR to cover the full cost of raising awareness, collecting, and treating these products at their end-of-life. These three products may present significant public and environmental health risks. The cost of their safe disposal may also pose a relatively high per-item burden, to municipalities or the government. In a similar manner, retailer take-back requirements for rechargeable batteries shift the costs of disposal away from the government. However, these batteries have high material value at their end-of-life, and the burden of carrying out this responsibility is largely on the retailer. For this reason, these policies do not constitute full EPR (Sanborn and Kobold 2016).

In the cases of carpet, paint, and mattresses, California chose to make use of non-EPR, product stewardship requirements in order to cover the costs of safe disposal. California’s carpet and paint stewardship policies evolved from voluntary regulations that failed to meet the public’s expectations, and led to fixed, visible fees. The state’s new mattress measure was selected for

product stewardship based on the understanding that it offers limited potential for DfE, and a prediction that the means of sale (which often involves home delivery) would support high rates of collection of the old product with simply a fixed fee (Kobold 2017). All of the policies that were chosen also reflect the other policies that were in place at the time (such as a landfill ban), the level of success of existing policies, and regulations and trends on the national stage.

In these forms of product stewardship, unlike EPR, CalRecycle may oversee efforts to assess a fee on manufacturers or customers in order to cover the costs of recycling or disposal. Depending on the type of incentive that has been used, the product-specific fee may be returned to the customer when that item is brought to a safe disposal site at its end-of-life. Table 2.1 presents the funding that CalRecycle received from product stewardship fees in order to cover the costs of its collection efforts in 2014-2015. The revenue from fees on each of these products is used to fund CalRecycle's programs specifically related to that product (CalRecycle 2016d, 79).

Table 2.1 The sources of revenue to CalRecycle in 2014-2015. (CalRecycle 2016c, 79).

Fund	Revenue
Integrated Waste Management Account	\$43,633,000
Used Oil Recycling Fund	\$23,657,000
Tire Recycling Management Fund	\$56,332,000
Beverage Container Recycling Fund	\$1,247,968,000
- Glass Processing Fee Account	\$5,699,000
- Bi-Metal Processing Fee Account	\$1,490,000
- PET Processing Fee Account	\$4,660,000
Electronic Waste Recovery and Recycling Account	\$59,367,000
Carpet Stewardship Account	\$275,000
Architectural Paint Account	\$275,000
Total	\$1,443,356,000

CalRecycle’s revenue for its product stewardship efforts has primarily come from fees or deposits, assessed on the manufacturer or customer. These generally simply cover the costs of recycling or disposal. In contrast, EPR policies are typically financed by producers, in full.

Note: 2015-2016 is expected to also include revenue from the Used Mattress Recycling Fund, as it begins its first year of operation (CalRecycle 2016d, 79).

The total revenue to CalRecycle from these programs approximately matches the total anticipated costs of Positions and Expenditures (excluding Infrastructure) within the state’s \$1,531,678,000 Resources Recycling and Recovery (CalRecycle) budget for the next year (Governor’s Budget 2015-2016). California’s programs have come close to covering all of the costs associated with these programs. However, it is important to note that CalRecycle’s budget for general waste management has been an area of concern. As landfill space is reduced and the Integrated Waste Management landfill tipping fee provides less revenue, California will increasingly need to look to other means of balancing its waste budget (CalRecycle 2016d, 80).

In contrast to this form of cost-sharing in product stewardship, in the case of full EPR policies, producers typically cover all costs, including state oversight. In this way, so long as producers fulfill their obligations, California does not face the risk of a deficit from EPR measures. In fact, in Maine's mercury thermostat EPR program, local governments estimated a total savings of \$29,098 just two years after shifting responsibility for covering these costs from municipalities to manufacturers (Product Stewardship Institute 2009, 2). However, the process of negotiating funding and regulations can be challenging, especially at the state level, where there may be a very diverse array of needs and interests. The costs of EPR requirements can pose a proportionately relevant burden to producers, as well.

When it is not possible to address an issue at the state level, EPR or product stewardship policies may be implemented at the local level in order to address local conditions and needs. In this light, California has seen the rise of a number of local movements, including a strong ongoing movement for regulation of pharmaceuticals and sharps. These are often similar in structure to the EPR policies that exist at the state level. While local policies may be regulated by city or county governments, producers must adopt policies in order to ensure safe disposal of their products in just the same manner. The need to accommodate such locally specific regulations can pose a burden to producers, and there are many disputes about the ability to ban, or place special regulations on, product disposal at the local level. Despite this potential inconvenience, such local level initiatives are gradually making headway. This is important because policies help build the information base and experience with which to demonstrate a need, and to evaluate products and EPR policy structures. These lessons and the evidence for these needs may also potentially influence policy proposals at the state level (Sanborn and Flowers 2014).

Chapter 3: Trends in Consideration and Implementation of EPR

General Trends in EPR Policy

EPR policies come in a variety of forms and may make use of a range of tools and incentives in locations around the world. While each policy is unique, over the past two and a half decades some similar patterns and challenges have emerged. One such challenge has included a lack of accessible and comparable data to evaluate EPR's economic, social, and environmental impacts (OECD 2016, 23). It can be difficult to consider EPR policy impacts relative to the counterfactual, or what may have occurred if these policies had not been put in place. Despite these uncertainties, EPR policies have clearly increased in prevalence and seem to have inspired important achievements, particularly in the past 15 years (OECD 2016, 19). Today, an estimated 400 EPR policies are in place around the world, 70 percent of which were implemented since 2001. This expansion has accompanied improvements in product collection and safe disposal rates, supporting a 300 billion Euro annual global market for material recovery services (OECD 2016, 19). EPR has also seemed to encourage DfE progress in many sectors, although it may not be sufficient to drive DfE innovation on its own (OECD 2016, 23).

EPR Policymaking

EPR policymaking may occur at many levels, and it may be guided by different structures and movements. At the broadest levels, EPR may be supported through regional requirements, general framework policies, and information sharing initiatives. These approaches may provide guidance regarding EPR policy or product consideration. They are often then complemented by locally-adopted legislation, incentives, and enforcement efforts. The EU has stood out in its overarching support and guidance for EPR, with a framework policy and Directives for EPR

implementation that apply to all of its Member States. The EU identifies products or product categories that it believes must be addressed through EPR policies, and individual Member States shape and oversee their own efforts to carry them out. While regional agreements may not be possible everywhere, countries, provinces, or states, may also guide EPR initiatives at the national level through a domestic EPR action plan, framework policy, or efforts to complement or remove barriers to EPR initiatives. These supportive efforts can be beneficial if they are able to establish a common goal and foster unity and transparency at local levels.

However, in many cases the energy surrounding EPR has come from more particular, local level concerns about an area of need. Community members, nonprofit organizations, waste management bodies, retailers, government agencies, and others may express the need for policies such as EPR in order to address waste management challenges that they have observed. This energy has led to consideration of a range of state and local level policies in the United States in order to address many different types of products, and to various extents. In contrast to the European Union, the United States has not passed federal statutes supporting the use of EPR for waste management. However, they have focused on minimizing obstacles to state-level EPR policies in a way that allows for states to draft policies to address their specific needs (Nash and Bosso 2013, 175).

As policies are implemented at local levels, sometimes these initiatives may help explore different approaches toward EPR that could eventually be scaled up. However, sometimes the nuances of local policy measures may be cumbersome for producers. This is especially the case if producers serve many different areas. If the requirements and incentives within EPR regulations are not uniform, then this may undermine EPR policies' ability to achieve some of their underlying goals. This is because local level policies that embrace a smaller number of waste producers and

a narrower consumer market base may be less likely to convey a direct incentive for producers to pursue DfE initiatives (OECD 2016, 174-175). In this case, broader policy guidance that offers greater standardization may help overcome policy boundary limitations and ensure that DfE priorities are aligned (OECD 2016, 175). The following chapter will offer a more in-depth look at how these trends in policy formation and guidance have influenced the nature of EPR policies, including the types of products they address and how, as well as their effectiveness.

EPR Product Choice

The expansion of EPR policies has been occurring largely in sectors with both a high product disposal cost and high consumption levels (OECD 2016, 25). However, a variety of factors contribute to the types of products that are selected for EPR. The 1991 German Packaging Ordinance focused on collection and disposal of common types of waste that held potential for DfE. Since then, policymakers have looked to EPR as a means of addressing safety and health concerns with products such as hazardous waste and durable goods. EPR policies might be considered when a product is difficult or expensive to dispose of, or when the social, economic, or environmental benefits of recycling or DfE are high. In this way, EPR may simply offer an efficient means of allocating special attention and resources to a product that would otherwise place a significant burden upon the waste management system or those who finance it. The momentum for EPR policy proposals may also have come from social movements, new products or technology that requires special disposal, or a heightened understanding of the risks associated with some components of products.

At the same time, EPR policy has been limited in its capacity to address some types of products. If it may be challenging to apply economic instruments, to collect a product, or to engage its users in safe return efforts, then EPR may not support improved safety and collection rates.

This might be the case if products are sold primarily online, or are otherwise difficult to regulate. While products with a higher end-of-life value may be more likely to merit high collection rates under EPR, it is difficult to know whether or not this policy supports a higher rate of safe disposal than could be achieved using other economic instruments. EPR may also be unable to embrace products that have a long lifespan, and it may lack the structure to support the extensive safety precautions needed to address some products. These factors define the types of products that may or may not see an improvement in their design and disposal through EPR policy measures. However, the potential for all of these policy efforts is contingent upon legislative support for EPR (OECD 2014, 17).

Information Sharing

The locations where EPR policy has been embraced and the forms that it has taken may have been influenced by the manner in which information regarding EPR policies has been gathered and dispersed. Organizations that have supported research and information sharing in EPR have also had an impact on the policy instruments and models that have taken shape. In 1994, the OECD began to research and report on the potential merits and risks of EPR. At the time, most of the EPR policies were focused within Europe. The dominance of this EU and OECD Member-centric research and information sharing may have had a significant impact on where and how EPR has been embraced. By 2006, nearly all of the OECD Member States had adopted one or more EPR policies (OECD 2017). However, Hickle (2013, 253) suggests that three factors 1) a country's historical openness to international policy guidance; 2) the level of local concerns regarding policy and interference with competition and; 3) the legal/governance structures to support EPR, have specifically contributed to the ways in which EPR policy has been adopted.

While the initial research and information shared regarding EPR has offered important models and pathways for such policy, this process also had significant limitations in its accessibility and applicability. This is especially the case for countries that have few resources or very little waste management infrastructure (OECD 2016, 25). Information for these locations, and the pathways to share it, are still emerging. In its 2016 *Extended Producer Responsibility: Updated Guidance for Efficient Waste Management* report, the OECD dedicated a full chapter to in-depth research on the potential for, and the structures that may be involved in supporting, EPR policy in middle-income countries or in locations with an informal waste management sector (OECD 2016, 181-210). These studies have emphasized the need for continual research and collaboration to support transparent and well-rounded progress that takes into account all of an EPR policy's potential areas of impact. It will be important to recognize the limitations of the historical context in which EPR policies have been shaped, and the lines of communication and evaluation that they have been carried through. The need for improved information sharing and standard means of defining and measuring many of the characteristics related to EPR is clear. However, the research that has been done to date may still offer a foundation for guiding EPR policies to address new products in different locations. With time, these diverse experiences may help offer a more robust understanding of EPR, and support efforts to guide EPR in order to maximize its ability to fulfill its underlying goals in a sustainable and efficient manner.

Incentives in EPR Policy

EPR policy often creates a stringent standard for safe product disposal that producers are obliged to finance and carry out. In order to fulfill these responsibilities, producers may make use of a variety of policy tools. These fixed expectations and the flexibility with which to fulfill them stand in contrast to many other forms of product stewardship. General product stewardship policies

may make use of a market instrument such as a tax or an advanced disposal fee in order to re-distribute the costs incurred throughout a product's lifecycle. Product stewardship policies may experience a range of success that depends, for instance, upon the public's receptiveness to that incentive. This is in contrast to EPR which, in theory, requires the producer to ensure a fixed level of achievement. If a producer embraces one effort but is unable to meet this set goal, then it may consider changing or adding on other instruments to help to meet its obligations. However, it is important to note that many policies blend EPR and Product Stewardship approaches, to some degree (Nicol and Thompson 2007).

The incentives and tools that might be used to address a need related to a product may vary based on the nature of the product and the industry, as well as historical preferences, policy structures, and competition in a given location. In some cases, these factors may support policies that align more with EPR, while in other cases they may favor more general forms of product stewardship. Typically, those locations with greater confidence in shifting the costs and burden of waste management efforts onto producers have been more likely to adopt fixed take-back requirements or performance standards. Alternatively, locations that are more hesitant to embrace EPR may choose to prescribe economic and market-based instruments in order to inspire change. This might be based on a cultural hesitation toward regulations that may reduce a producer's ability to compete (Hickle 2014).

EPR may also begin as, or be carried out in the form of, a voluntary policy. Voluntary EPR is less common than mandatory EPR policies, in part because producers typically do not want to take on additional responsibilities that may pose a greater relative cost to them than to their competitors. For this reason, voluntary policies have been relatively ineffective in the case that producers have failed to follow through on their obligations. In a similar light, the most effective

voluntary policies have largely focused on products when the need for special disposal is clear and commonly understood by consumers, who then take on an active role in fulfilling these voluntary EPR measures. The potential for more stringent regulation if their voluntary policies fail may inspire producers to make use of market instruments to fulfill their voluntary contracts (OECD 2016, 27).

In the United States, just under fifty percent of EPR/other product stewardship policies make use of a deposit/refund system or an advanced disposal fee. This rate is more than double the worldwide average of what is considered the OECD standard for EPR policy (OECD 2016, 25). This reflects the fact that, in contrast to fixed take-back requirements or performance standards, the policies in the United States may have allowed for greater flexibility in the *amount* of responsibility that producers take on through product stewardship efforts. These tools may serve as one means of expanding producer responsibility, even if it is not in full. In this way, some degree of flexibility in the extent of producer responsibility for covering a portion or all of the costs of product collection and disposal may have been important in the United States in light of the historical hesitation to support EPR at the national level (Hickle 2013)

The type of policy instrument that EPR or other product stewardship policies use also has significant implications on the relationship between producers and regulatory agencies. For example, EPR policies that establish strict performance standards may require high levels of agency involvement, including review of proposed EPR plans and enforcement to ensure that producers achieve these goals. Alternatively, some other product stewardship requirements may require producers to make use of an economic instrument, or provide a specific service to users, but may not set a fixed rate of achievement. If this is the case, then regulation may be more in the

form of ensuring that everyone takes equal action, rather than ensuring that each industry meets its associated policy's goals.

While, for the most part, there is some degree of flexibility in the scope of product stewardship goals and the instruments that are used to achieve them, some incentives have clearly been less favored. The OECD (2016, 24) observed that some of the policy tools that were originally presented in its 2001 EPR Guidance Manual for Governments, such as taxes and subsidies, recycling content standards, and taxes on virgin materials, seem to be used infrequently overall.

Means of fulfilling EPR Requirements

Producers may pursue efforts to fulfill EPR requirements individually, or in collaboration with other producers, waste management organizations, nonprofit organizations, or regulatory agencies. The specific pathway that a producer may follow in order to fulfill its EPR obligations depends on the nature of the regulations that it and other actors may be facing, as well as its relationship with these other actors. The structures that producers create in order to fulfill EPR obligations have important implications on the cost effectiveness and enforceability of EPR policies.

Producers often contract with or lead efforts alongside PROs in order to fulfill their EPR obligations. In many parts of the world, the formalization of industry-wide regulations inspired producers to collaborate and to invest in and organize efforts to comply with EPR requirements. PROs in the United States have largely defied this trend. This difference may stem from the lack of strong, centralized support for EPR in the United States. As local policies have formed to address EPR, the variety in the types of products and specific policy requirements that they focus

on may have reduced the comparative advantage of unified efforts to fulfill EPR requirements (OECD 2001, 67).

However, as support for EPR policies to address certain products has expanded, producers in the United States have increasingly formed joint efforts to fulfill EPR obligations (Hickle 2013, 253). These PROs may carry out voluntary or mandated EPR efforts, or a combination of the two, depending on each policy's specific requirements. PROs may also represent from few to all producers in an industry. The portion of the responsibility that they take on has a significant impact on their relationship with collectors and enforcement groups, and their role in the market.

In cases where only one PRO leads industry efforts to fulfill these requirements, these actors may become monopolistic and may wield undue influence on product collection and prices. This trend has posed a challenge to a number of EPR Directives in the European Union, however it can be difficult to address once such large PROs are in place, as these organizations often carry out many of the responsibilities inherent to the success of the policy. Policymakers are increasingly establishing checks that safeguard against monopolies or corruption, and support systems that include multiple PROs within an industry. PROs may be required to pass through a "clearinghouse" for regulatory approval to fulfill EPR obligations on behalf of producers. They may also be required to submit annual targets and follow-up reports to demonstrate their progress toward fulfilling EPR objectives. Their ability to take part in the market to provide these services may be contingent upon successfully setting and achieving these goals (Mayers and Butler 2013, 286).

As PROs lead efforts to fulfill their EPR obligations, they may distribute costs collectively (based on each producer's respective share of the market for the products collected), or individually (based on the product-specific cost of collecting and disposing of a producer's share

of regulated products). While most PROs have historically made use of collaborative producer responsibility in light of the ease implementation, this typically does not allow each producer to experience the competitive advantage of their specific DfE efforts. While some EPR policies are specific to a relatively narrow range of products, such as mercury thermostats, others such as electrical and electronic equipment may be vastly different. Within these more diverse markets, individual responsibility may be important (Atasu and Subramanian 2012).

If there is strong potential to pursue DfE and reduce collection and disposal costs, then PROs may choose to embrace individual financial responsibility. In this way, each producer only pays for the costs of their own products at their end-of-life. This should not undermine collective administrative and take-back efforts, but it may reflect the fact that, in some industries, the ability to recover reduced costs from DfE improvements may in fact outweigh the inconveniences of attributing each cost back to that specific producer (Atasu and Subramanian 2012). Individual producer responsibility has especially been considered with respect to WEEE legislation in Europe (Mayers and Butler 2013, 286). It has also been embraced in the United States, although sometimes in the United States individual responsibility efforts have taken the form that is more specific to individual brand and collection responsibility (Hickle 2013, 253).

Overarching Trends

The definition of EPR as distinguished from other forms of product stewardship varies widely in different locations. This medley of requirements can make it challenging to identify the trends and achievements of EPR, alone. However, in the broad context of product stewardship, and EPR as a whole, there has not been a singular structure or approach that has stood out in its ability to meet the needs of all.

In the EU, in particular, different levels of policy success in different countries suggest that factors within the policy structure, such as whether or not the policy is voluntary or mandatory, and the nature of reporting and enforcement, are the drivers of their effectiveness. For example, EPR portable battery (i.e., small batteries used in electronics and lighting) recycling rates range from an estimate of five percent collection in Malta to 72 percent in Switzerland. The average fee per ton paid by producers varies from €240 in France (which has a collection rate of 0.268 kg/cap./yr.) to €5,400 in Belgium (which achieves 0.219 kg/cap./yr.) (Bio IS 2014, 13). These patterns suggest that even the most cost effective policies may not necessarily be the most effective in inspiring consumer response.

The combination of historical and environmental factors, and differences in the tools and levels of governance of EPR policies can make it very difficult to measure and compare the impacts of certain characteristics of EPR. This is further hindered by a lack of cohesive and available data. Nonetheless, some important patterns about the nature of EPR have seemed to prevail. EPR policies have helped transfer and reduce some of the burdens that taxpayers and regulatory agencies might face with respect to waste management initiatives. In 2012, French producer organizations spent €230 million, and local authorities received €630 million to treat collected products (OECD 2016, 33). Both of these contributions offered a significant reduction of waste management, relative to the overall budget of around €9.7 billion (OECD 2016, 33). EPR policy may also inspire economic opportunity as a result of innovation and potential increases in the availability of recycling, and jobs in the recycling sector (OECD 2016, 34).

EPR policies also seem to have served as a trigger for DfE, but to a lesser extent than most policymakers had hoped. The connection between DfE achievements may depend on how customers experience fixed or variable fees that are applied to products, and the way that producers

collect and bear responsibility for products. This varies by product and location, although variable fees and individual producer responsibility, in theory, offer the greatest potential to tie the environmental and economic costs of a product's end-of-life into customer decisions and producer actions (OECD 2016, 31).

It is essential to note that both the economic and environmental benefits of EPR may be reduced if there are any risks of leakage or free riding. The European Union suggests that the capacity for enforcement of EPR compliance is below where it should be in some Member States. This may be allowing unauthorized facilities to operate, and diminishing the potential of EPR policies. A lack of competition and transparency in EPR policies today are some of the most severe obstacles to EPR policy success (OECD 2016, 42).

EPR efficiency and effectiveness seems to be aligned with support for and adherence to good governance principles. In following with current trends, moving forward EPR policy ought to focus on achieving clarity with respect to all definitions, expectations, scope, and results, with defined mechanisms for enforcement/sanctions and problem resolution. EPR policies may be improved by the use of a combination of different instruments at points throughout the product chain (OECD 2016, 39-40).

Trends in the United States

Consideration of EPR in the United States

Over the past two decades, EPR policy has been received with a range of enthusiasm and uncertainty in the United States. At the national level, many policymakers have been reluctant to burden producers with the financial and organizational costs of EPR. Rather than focus on the actor who ought to bear responsibility for safe disposal, policymakers in the United States have tended to support consideration of how the product will be managed through extended *product*

responsibility or product stewardship (Jackson 2007). At the local level, however, most U.S. elected officials have been pleased with the opportunities that EPR has presented. Customers have largely welcomed EPR as it often improves the accessibility of proper recycling areas, easing the burden of product disposal, or reducing the risk of dumping and damages. Thus, local government actors tend to view EPR as an opportunity to meet some of their constituents' needs. These factors have helped characterize EPR policies in the United States that are largely distinct from those in the rest of the world (Nash and Bosso 2013, 177).

U.S. producers and businesses have responded to the concept of EPR, and to different programs and incentives within the policy, in a variety of ways. Some producers have taken note of the hesitance toward EPR legislation in the United States and have embraced the chance to continue to defer the burden of waste management. In fact, several producers that faced regulation in Europe have stepped up to lobby against EPR in the United States (Jackson 2007). In some cases, groups of producers have come together to form coalitions such as the Product Management Alliance, that formally oppose EPR laws. These groups may claim that EPR policies are less efficient than the market, place the cost burden on the wrong parties, or offer inadequate incentives for producers and consumers to reduce waste (Nash and Bosso 2013, 177). In some cases, industry resistance has posed a significant barrier to EPR policy implementation (Kobold, 2017).

Alternatively, some producers have chosen to embrace EPR on their own accord. These efforts may be voluntary, or they may involve openness to a campaign for legally-backed EPR requirements. Producers may be inclined to support these efforts in order to delay or reduce the severity of policy proposals, or they may focus on building a positive public perception of a brand as an aspect of corporate social responsibility and community engagement.

In the early 2000s, many large manufacturers, including Dell and Honeywell, publicly backed EPR policy measures to regulate their products in some states. However, as time passed, community members and environmental organizations found that the expectations and capacity for enforcement of these regulations were too soft. This trend has been echoed in voluntary policies across the country. In response, constituents have called for highly prescriptive EPR policies, with standard measures and clear and regular reporting to ensure that producers meet fixed take-back requirements or performance standards. In this light, EPR policies in the United States seem to be continuing to shift away from voluntary standards, and toward formalized law (Nash and Bosso 2013, 176-177).

On the producer end, increased stringency has again led to pushback. Both Dell and Honeywell retracted their support as the public requested more comprehensive policies with set performance goals (Nash and Bosso 2013, 177). While response to the shortcomings of voluntary EPR has led to rather heavy-handed, formal policy measures and a tendency toward individual responsibility, this stringency will likely relax a bit as time goes on and producers advance toward policy goals (Hickle 2013, 253). While clear and progressive EPR standards are important, the policy experience in Europe and Canada suggests that flexibility for producers to adapt to and address EPR policy requirements is central to well-rounded realization of policy goals (Hickle 2013).

Products Subject to EPR Regulation

As EPR policy has been developed in the United States, clear patterns in its progression have emerged. In particular, while the types of products and the specific policy tools for which EPR has been embraced are naturally varied, they have often focused on items that are bulky,

hazardous, or valuable (Nash and Bosso 2013, 176). This is especially true at the state level, while local policy measures may have greater flexibility according to citizen interest and support.

Recently, however, California spearheaded consideration of EPR or other product stewardship policies for pesticide containers and mattresses, two products that had not been subject to state level measures the past. In the years since this occurred, two more states have passed EPR policies for mattress disposal. Additionally, at the national level, several nonprofit organizations and citizen groups are considering EPR regulations to address product packaging (Product Stewardship Institute 2017). These movements suggest that the United States may be heading toward consideration of EPR in order to address a wider range of products, including non-hazardous waste (Sanborn and Flowers 2014). Nash and Bosso (2013, 176) have also observed that the increasingly broad and complex nature of EPR regulations may indicate 1) a growing understanding of the policy and how it can best be shaped to achieve specified goals and; 2) manufacturers are becoming more open and able to support well-structured EPR policies. At the national level, several nonprofit organizations and citizen groups considering EPR regulations to address product packaging (Product Stewardship Institute 2017).

Efforts to Fulfill EPR Requirements

As industries seek to fulfill their EPR obligations, Hickle (2013, 249) notes that producers in the United States tend to form smaller PROs that include fewer producers than those in the EU. While PROs are on the rise in the United States, these groups, formed to support joint compliance with EPR, have largely continued to work along brand lines, rather than to branch out to the entire industry (Hickle 2013, 249). This may, in part, be due to a higher perceived importance of ensuring efficiency and protecting brand image in the United States. Despite their lower rates of use, PROs have played an important role promoting equitability and distributing the financial and

organizational burden of economic and environmentally conscious waste management under EPR. However, progress regarding EPR policies in the United States remains slow, as they are implemented state-by-state, and one product at a time.

Future Considerations

As EPR is considered at multiple levels, from city- to county- and state-wide, it will be important to examine how different EPR policy measures may fit together all throughout the United States. While it can be difficult to determine exactly why some policies worked and others did not, moving forward the challenge will be to continue the momentum surrounding EPR, and to support a unified approach from there, if possible. These trends may send an important and clarifying message to industries that might otherwise feel threatened by the unknowns of expanding consideration of EPR. Efforts to standardize the means and frequency of measuring and reporting policy progress may also support analysis of the forms and conditions that shape effectiveness of EPR policy.

Moving forward, those who are leading EPR policy consideration in the United States might consider the roles that national level policies and framework initiatives may be able to take on for the country as a whole. On one hand, analysis and structures for EPR at the national level may hold potential to help inspire a more standard and smooth process of EPR policy implementation. On the other hand, however, it is important that such efforts do not preclude the stakeholder's perceived and actual opportunity to take part in policy decisions in any way. In Maine, for instance, while an EPR policy framework was originally passed as a means of facilitating a standard and clearer way to consider EPR policy proposals, many members of the community viewed the process with strong suspicion that it would not allow for adequate debate before policies were passed into law. As a result, all of the policies brought under consideration

for several years faced intense public scrutiny, and no measures passed. Whether state or national level policies lead the way forward in EPR in the United States, it will be important that they set a careful precedent that supports diligent analysis of EPR.

EPR Policy in California

EPR policies in California have been eyed with both hope and hesitation. This pattern has also held true in many other states. While EPR measures have helped establish a means of funding and collecting a number of products, there are fears that state agencies may have a limited capacity to lead effective oversight. There is also lingering hesitation regarding the costs that implementation of new measures may pose for the state and for industries. In light of the challenges of changing existing regulations and the potential risks of a new policy, CalRecycle chooses to pursue EPR policy measures only in cases where there is not already a policy to address an issue, or where the policy in place has clearly failed to achieve its goals (CIWMBD 2007a). Nonetheless, California has been a leader in its embrace of EPR. This is notable as, even prior to EPR's prominence as a waste management policy option, California already had many waste management policies in place in order to protect the environment and address concerns. Therefore, this form of product stewardship may have been viewed as superior to policies that were tried in the past, or have applied to products that were not covered by existing regulations.

California's EPR and product stewardship policies have taken a variety of forms, and many have experienced a range of effectiveness that can largely be attributed to each policy's specific structure and incentives. Full EPR policies at the state level (including regulation of mercury thermostats, agricultural pesticides, and recalled products) have largely been successful to the extent that information regarding the regulation can be conveyed directly to those who use and dispose of that product. The portion of the population that makes use of large quantities of these

agricultural pesticide containers, for instance, is relatively limited. In this way, communication and enforcement of this policy has been fairly straightforward (CDPR 2013).

Mercury thermostats, on the other hand, are more likely to be used by anyone in the community. In this light, the Thermostat Recycling Corporation (an industry-wide PRO that leads EPR collaboration efforts) has struggled over the past two years to inspire individuals to bring mercury thermostats to collection sites for safe disposal. In 2015, TRC's collection amounted to only sixteen percent of its goal of 113,850 thermostats (Lennett 2016). As a result, California is planning to pilot payment incentive programs for customers, retailers, contractors, and wholesalers who turn in thermostats (Lennett 2016). This option has merited significant improvements in Maine and Vermont, and will hopefully help inspire improvement in California, as well (Product Stewardship Institute 2016g).

Recalled products present a slightly different form of producer responsibility and liability. While industries are solely responsible for arranging and covering the costs of collection and treatment, these policies are broad and apply to many industries for any type of product that may be recalled. As a result, there are few aggregate analyses of collection rates and trends related to this product, and for the most part it may be considered as separate from the general patterns and trends of EPR.

The degree of success of California's product stewardship policies (those for which responsibility is not fully delegated to producers) has, in large part, been a factor of policy design and the costs of, or value that comes from, disposal of the product. The dominant policy model that has emerged requires PROs to establish a visible and standard, per-product fee for the consumer to pay at the point of sale in order to cover disposal costs. These fees are expected to cover, but not exceed, the cost of disposing of that product. This leaves behind some expenses

associated with oversight, which regulatory agencies take on as they lead this effort. In this way, costs are largely passed directly on to the consumer or left to state agencies, and these policies are not full EPR.

Despite this joint process for state and industry consideration of policy goals, in recent years the state has struggled to inspire the producers who are subject to product stewardship requirements to propose and pursue ambitious collection goals. Many of these obligations are fulfilled by a single, dominant PRO for that industry, which has limited the state's leverage and the credibility of its demands. In recent years, for example, California's programs for architectural paint and carpet stewardship have proposed plans limited improvements in their collection targets (Nash and Bosso 2013, 182).

California's product stewardship policy for architectural paint (2010, AB 1343), has historically been strong, much like other policies across the country, due to the paint industry's historical responsiveness to policy proposals and environmental concerns. This relationship has allowed for compromise as product stewardship regulations have gradually progressed from voluntary initiatives to a visible, customer fee at the point of sale, in order to cover transportation and recycling costs. However, this understanding could be at risk as some of these parties feel that the level of proposed performance goals and funding for state oversight has been underwhelming in recent years (Nash and Bosso 2013, 182).

California's carpet stewardship program (2010, AB 2398) has established a similar, state-approved fee that the consumer pays per square yard at the point of purchase in order to cover recycling costs (Product Stewardship Institute 2016a). The Carpet America Recovery Effort (CARE), a nationwide PRO, facilitates the use of this fee for carpet recycling and is required to submit annual plans and follow-up reports detailing their community education and carpet

collection efforts and goals. California was the first to formalize these requirements as a carpet stewardship policy. In recent years, CARE has failed to fulfill its obligation to pursue “continuous meaningful improvement in the rates of recycling and diversion and other specified goals” in California (CalRecycle 2017b). CalRecycle found CARE’s annual plans and reports to be incompetent in September of 2013, 2014, and 2015. In September 2016, it gave the PRO four months to amend its annual plan and submit it for re-approval, yet with the start of the new year it began to look toward enforcement action which could include fines of up to \$10,000 per day (Resource Recycling 2017).

California’s carpet regulations demonstrate a particularly extreme case of the challenge of non-competitive producer responsibility efforts, as the specific PRO (CARE) is in fact named in the product stewardship law as the responsible entity (2010, AB 2398). Therefore, it has seemed that the state has limited other options to carry out this measure. However, with the potential for monetary enforcement on the horizon, it will be important to observe the ways in which this may influence the carpet industry’s collection efforts, and perception of the policy, as a whole. While California’s carpet regulations and challenges with CARE compliance demonstrate a less than desirable outcome, a variety of factors may have also contributed to the insufficient goals that this policy has inspired. One such factor has included an unexpected drop in the demand for recyclable carpet materials due to the low current price of oil (Wiley Rein LLP 2016). It is worthwhile to note that sometimes a singular PRO that takes on EPR efforts may help promote efficiency, and may reduce overhead and transaction costs. However, it is important that oversight bodies maintain a degree of leverage that allows them to ensure this efficiency is favorable to the policy’s underlying goals.

In addition to carpet, paint, and mattresses, e-waste and tires are also covered by product stewardship policies. In contrast to the product stewardship policies described previously, these stewardship programs are carried out by state agencies. They do not have requirements that producers cover the costs of collection or work with PROs. In this way, CalRecycle has been able to set the rates of Advanced Disposal Fees, and to lead the extent of collection efforts, without facing significant limitations based on competition and credibility. These policies have faced challenges from other factors, such as fluctuations in market conditions and public demand for recyclable materials (tires), and ability to expand and adapt with changes in technology (e-waste) (Kobold 2017). Tires, much like mattresses, are perceived to have limited potential for DfE, and are therefore well suited for fixed disposal fees. However, the failure of product stewardship policies to inspire DfE can have a significant impact when a product has a lot of potential to be re-designed for environmental improvements. For this reason, California's e-waste regulations have made use of scaled fees based on the expected costs of product disposal. However, this form of product stewardship still does little to drive DfE as the state leads this program and producers are not engaged in the waste management process.

California's Bottle Bill (AB 2020) offers more of a compromise in this respect, as it strives to inspire customers to engage in recycling of these products with a deposit-refund scheme, and requires the industry to take on per-unit recycling costs that vary based on container type (Sanborn and Kobold 2016). However, this policy has faced challenges as it relies upon unredeemed deposits in order to cover a portion of its recycling costs that would otherwise be paid by the state. In recent years, the number of claimed deposits has been so high that it has left a deficit in the budget for these efforts (California Legislative Analyst's Office 2015).

The conditions that are most important to address may vary for each type of product. However, in general, EPR policies seem to offer an important potential to distribute the full burden of the end-of-life costs of products, and the incentive for DfE, in such a way that it may drive the most efficient improvements. Yet, there are still important analyses that must be conducted in order to understand the impacts of EPR or other product stewardship policies. It is important to know how EPR and other product stewardship policies may influence consumer purchasing, and how this applies to products that come into California from out of state and online. The success of any of these policies will be contingent upon addressing the challenges that existing policies have faced, notably ensuring competition and government credibility, as well as refined and improved analysis for the future.

EPR Policy Consideration

Citizen activists and non-profit organizations are constantly driving consideration of waste management policies that are both inclusive of and opposed to EPR in California. This energy moves them throughout the legislative process as they receive favorable or oppositional endorsements from cities, counties, industry groups, or other citizens other nonprofits. By and large, most policy proposals die while in committee due to a failure to achieve the prerequisites or necessary support to move forward. In other instances, policy proposals may inspire a compromise that does not require the use of market instruments. In 2010, for example, the California Product Stewardship Council and local water stewardship organizations worked with brake pad manufacturers to phase copper components out of brake pads sold in California. In place of a product stewardship requirement, this inspired a new product design that reduced the risk of harm to marine life in watersheds, right away (California Product Stewardship Council 2015).

While it can be very difficult to inspire consensus at the state level, some of the most significant growth in EPR policy is being led in local areas for products that individuals are particularly concerned about. This has allowed for some freedom in EPR policy choices, and inspired a range of products and different types of policies, from EPR and advanced disposal fees to product takeback, in order to address waste management challenges (Sanborn and Flowers 2014). In California, in particular, local communities have increasingly looked toward EPR policy in order to establish full producer responsibility for safe collection and treatment of pharmaceuticals and sharps (Sanborn and Kobold 2016). As various counties express their concern for public health, and shape policies in response to their perceived lack of sufficient statewide regulations, this can also serve as a message of support for such efforts at the state level, as well. These initiatives also most likely to foster increasing industry openness to EPR or other product stewardship obligations as the marginal costs of each additional effort to comply with EPR decreases. This trend has allowed consideration of ideas from a wide range of concerned actors. Moving forward, it will also be important to consider the implications that it poses with respect to the relative feasibility of enforcing EPR policy at the local as opposed to state level.

EPR Policy Impact

The success of California's EPR policies has varied based on market conditions and the nature of the policy and the product. However, by and large, analyses have suggested that safe recycling and disposal has increased following the implementation of most EPR and product stewardship regulations (CalRecycle 2017d). This has been important for the environment, public health, and the economy. While most product stewardship programs do not cover the overhead costs that the state incurs, collection and safe disposal costs have been shifted away from general taxpayers and specifically onto the consumers of that product. PaintCare's collection costs in Kern

County amounted to \$200,000, and over \$350,000 in Santa Clara County, which were all savings to taxpayers (Sanborn and Flowers 2014). These requirements have also historically supported the creation of jobs to provide these services (CalRecycle Impacts 2017).

While most organizations that fulfill EPR or product stewardship efforts are required to report their collection rates and costs incurred each year, there are still barriers to evaluating the precise impact and the full potential of these policies. It is difficult to tell the extent to which policies have influenced product design and development. In some cases, collection availability may have had an impact on clean up and restoration costs. CalRecycle has actively worked to foster communication that reduces the burden that these regulations may pose for producers or retailers. The agency has led efforts to ensure transparency and accessibility on its end in order to promote clear reporting and compliance with fixed standards from all types of producers. California has adopted special requirements for small and medium enterprises, and focuses on accessibility and timely communication, for instance, through freely available listservs (CalRecycle 2017). Through these efforts to support such openness, CalRecycle hopes to evaluate its impact and to be able to shape its support in order to increase its policy effectiveness.

Challenges

Throughout CalRecycle's initiatives to ensure that regulations apply equally to all producers of a product, and to support competitive efforts to fulfill producer obligations, maintaining transparency and enforcement credibility have remained among the most challenging aspects of EPR in California. California's EPR Enforcement Team focuses on ensuring against noncompliance through on-the-ground inspections of types of products that are registered, reported, and returned. The Enforcement Team also looks to ensure that the goals for EPR policies

are well within the standards of the competitive market, and will inspire appropriate results (CalRecycle 2017c).

The Enforcement Team makes use of a progressive enforcement approach with increasing penalties depending on the amount of time and the severity of a failure to fulfill EPR responsibilities or to achieve set goals. However, in 2015, CalRecycle inspections of carpet and paint manufacturers revealed high rates of noncompliance (five of six, and three of three, respectively). A further 58 percent of carpet retailers and 33 percent of paint retailers also failed to register properly. While all manufacturers and retailers who received a Notice of Violation took steps to comply, and enforcement penalties were not issued, the fact that violations were so prevalent raises significant questions about the whether or not CalRecycle commands a substantial enough amount of authority to lead these regulations (CalRecycle 2015a, 32).

The CalRecycle Enforcement Team also evaluated industry product stewardship plans, expected financing rates, and goals. In 2015, CalRecycle found that the carpet product stewardship organization, CARE, had failed to demonstrate adequate progress in fulfilling EPR requirements, and did not submit plans to enter into compliance in a timely manner (CalRecycle 2015a, 32). CalRecycle also rejected CARE's proposed 2017-2021 Carpet Stewardship Plan, suggesting it did not include provisions to address the PRC 42970 requirement for "continuous, meaningful improvement" (CalRecycle 2017a, 1). While CalRecycle has the authority to issue enforcement penalties of up to 10,000 dollars per day, the department has offered CARE 120 days to revise and receive approval of its plan, before it faces any charges (CalRecycle 2017a). However, it is clear that this ongoing process of negotiation is only further delaying the progress that the State has been hoping to achieve since 2002.

This delay raises important questions about whether or not state agencies have maintained the leverage and authority to carry out a credible threat of enforcing product stewardship policies. As California looks toward efforts to achieve a 75 percent waste diversion rate by 2020, cooperation with local agencies will be an important tool for CalRecycle's efforts to monitor the EPR and product stewardship policies that are expanding around the state (CalRecycle 2015b, 101). However, in considering the potential use of EPR and other forms of product stewardship in the future it is important to ask, firstly, whether or not the threat of enforcement is perceived by producers as a credible to those who face EPR or other product stewardship obligations. Secondly, are the penalties for non-compliance sufficient to inspire producers to adhere to policy requirements? Thirdly, comparing the costs of enforcement and rate of progress under EPR or other product stewardship, would it be more effective for the agency simply to fulfill these obligations on its own? These answers may vary based on the nature of the industry and the type of product.

Future Considerations

Moving forward, California will most likely continue to look toward EPR and product stewardship under certain conditions, however in light of the challenges to ensuring that there is competitive pressure to fulfill these goals, policymakers may choose this option with some degree of hesitance. The success of California's EPR and product stewardship policies will be contingent upon addressing challenges associated with competition and enforcement. To some extent, this may come from review and amendment of existing policy measures in order to ensure that PROs compete for the opportunity to fulfill policy objectives. In addition to this, regulatory bodies may boost their credibility and leverage through increased monitoring and enforcement, and by applying penalties when they observe issues of noncompliance. Finally, regulators may seek to

embrace improved means of tracking and evaluating policy success in order to further refine policy models. These results may serve to help guide future policy both in California and throughout the country.

Chapter 4: Challenges to the Implementation and Success of EPR

Waste is “*a failure in design, markets, and market regulation*” – Upstream 2017

As economic development, population growth, and globalization have supported increased consumption activities, this demand has often been separated from both the financial and the marginal social costs that it incurs at its end-of-life. This mismatch has created a significant issue of waste. In order to address this, policymakers may choose to make use of different requirements to distribute the social and economic costs of waste so that they align with those who produce or demand products. These may be a set responsibility to take on a cost, or they may be incentives, both of which can potentially help inspire changes in the production or demand for products that require disposal. These efforts may take two primary forms, including “command and control” policies that set and enforce fixed requirements, or economic instruments that aim to shift costs or drive proper disposal. They may also make use of both options, together. The problem of the current incentive structure surrounding waste is clear. However, regulations to address this issue are very much a patchwork, and continue to depend on the nature of the product and the industry. This chapter dives into the challenges that EPR policy may face, and the limits that these may pose toward the policy’s ability to fulfill its underlying goals.

The Stringency and Potential of Regulations: EPR in Contrast to Other Product Stewardship

EPR and other forms of product stewardship policies each lead an important focus on shifting the costs of waste management. Yet, beyond their surface similarities, EPR clearly stands out in the structure and long-term goals that it supports. Legislation for non-EPR forms of product

stewardship tends to embrace a more stringent, command and control approach. In this way, regulatory bodies may establish a fixed fee, paid by the customer at the point of sale, in order to cover disposal costs. In contrast, EPR policies tend to hold producers accountable for achieving a certain collection rate, and allow producers to apply the types of tools to the market areas that they view as necessary in order to achieve these goals. While these policies may produce similar results in the short term, the respective goals that they drive in the long term may be strikingly different.

Product stewardship policies may establish a landfill ban and remove the financial costs and some of the inconveniences that customers would otherwise face in order to dispose of products at their end-of-life. This form of relief will most likely help raise awareness of the need for special disposal of this product, and drive some customers to safely dispose of these items when they may not otherwise have viewed these actions to be worth their inherent costs. However, there are important limits in the extent to which this form of relief may inspire these types of change.

In balancing stewardship responsibilities with the need to remain competitive relative to areas that are not subject to such regulations, there are practical limitations in the extent to which industries will be willing to raise the point of sale stewardship fee for a product. While oversight bodies may have some influence on product stewardship fees in their review and approval of annual plans, in reality their leverage over these industries may be fairly limited. This limitation has come to light in the case of California's carpet regulations, where CalRecycle has found the PRO's product stewardship plans to be insufficient for the past three years (CalRecycle 2017b). Without the leverage to negotiate a higher stewardship fee, the portion of customers that are inspired to act based on this level of an economic incentive may cap off. California has experienced a similar situation with its mercury thermostat regulations. However, this full EPR

policy requires that the producer lead efforts to achieve a set collection rate. Therefore, the PRO is looking into applying additional economic incentives in order to comply (Lennett 2016).

In contrast to other forms of product stewardship, EPR seems to hold at least theoretical potential for more impressive achievements. This can be attributed to the greater relative flexibility of EPR, as it often sets a performance requirement for producers, and allows them to make use of any economic or information instruments to achieve this goal. EPR also places the responsibility specifically on the producer, which offers a clear source of liability if sufficient goals are not set or achieved. This direct incentive may drive additional compliance efforts, such as DfE.

Product design can have a significant impact on the financial and marginal social costs of product disposal. However, if the additional cost that producers are driven to place on their products at the point of sale is limited, then it is likely that they will not be inspired to make design changes to their product in order to reduce its unit disposal cost. These demonstrate important limitations in the potential of product stewardship policies, and possibly a very roundabout means of inspiring efforts to reduce the potential harm and burden of products at their end-of-life. Alternatively, EPR policies may offer greater flexibility toward the ability to achieve these goals. In this way, regulators may be able to set and count on the achievement of fixed requirements for the rate of product collection and disposal. The specific group that is held accountable for meeting this requirement may then choose to balance between economic incentives and improved design in order to ensure that these goals are met in the most efficient manner possible.

While EPR efforts appear to support a superior ability to guide improvements in the financial and social costs of product disposal in the long run, these policies may also depend heavily on government credibility and a competitive marketplace in order to establish and uphold

a mandate for this shift in responsibility. EPR policies have faced a number of obstacles that have placed them under scrutiny in this respect, or limited their ability to achieve their goals. Some of these obstacles are inherent questions with respect to the nature of EPR, while others seem to have come about as a result of the structure and form of the dominant EPR policies today. The following section offers just a brief overview of some of the dynamics within these challenges, and trends toward addressing them. These conditions are important to take into account when considering use of EPR in order to achieve waste management goals.

Obstacles to Successful EPR Policies

Challenges from the nature of EPR

Competition is essential in order for the incentive structures in EPR to function efficiently and effectively, and to allow EPR policies to achieve their goals. However, EPR policies can also pose a threat to the very competition that they depend on. As producers each take on extra costs to accommodate these policies, they open themselves to potential vulnerability and competitive disadvantages relative to others who may be able to bend the rules or get by without taking on full responsibility. These adjustments may in fact leave those in compliance at a disadvantage if there is significant leakage that allows other products to be brought in, if there is collusion that leaves them out of competitive deals, or if they have to take on the costs of free-riders or orphan products. Producers and policymakers may establish several different structures to help them avoid and overcome losses, in part through peer regulatory pressure and group insurance efforts, as well as government regulation and enforcement (OECD 2016).

EPR policy requirements for product components or materials management may hold potential to impose barriers and produce positive and negative impacts in the international market for primary or second-hand goods. These requirements may also influence small and medium

enterprises, and products that have traditionally been collected in the informal sector. As PROs take on some aspects of the product stewardship responsibilities that EPR mandates, the structure of the market that they create to provide these services may have a significant impact on the competitiveness, and openness, of EPR. It is essential that the policy structures in the EPR market encourage healthy, open-market competition, and that they align with other regulations and agreements that have been established to protect safety and economic opportunity. EPR policies that are shaped appropriately to address issues of competition and trade can stand out in their economic efficiency and strong environmental commitment (OECD 2001).

At the International Level

EPR policy may be composed at regional, national, state, or local levels. However, these product stewardship requirements have important implications for producers whose products are imported, sold, and collected, at any of these market levels. The impact that these regulations may have on those engaging in the trade of primary products and end-of-life, secondary materials initially raised a number of concerns regarding international law. Producers who exported their products into areas with EPR and take-back requirements were especially concerned about how they might be subjected to and impacted by these policies (OECD 2001, 65). In recent years most take-back efforts have been contracted to PROs and other service providers, which has limited many of the major concerns of barriers to information and trade. Nonetheless, there still remain a number of situations in which EPR could pose a competitive disadvantage.

One example of a competitive disadvantage that EPR might inspire is if the product that is subject to regulation (packaging, for instance), has to be of higher cost or less recyclability by nature (in this case, for transport from abroad). Other times, some aspects of EPR requirements may not align with the most economically or environmentally efficient options that the producing

country's infrastructure and resources have to offer (OECD 2001, 68). It is important to consider how specifications regarding a product's sourcing, or its processes or production methods, may be regulated. It can also be important to carefully consider the degree of flexibility that should be permitted in order to accommodate for differences. Finally, if there are regulations in place that restrict an importing body's ability to make changes that would help them face a smaller burden, this may require consideration from trade authorities. One example of this may be if national requirements mandate that producers cannot import materials in certain types of containers, but at the same time these containers can be used for transport internally (OECD 2001, 69).

EPR products must also be taken back and managed as recyclable or waste material, therefore it is also important to consider the impact on the market for end-of-life materials. EPR policies can drive a significant change in the recycling and waste management markets. EPR requirements may alter the structure of how and by whom waste is collected, processed, and overseen. They may also influence the quantity and price of secondary materials, especially as, in some cases, collection and recycling may also be subsidized by governments and PROs. EPR policies may present a risk of undercutting other countries' recycling markets if these products are "dumped" or exported into the international marketplace at low prices. Accordingly, the financing for EPR policies is subject to the WTO Agreement on Subsidies and Countervailing Measures. In order to strategically prevent violations, some policies also set a cap on the rate of recovery of certain materials, according to local recycling capacity (OECD 2001, 70). EPR policies should also take into account local and international regulations and requirements such as hazardous waste (OECD 2001, 70-71).

EPR policies ought to ensure appropriate transparency, non-discrimination, and resources to avoid technical barriers to trade (OECD 2001, 71-79). When addressing the global ecosystem

and goals as a single issue, it is imperative that both the policy instrument and goals work together and are compliant with the WTO. EPR policies that will involve imports and trade should take care to inform relevant actors, including the WTO and foreign trade associations, and ought to allow adequate time for them to comment on the proposal, and then for changes to be made. They should also take care that PROs do not form barriers to other waste management organizations entering into the market of providing this service. Over the years, EPR policies have sometimes come to the attention of trade and competition authorities and courts. While the criteria for evaluating anti-competitive behavior often varies between countries, these guiding bodies can may serve as a standard reference for the requirements that have to be addressed in order to integrate EPR within the global market (OECD 2016, 47).

Liability. When shaping EPR regulations, it is important to consider and appropriately frame who will bear the burden of accountability and how. However, the real application of these efforts can be very complex. Brüggemeier (1994) observes that one significant challenge to establishing liability lies in the fact that environmental damages generally occur gradually, and even through contributions from many different sources. Often, clearly defined boundaries do not exist to establish who owns something at any given time, the information that they have about it, and when and where their responsibility ends (Kroepelien 2000, 5). This is very relevant in the case of EPR, as products often change hands from suppliers to manufacturers, retailers, and intermediaries. While just one of these groups is typically responsible for associated end-of-life responsibilities, the inherent public and environmental health risks associated with these products may primarily lie with another actor.

Kroepelien (2000) considers trends in liability law to address the complexity of risk distribution in modern production. In place of tort law's traditional focus on specific damage to a

person or a property, he notes a new and growing branch of liability law that is interpreted and applied broadly, reducing individual risk. Kroepelien also suggests that EPR would likely fit within Brügge-meier's objectives of environmental liability, including "damage prevention" and "distribution of loss" throughout the production line (Kroepelien 2000, 6). In this way, industries may be willing to embrace responsibility for the end-of-life disposal of their products, so that the environmental standards that the policy was created to achieve are not compromised.

The Burges Salmon LLP guidelines for legal experts' application of new environmental legislation regarding the European Union's 2009 Waste Batteries and Accumulators regulation emphasizes the importance of ensuring that all actors affected by EPR legislation take responsibility for the control of supply chains and agree on liability contracts from the outset (Burges Salmon LLP, 2010). In this way, liability may be shaped and agreed upon based on the industry and existing policy's greatest needs.

With respect to national liability, Tuebner (1983) suggests that many of the political, economic, social, and ethical considerations of legal theory are incorporated directly into legal standards through "reflexive laws" that are produced in response to issues such as EPR, and determine what is sufficient competence, organization, and decision-making in a specific context. In this way, broadly distributed producer liability, shaped by a combination of external constraints and internal regulations, in fact supports EPR (Kroepelien 2000, 6). This support may reduce direct producer liability in some ways, in order ensure that it is reasonable to embrace end-of-life EPR, and possible to protect environmental and public health efficiently and effectively.

Local Adaptability

EPR policies apply to all producers in the marketplace at whatever level they have been established, therefore all those involved in this market should not have to worry about the costs of

their products relative to others, and their ability to compete outside the bounds of the EPR policy. However, it is important to note that the costs of adapting to these regulations may pose a significant burden to some industries, and less to others. EPR policies often hold distinct collection, payment, and reporting requirements. Learning about, and adapting and adhering to each of these policy requirements can pose high information, compliance, and reporting costs that might especially burden large manufacturers (OECD 2001, 67). Large manufacturers may also face challenges if they need to adapt their products between different areas where the policy is applied, and where it is not, in order to remain most cost competitive. Alternatively, in some places waste collection may be led through the informal sector, and it will be important to foster information sharing, competition, and regulation in this setting (OECD 2016, 183).

Small and medium enterprises. Small and medium enterprises may have greater flexibility than large producers, and may therefore be able to avoid bureaucratic delays and to quickly adapt to new regulations. However, they may lack the weight they need to drive important changes on the parts of other parties that are up- or down-stream. Their research and development efforts to keep up may also be a higher proportion of their total operation costs. Finally, it can be difficult for smaller enterprises to find out about particular details within regulations if they do not have the experts on hand (OECD 2001, 96). As small and medium enterprises hold approximately 45 percent of global employment, it is imperative to ensure that they can remain competitive, alongside large producers, under EPR policies (The World Bank 2015). Policymakers may consider a number of measures in order to assist small and medium enterprises where they might face a risk of competitive disadvantages, including: meeting with stakeholders from this group in order to gather input before and during the implementation process, gradually phasing in requirements over time, ensuring standards and reporting requirements are as clear as possible,

and offering guidance and accessibility to support efforts to comply with the regulations established (OECD 2001, 96).

Within the industry. Even if the burden of EPR regulations is shared evenly across an industry, it may still carry significant weight and potentially interfere with a producer's ability to operate profitably. To this extent, it is important to consider how the additional financial and administrative burdens of EPR policies may affect individual producers. The costs of carrying out an EPR policy may vary depending on the nature of the product and the take back and treatment costs that it incurs. The portion of the burden that producers bear may depend on the customer's willingness to accept changes in the product price, if producers are able to pass on some of the costs of efforts to meet EPR requirements.

In theory, the costs of EPR efforts should be distributed relatively evenly across an industry. But this does not necessarily ensure against the risk that the burden might be so great that a producer cannot turn a profit while complying with EPR regulations. In 2012, the Pharmaceutical Research and Manufacturers of America, the Generic Pharmaceutical Association, and the Biotechnology Industry Organization, sued Alameda County, claiming that its Safe Drug Disposal Ordinance infringed on the free flow of goods. The industry argued that the EPR policy imposed requirements that violated the U.S. Constitution Interstate Commerce Clause, and in doing so imposed an undue burden on their ability to operate efficiently and effectively. This EPR policy, which required producers to offer safe collection and disposal of medicines in Alameda County, was the first of its kind in the United States. Passed at the county level, it required producers to make a very locally-specific effort to collect medicines at their end-of-life. As the Supreme Court refused to hear the case, and effectively upheld the lower court's ruling, this case affirmed that even local product stewardship efforts are reasonable within the competitive

marketplace, even if they may pose a relatively high cost of oversight (Bay Area News Group 2016). This case set an important precedent that stretched beyond just pharmaceutical product regulation and was noted across throughout the state.

Challenges in light of EPR Policy Structure

The extent to which EPR policy is able to redistribute and reduce the costs of product disposal depends on competition as a driver of progress to fulfill policy goals. Competition between the actors that take on roles in EPR can also be an influential aspect in regulatory bodies' leverage over these actors, if they are able to choose which among them may have the opportunity to fulfill EPR obligations. This can sometimes be a challenge because EPR policies may inspire changes in the balance of power surrounding waste collection services, which can have an impact on the incentives that support accountability for fulfilling EPR policy efforts.

Regulator Credibility and the Incentive to Fulfill EPR Goals

One important determinant of progress toward EPR policy achievement is the degree to which PROs are competing with one another in order to fulfill EPR obligations. The way that PROs are founded and governed, and the number of them that exist within a particular industry, have important implications toward these organizations' authority and accountability. In some industries, all or the majority of the producers may elect to make use of or create a single PRO to fulfill their EPR duties. In other industries, a large number of PROs thrive. Some may have been established independently, while others were founded by a single producer or brand. The history and the portion of the market that they serve has a significant impact in shaping a PRO's interests, based on whether or not it may share historical ties and interests with producers, or if they are competing for a producer's business.

PROs may also have different levels of organization and oversight. While some PROs take on all of the tasks related to EPR, from managing research and funds, to collecting products at their end-of-life, other PROs may contract with separate collection and recycling agencies. This can have an impact on the way that the interests of PROs are distributed. Sometimes differences in the interests of PROs may clash beyond the extent of a healthy, competitive market. Other times, a lack of competition may allow PROs to advocate or act in a way that does not align with the goals of EPR policy. In this light, the nature of PROs has important implications on the credibility of regulators and the incentive to achieve EPR progress.

The advantages and risks specifically of large or small PROs is an important debate. In theory, large PROs may incur lower overhead costs and offer a stronger foundation for DfE. However, if a single PRO dominates in that industry, it may hold undue influence on product prices and collection records. Powerful PROs may intentionally choose to over- or under-collect products in order to strategically influence their own costs, product prices, and the expectations toward them. Alternatively, PROs that are just one among many, may be forced to offer the most competitive prices and collection rates. In order to create their own advantage, or to maintain approval, PROs may adjust the ways that they count the number of products collected, inappropriately influencing their ability to meet set goals, and the way that future goals are established (Mayers and Butler 2013, 286).

Product-specific recycling systems in EPR may also inspire changes in the nature of waste collection. Locally organized waste management often offers services to collect and treat a variety of products as recycling, trash, or hazardous waste, at its end-of-life. On the other hand, producer-organized collection efforts often make use of PROs that operate at a state-wide, national, or international level, but focus on collection of a single product. In this way, EPR policy may have

significant impacts on the nature of the recycling industry. While EPR may inspire growth in the recycling and waste management sectors, it may also lead to specialization and sectionalism (Mayers and Butler 2013). Paul Gardner (2013) suggests that this process of unifying efforts to safely recycle and dispose of waste, is essential to moving forward, with improved access to recycling options. However, this may require the consideration of guidelines to support competitive PROs and fulfillment of EPR.

In order to overcome these challenges, the OECD (2016, 47) recommends that all EPR policies should include provisions to ensure that PROs are held accountable within their horizontal (between other PROs), vertical (serving producers and sorting or treatment sites), and downstream (recycling and waste treatment) market relationships. One initiative to support this might include regular competition impact assessments, alongside efforts to establish or contract with a PRO reviewed by a neutral authority. Advisory bodies may be able to help uphold a focus on transparency in all exchanges of money and waste. They should be committed to supporting competition among PROs, regardless of whether they are fulfilling voluntary or mandated policies. Later down the line, this can have important implications for oversight efforts. These preemptive measures may help ensure that regulators maintain their leverage because they have viable alternative PROs available to fulfill EPR obligations (OECD 2016, 47).

The Potential for Loopholes and Inverse Incentives

EPR stands out among waste management policy theories through its focus on offering incentives for investment in research and DfE, in addition to providing structure to support safe end-of-life product disposal. DfE efforts might involve changing the contents of a product, the technology used to make it, or even the means of distributing it to customers (for example, producers may choose to lease rather than sell the product) (Lifset and Lindhqvist 2008, 144). In

theory, producers who invest in DfE should be able to offset the extra costs of end-of-life disposal so that they are not passed on to consumers and so that producers are not left at a competitive disadvantage. DfE should also include a focus on refurbishing and reuse, just as much as redesign for recycling.

Over the past twenty years, EPR has faced a number of challenges that may have led some policymakers to focus more on mandating collection and recycling than on inspiring DfE (Lifset and Lindhqvist 2008, 144). In this way, EPR has inspired a notable increase in the number of opportunities for safe product disposal, and has relieved governments of some of the burdens associated with waste management (OECD 2016, 30-33). However, the degree to which EPR has succeeded in inspiring DfE is still unclear.

There are two primary factors within the structure of many of the EPR policies that have been passed so far that may contribute to EPR's limitations with inspiring DfE. First, how the roles of producers and stakeholders might be separated when they are fulfilling EPR requirements. Second, the way in which EPR is distributed between producers in an industry (Kalimo et al. 2015, 41). Many experts argue that the tendency toward collective efforts to fulfill waste management responsibilities has distributed costs in such a way that the incentive for individual producers to make DfE improvements has been diluted (Lindhqvist and Lifset 2003, 3). If a reduction in costs does not cycle back to benefit producers, then the theoretical incentive for DfE may be lost.

Separation between producers and stakeholders

The incentive for overcoming the burdens that producers face under EPR may be lost or mismatched if some of their obligations are contracted out to other parties, such as recycling or collection companies. These service providers may already have the infrastructure and experience to support product collection and processing, which offers them a natural role helping efficiently

fulfill EPR requirements. However, these actors are typically not subject to the same mandates or collection quotas as producers are, under EPR. In fact, producers may have to buy their products back from collectors and recycling centers in order to fulfill these requirements. This can create an inverse incentive that in fact opposes the goal of DfE. By designing their products so that they are more competitive for reuse, producers may be less able to offer a competitive price to reclaim it. This is especially the case if collectors and recyclers are able to pick and choose the most valuable components to recycle, and producers are left with the lowest value products (Kalimo et al. 2015, 41).

The incentive for DfE may also be reduced if there are loopholes, exemptions, or non-competitive negotiations that might allow producers to avoid these fees (OECD 2016, 51-52). Some products, for example, may not be subject to regulation unless they contain a certain level of recyclable components. If this is the case, producers may choose not to make DfE improvements, in order to avoid these potential costs and responsibilities. Differences between the policies and incentive structures around the world may also make it difficult for producers to adapt to any regulations, and collectively dilute the incentive for DfE (OECD 2016, 52). In order to overcome these negative influences, policymakers may be able to take measures to diagnose and prevent challenges that may discourage producers from pursuing DfE. They may, for instance, extend extra benefits to producers if they are likely to suffer a disadvantage relative to a recycling service provider. They may also consider taking part in international efforts to harmonize DfE incentives (OECD 2016, 52). Finally, EPR policies, themselves, may include provisions for competition authorities to regularly review EPR initiatives, to ensure that they are being carried out in an open and impartial manner.

The distribution of responsibilities within an industry

It is also important to consider how responsibility is shared among producers from the same industry. EPR responsibilities may be carried out individually or collectively. Collective efforts to lead EPR initiatives are often thought to reduce overhead costs and allow for collaborative investment in research and development. However, the way that DfE incentives are distributed among collective responsibility efforts may vary based on the nature of these collaborative efforts, and the industry. The benefits that a producer receives from DfE initiatives may depend on the stake that a producer holds within a PRO, and the way in which the costs of EPR are applied to the product. The rate of return that a specific producer experiences may be especially diffused when they are a part of collective efforts to meet EPR requirements (OECD 2016, 52).

Collective responsibility may do little to reward DfE improvements for specific products or brands. Some PROs have made use of a modulated payment system for producers that vary based on certain features of a product (OECD 2016, 52). In this way, products that are from industries with a diverse range of items can be included in joint efforts to fulfill EPR and offer advantages with respect to the efficiency of collection and accessibility for consumers. One example of such a diverse industry may be electrical and electronic equipment, in which an array of items from cell phones to televisions, is often regulated under a singular EPR policy, and may be collected from the same sites.

In the mid-1990s, policymakers were somewhat caught by surprise when a number of major producers, including IBM, Sony, and Electrolux, announced opposition to early EU efforts to shape producer responsibility regulations for electrical and electronic equipment. Examining EPR systems' historical tendency to produce collective responsibility efforts, they highlighted the risks of these joint efforts, including the "orphaning" of products, and the fact that others may free

ride on their DfE initiatives. As an alternative, they proposed, they would be able to meet these requirements more competitively and efficiently if they could be led and organized on their own terms (Lidhqvist and Lifset 2003, 4).

Policymakers soon began to embrace these terms. In 2002, the EU incorporated provisions for individual responsibility in its WEEE Directive. Over the years, while individual responsibility helped address many of the concerns that producers had raised, it also presented many challenges of its own. In order to regulate individual initiatives to fulfill EPR obligations, enforcement bodies must be able to monitor and audit individual producers as they store money to manage the end-of-life of their products. The risk of orphaned products that go unprotected is especially strong in the case that the producers who should be held responsible go out of business or file for bankruptcy before they have had the chance to collect their product at its end-of-life (Lidhqvist and Lifset 2003, 5). The WEEE Directive strives to overcome these risks by encouraging electronics and electrical product producers that opt for individual collection to make use of insurance and savings funds that are managed apart from the company. However, some critics argue that these services may again separate producers from the incentives for DfE (Mayers 2007, 122).

Many businesses today have chosen to embrace corporate social responsibility as a form of self-regulation that shapes its business strategy, with a broad goal of encouraging a strong relationship between firms and customers. This tends to include a focus on achieving certain objectives within the supply chain, rather than embracing end-of-life responsibility for products (Hickle 2015, 10). However, corporate social responsibility initiatives may provide the foundation for changes that support DfE and improved end-of-life options. Hickle (2015) suggests that individual producer responsibility may help brands incorporate their role within their corporate social responsibility goals, and they may then take on end-of-life collection efforts.

EPR Policy Enforcement

Compliance and enforcement measures are imperative to ensuring that product stewardship responsibilities fall evenly and on the appropriate actors. In this way, the producers that adhere to EPR regulations will not be at a disadvantage. EPR incentives will only work if the policy is enforced and clear standards for evaluation are established and upheld. Government bodies generally take on this role as regulators, overseeing EPR policies and holding producers accountable for their product stewardship responsibilities. However, there are often important checks and balances within these networks, as well. While working in between these checks and balances, regulatory and enforcement bodies may face significant challenges that limit their capacity or credibility to act.

The way that responsibility is distributed, and efforts to fulfill it can be evaluated, is often not as clearly defined as a first glance at EPR systems might suggest. As producers contract out or collaborate to achieve some aspects of their stewardship requirements, the amount of competition among PROs can also impact their accountability. In order to monitor compliance, states may also depend on local governments to conduct on-site reviews. Unfortunately, there is often limited transparency, and it can be difficult to compare data from this variety of sources. In this way, EPR regulatory efforts may not reveal if PROs or local governments skew their numbers so that they align more closely with their own interests. Alternatively, even if producers clearly fail to achieve their goals, local regulators may sometimes be hesitant or unable to carry out enforcement measures. If there is only one major product stewardship leader or PRO, the government would most likely be unable to revoke its accreditation in a case of non-compliance without delivering a major blow to the program as a whole (OECD 2016, 41).

The OECD suggests a number of best practices to encourage transparency and accountability in all EPR efforts. First, it is important to clarify relationships between different regulations, and between different regulators at all levels, very early on. These relationships should also include clearly defined requirements for transparency and reporting procedures. The consequences of non-compliance might include fees, criminal and civil penalties, prosecution, loss of accreditation, and public disclosure (OECD 2016, 100). Some policymakers suggest regulations should be conducted by an independent authority. Alternatively, regulators may be able to overcome conditions that would cause them to lose their enforcement credibility by requiring PROs to keep a contingency fund of that matches the operating costs of one year. Regulators may also reserve the right to take over the product stewardship operation if they find PROs insufficient, and they may charge the PRO for their costs (OECD 2016, 100).

Finally, EPR policy regulations should carefully weigh the impacts that EPR objectives may have on other policies, and take care not to offset their incentive structures or the balance of authority between these groups. If EPR policies call for other actors to play a role in regulating or incorporating incentives to fulfill some aspect of a regulation (pesticide regulation, for example, may require collaboration with the appropriate pesticide/rodenticide agency), compliance and enforcement efforts ought to account for this. This ought to include a balancing of priorities and goals, so that EPR policies that encourage efficiency and minimize environmental impact are not weighted against other priorities such as product safety (OECD 2005, 45).

Chapter 5: Conditioning Factors and Recommendations for the Future of EPR

The challenges and conditions that EPR policies may face have important implications on when and how EPR should be considered and implemented, and its results evaluated. A decision to shift the burden of waste management ought to include consideration of who can do the most good and how this will help achieve important social, economic, and environmental goals. EPR's primary objectives, to relieve some of the financial and infrastructural burdens of waste management and to inspire DfE, will fill an important niche in waste management systems and provide an incentive for safe and efficient production and use throughout the product lifecycle. In this light, policymakers ought to continue to consider EPR as distinguished from other product stewardship policies. However, EPR policy success will depend upon regulatory bodies' ability to establish and uphold reasonable but stringent goals, and to foster competitive efforts to meet these objectives while respecting global trade, liability, social, and environmental considerations. Looking forward, there is a strong case for consideration of EPR policy in order to optimize efforts to align incentives for safe product disposal and DfE, even when there may be other policy measures in place. In order to refine understanding of best practices and to ensure that EPR is able to achieve its full potential, existing policies may be amended, and future policies ought to be shaped in order to place a special focus on sharing and analyzing policy impacts.

EPR on the Global Stage

As EPR policy has spread and evolved over the past two and a half decades, there has been a growing awareness and understanding of the policy's potential benefits and limitations. While EPR policies have faced some significant obstacles, the concept of EPR and its approach toward

aligning the costs of waste management have been received with relative warmth. EPR is viewed as a viable policy option by many policymakers, around the world. In Europe, EPR continues to expand with consideration for a wider range of products in more and more countries. In the countries that already have prevalent, well-established EPR programs within Asia, South America, Africa, Australia, and North America, the momentum surrounding EPR proposals in each of these areas is largely continuing to push forward. At the same time, EPR consideration of EPR policies is expanding, with different levels of government around the world beginning to lay the groundwork for EPR policy, and to weigh one measure at a time (OECD 2016).

Based upon its varied history and the work that has already been done to expand familiarity with and support networks to guide EPR policy measures, consideration and implementation of EPR may become more customized and efficient in the future. Previous policy measures may serve as a guide for EPR, and may help anticipate and overcome some of the challenges that new policy proposals would otherwise face. They may also help customize efforts to fit the nature of a product, industry, and the market surrounding its efforts to manage a product at its end-of-life. Furthermore, some of the infrastructure needed to carry out aspects of EPR, such as PROs or the authority for regulators to enforce EPR efforts, has now been established and can be applied toward the implementation of other EPR policies.

At the same time, it is important to note that information sharing has been limited by a lack of standardized data collection and reporting requirements, and sometimes an industry's failure to disclose information about their product, making it difficult to evaluate the policy's environmental impact and to estimate its ability to inspire DfE (OECD 2014, 11). As EPR policy may take a wide range of forms and may be implemented in many different conditions, it can also be a

challenge to distinguish which elements of the policy have been successful and which have not, and under what circumstances.

Following from its role of gathering and sharing information regarding EPR, and in spite of some limitations in access to information and comparability, the OECD has offered guidance in order to support more standardized consideration of EPR looking forward, and to allow greater analysis when looking back. The OECD's "Updated Guidance Manual" (2016) compiles and lists good governing practices that may help support all actors involved in EPR policy. These best practices focus on careful consideration of the nature of the policy and the products that it regulates, clarity in the expectations to which all actors are held, transparency to ensure that information is shared, and standards that will support consistency for fair competition and impact measurement (OECD 2016, 28). These guiding principles also allow support for anticipating and managing any potential issues with trade or liability.

In a similar manner, the European Union has published an analysis of its existing programs and needs through the "Development of Guidance on Extended Producer Responsibility" (Bio IS 2014). While this looks particularly at the European Union, many of its recommendations and trends offer a broad outlook toward EPR on the international stage, as well. Moving forward, this form of analysis and information sharing from research organizations or policymaking bodies will be an important means of learning about and improving upon EPR policies. In order to optimize these efforts to address waste management and its associated challenges, this thesis offers the following five recommendations regarding an approach toward EPR, in general:

- 1. In order to support EPR progress, it will be important to continue to organize and share information related to EPR, with a particular focus on promoting standard definitions and transparency.**

While analysis of the successes and challenges that stem from EPR has served as an important resource for shaping these policies, interpretation of these trends has been complicated and limited by a lack of standard definitions and principles surrounding EPR. These standards will most likely come from understandings formed at the international level, for instance, the OECD. Many organizations have indeed drafted such standards, however, these will only allow for progress if they are embraced by policymakers and policy analysts in the places where EPR is actively implemented. However, efforts to standardize the definition of EPR and its associated actors (such as the “producer”), may present a significant challenge in light of the wide spectrum of interpretations that already exists at local levels. In this light, an international standard may include a process of calculating where, and the degree to which, responsibility has been shifted, and then categorizing the policy accordingly. While it may be difficult to inspire the support needed to adopt these standards, one initiative to engage relevant policy actors may be to lead stakeholder consultations similar to those conducted in the EU’s “Development of Guidance on Extended Producer Responsibility” (2014). International actors may also support local efforts to embrace their standards by offering assistance with categorizing and interpreting local policies in terms of the standard definitions. This common vocabulary and mutual support may also play an important role in driving transparency regarding financial and collection expectations and achievements in all policy measures, which will further support policy analysis and improvement.

As an awareness and understanding of EPR grows, policymakers will increasingly be confronted with the question of when and how to choose to pursue new regulations for waste management, and the extent of the responsibility that may be associated with them. While the nature of the policy that is most appropriate in each situation may vary, a focus upon incorporating

the full costs of the end-of-life waste management of a product may hold potential to inspire the most extensive results.

2. Policymakers ought to consider at least some aspects of EPR, rather than other forms of product stewardship alone, in many cases.

A key element of EPR or other product stewardship policy considerations is the challenge of determining the amount of responsibility that an industry ought to take on in order to reduce the economic and social costs of that product's end-of-life. This depends, in part, on the nature of the market and the industry. In many cases, rigid product stewardship requirements may offer a limited incentive for continuous improvement in end-of-life disposal rates and DfE. In this way, when applied appropriately, EPR policy that requires producers to take full responsibility may be a superior option in the long term. However, in some cases it may not be feasible or most efficient to negotiate or implement EPR. The extent to which it might be best to focus on EPR may vary in light of conditions such as the nature of the product and industry, receptiveness to new policy measures, and the regulations that are already in place.

Nature of the product or the industry. In some cases, other product stewardship policies may be an important first step, or a more efficient option, than EPR. In 2015, for instance, as California worked to develop a policy that could help relieve the burden of mattress disposal, policymakers were willing to settle on other product stewardship regulations based on their perceived potential to inspire positive results. For this type of product, a new design was unlikely to inspire significant environmental improvement. Further, in light of the ability to deliver a new product and collect the old one in the same visit, stewardship organizations might be able to achieve high collection rates even without flexibility for the use of other economic instruments that may be present through EPR (Kobold 2017). If there is limited potential regarding efforts to

redesign a product, then it may not be as important to focus on aligning the cost of disposal specifically with the producer. Additionally, if the value of a product (both financially and in terms of the effort required) exceeds the costs of disposal at its end-of-life, then there may not be a need to make use of this form of incentive.

A hybrid compromise. In other cases, a hybrid policy option that combines a fixed fee from the point of sale, and economic incentives, may meet the needs best. California's Beverage Container Recycling Program, for instance, has been an effective measure insofar as it has reduced the amount of litter and increased recycling in California through a deposit-refund system, and has inspired DfE through a charge to producers based on the type of containers that they use (Californians Against Waste 2015). EPR policy in general may be more financially feasible when products hold a lot of value as materials for recycling or reuse (Kobold 2017). In such a case, the end-of-life value of these products may pay for the costs associated with collection, treatment, and program oversight. While this is certainly not required for EPR policies, it may ease the burden that producers face under such regulations, and may help support openness to EPR policy proposals.

If the potential costs of compliance appear to be too high, then an industry may oppose EPR policy proposals and it may take steps to try to prevent them. If this is the case, then voluntary agreements may offer one form of compromise, with the understanding that they will lead to more formal regulations if the agreed upon standards are not upheld. However, it is important to note that, in many cases, voluntary agreements lack the enforcement mechanisms needed to ensure that all actors follow through on the actions that they agree to lead. The general trend of EPR policy regulations, both for a specific industry, and for a regulatory area, may influence producer openness and public perception regarding EPR proposals. The best approach may therefore be

context-specific. In this light, it will be important to consider the level of stringency that is appropriate in order to ensure that the underlying need for such a policy is addressed.

3. EPR or other product stewardship policies must be supported by appropriately stringent goals and enforcement measures. The nature and rigidity of these requirements may depend upon the regulatory authority that will be responsible for oversight and the way in which policy standards will be enforced.

Voluntary and mandatory policy measures. Nash and Bosso (2013, 183) recount that producers in the United States have historically initiated strategic voluntary policies to keep stringent regulation of their product from expanding to more states. However, these efforts have generally failed to fulfill the responsibilities that were expected of them, and have therefore only delayed the need for mandatory policy measures. In a number of cases, however, mandatory policy measures have also failed to produce the desired results due to a lack of credible authority among regulatory agencies. These two potential outcomes suggest a delicate balance in negotiating the stringency of such regulations, and a heavy dependence upon the credibility of enforcement. While EPR policies may hold the potential to threaten civil or financial penalties for a failure to achieve their set goals, these costs may be too high to begin with, in some cases. Policymakers ought to remain open to voluntary efforts that demonstrate an ability to meet many aspects of the policy need with reasonable credibility that they will follow through. The degree to which needs are addressed may be in terms of safety and public health standards, and trust for follow up action, may stem from past examples or promised programs or funds (Nash and Bosso 2013, 183).

When proposing any form of agreement, policymakers ought to consider its stringency with care so as to ensure that it is neither too strict nor too relaxed. While a policy that sets a low requirement may fail to meet the public's needs, policies that are too strict may cause an undue burden. Both of these possibilities may create hesitance and resistance toward future policy

measures. It will be important to weigh the public perception of proposed policies in order to prevent this from occurring on either end. Further, policymakers also ought to continue to review these agreements regularly, particularly if there may be proposals or public pressure for a voluntary agreement to shift into formal policy agreement. Regardless of the level of stringency that policymakers agree upon, it will be essential that policy objectives and responsibilities are clear and that authorities maintain their ability to lead enforcement so that their expectations will be met.

Enforcement. Active enforcement of EPR policy is essential in order to ensure that all actors adhere to their obligations under EPR, to allow the potential to achieve the policy's intended results. Enforceability depends not only on the authority to make use of a policy measure, but also on a willingness and ability to evaluate the level of policy achievement, and to impose penalties when actors do not comply. If a regulatory body has struggled to enforce policies in the past, or if its credibility or leverage may be limited relative to the parties who bear responsibility under an EPR policy, then the incentive for compliance will be significantly reduced, and EPR may not be appropriate.

Enforcement efforts may come from penalties for non-compliance, or from a regular review and approval of all of the producers and organizations acting on their behalf. Based upon this review, regulators may have some say in whether or not, and how much, these actors may sell or collect items within the areas that are addressed through the policy. Policymakers ought to consider regular reviews at all of these levels, and enforcement, as necessary. Ultimately, the needed credibility and leverage will come from competition. This is evident in the fact that some PROs can in fact be effective regulators, in their own capacity. PROs may lead efforts to ensure that all other PROs in an industry are fulfilling their obligations in a responsible manner. In this

way, they may verify that the producers they represent are not at a competitive disadvantage relative to others. PROs also ought to be a focus of regulation and efforts to inspire competitive responses that maximize efficiency. Following from the model of the Ministry of Environment in Austria, regulatory bodies may support information sharing, monitoring, and efficiency by reviewing PRO goals and achievements. Only those with strong competitive potential may be approved for the chance to help producers meet their EPR obligations (OECD 2014, 11).

4. In order to support EPR policies, regulatory bodies ought to foster a competitive environment to fulfill these obligations. The responsibility for policy compliance must be distributed in such a way that it inspires efficient performance and supports enforcement efforts when needed.

Competition for the chance to serve or represent producers as they strive to fulfill EPR obligations can help ensure that no single group wields undue authority to manipulate prices or overshadow enforcement efforts. In this way, regulations that establish EPR policy obligations typically ought to be open to a variety of potential actors who will compete in order to achieve the most and to embrace the economic opportunities that are available through this role. However, it is important to note that sometimes this may drive the opposite reaction, as well, and that sometimes the costs of efforts to maintain this competition may seem to outweigh the benefits. At times, there may be so many groups involved in efforts to fulfill EPR policy obligations that it may be very difficult for the government to monitor compliance. While this does not seem to have happened often, some individuals have jumped at the chance to make use of the California Refund Value (CRV) for cans and bottles, and organized to bring in truckloads of bottles from out of state, and to receive the refund when they never made a deposit. This fraud has posed a challenge to the nature of, and ability to sustain, the program (Garrison 2012).

Careful action by regulatory bodies is key to policy effectiveness, setting standards for PRO achievements, and overseeing progress in this direction. The amount of authority that PROs command relative to regulatory bodies may vary in light of the number of PROs that are actively fulfilling, or are willing to take on, the responsibilities that are delegated to producers through that EPR policy. If there are multiple PROs that are working to comply with an EPR policy, then there may be greater accountability for each of them, as well as an inherent incentive to maximize efficiency and to achieve policy goals in the face of a real threat of losing their ability to lead efforts to comply with that policy. On the other hand, if the market to take on efforts to fulfill EPR obligations is not competitive, regulators may be less able to hold PROs accountable, and PROs may wield undue authority to the extent that other actors are dependent upon them, alone, to fulfill certain responsibilities.

The number of PROs that exists may depend on how producers have come together to fulfill their obligations under EPR and previous policies. If policies established disposal requirements for this product or for others that may have been similar prior to EPR, then there may already be organizations and businesses that have the structure and connections to lead efforts to carry out the responsibilities established under EPR. In some cases, a single group may have performed all of these roles in the past, while in other cases there may have been many different businesses or organizations that each carried out all or some portion of the effort to fulfill these obligations. Regulatory bodies often ought to foster a competitive market in which PROs feel that they must compete in order to earn the opportunity to fulfill EPR obligations.

PRO Monopoly. Efforts to fulfill EPR policy obligations may arise naturally, within the market for end-of-life products, or they may be forced by the need to meet these expectations. A single PRO may dominate industry efforts to fulfill EPR obligations in light of the potential

advantage toward concentrated, lower administrative and transaction costs. In some cases, a monopoly may also be forced if a policy works against the market, and otherwise a market incentive is lacking to fulfill end-of-life obligations associated with a product (OECD 2016).

In the case of such a monopoly, efforts to inspire EPR may depend upon a credible and significant threat of a penalty for non-compliance. If the market does not drive competitive efforts to achieve EPR, then regulators will have to take extra care to protect their position of authority. In order to do this they might, first, make sure that the market remains open to others who may potentially fulfill these responsibilities. In this way, even if there is only a single group in a position to carry out the responsibilities at the time, regulators ought not to base the policy on the presumption that this group will lead these efforts. Second, regulators should ensure that they can maintain their ability to impose penalties on those responsible if their expectations are not met. One example of this might be for the government to reserve the right to charge producers for any costs that are incurred if regulatory bodies have to take up efforts of their own in order to ensure that the policy objectives can be achieved. Finally, regulators ought to maintain their ability to ensure sufficient rates of progress by setting the aforementioned performance standards, and overseeing regular reviews.

- 5. As EPR is considered in the future, it will be important to examine the policy's potential impacts on both the local and global scale. In this way, EPR ought to adhere to international guidelines, and to harmonize efforts to support its social and environmental objectives.**

Adherence to World Trade Organization Requirements. EPR policies are subject to WTO standards and regulations if they involve newly purchased products, or recyclable/waste components from regulated products, that are traded across international borders. In this way, EPR policies must not be overly prescriptive or restrictive. They ought not to reduce the potential

for a competitive product market. Specifically, EPR policies must be drafted and carried out in manner that is transparent and does not create non-tariff barriers to trade or place a disproportionate burden on importers, in accordance with the WTO Agreement on Technical Barriers to Trade (WTO 1998). The OECD (2016) suggests that EPR policies are most often amenable to WTO standards and regulations so long as they take these statutes into account while shaping and carrying out their policy. In order to ensure that they comply with the WTO conditions, EPR policies should strive to 1) follow proper procedures for notification, consultation, and transparency; 2) create infrastructure to ensure that foreign and domestic producers remain on equal footing and; 3) consider the impacts that the policy may have on the waste management industry and issues of leakage.

EPR policymakers ought to lead efforts to comply with this first recommendation by notifying the International Organisation for Standardisation (ISO) if a policy will cause changes in that might affect the standards for imported products (OECD 2001, 78). Policymakers may also consider granting exemptions for small-scale producers, or those in developing countries, that may face a proportionately greater challenge in their efforts to comply with EPR (OECD 1998, 17). Following from the second recommendation, EPR policymakers may also help guide efforts to ensure that importers do not face a higher relative cost burden of compliance. Compared with domestic producers, foreign producers may be less familiar and able to contract with local companies in order to meet EPR obligations. If they serve many different places, producers may struggle to comply with local policy requirements that vary among each of these areas. They may also be less able to customize their product in order to achieve the greatest possible efficiency in response to that policy. To ensure that equitable competition continues in this market,

policymakers may consider helping bring stakeholders together to form a PRO that all parties may pay into, and that will manage many aspects of their EPR obligations.

Social and Environmental Impacts. As EPR policy aims to inspire changes in the way that products are designed and disposed of, it is important to consider the broader potential impacts of these efforts. EPR policies that drive a change in the cost or need to dispose of waste may harm some waste management sectors that are no longer profitable. They may also overwhelm other waste management groups that did not have the resources in place to take on so much waste prior to this policy (Mayers and Butler 2013). A significant change in the cost of disposal might lead to leakage, in or out, as those responsible for disposing of products at their end-of-life seek the lowest cost option. In response, policymakers may choose to help boost a market for the components of those products that remain at their end-of-life.

In the immediate sense, this may help ensure that EPR policies are financially feasible for all producers. While EPR policies often lead change in local level product collection and use, the new materials that are chosen or the way that components are disposed of might allow for production or disposal choices that cause detrimental impacts on a larger scale. In the case of Bulgaria, for instance, an EPR system for packaging waste was implemented in 2004, however it did not take into account the informal waste sector that already existed to manage this waste. As a result, the new, formal sector and old, informal waste management sector became engaged in competition that in fact destroyed infrastructure and placed livelihoods at risk. Regulators may weigh the risks of this, and the respective costs, on a case-by-case basis. In this instance, policy analysts recognized the need to integrate the perspective of informal waste managers into EPR plans in order to reach a sustainable and inclusive means of achieving their goals (OECD 2016, 204).

It is also important that policymakers consider the implications of their support, especially as the export of products or a change in the materials used may ultimately have other environmental or human rights consequences. For example, if waste is exported, then a local EPR policy may have unintended impacts that could allow those who manage waste to do so without full understanding or safe equipment to mitigate its potential hazards. If the potential for violations of human rights or environmental harm from a policy seems to exist outside of that area of regulation, one option may be for EPR policymakers may consider placing specific conditions on PROs to ensure that they address this.

Liability. The potential liability associated with EPR obligations also has important consequences on how EPR policy proposals are received, the standards that they are held to, and the manner in which they are fulfilled. Balancing the liabilities associated with managing a product's safe disposal is an essential aspect of EPR. On the one hand, if there is too much of a risk of legal responsibility if something goes wrong, producers may become very strongly opposed to any form of EPR. On the other hand, if the risk is too low, then those who are fulfilling EPR obligations may take shortcuts, focusing on profit rather than working toward the social and environmental objectives of EPR. In order to keep these goals in focus, liability under EPR typically ought to remain with the producer, to the extent that it is reasonable for them to oversee the performance of those who are fulfilling EPR requirements for their products further down the line. While this may offer one standard, feasibility and producer buy-in are essential conditions to a successful EPR policy, as a whole.

Addressing Challenges in the Future

As consideration of EPR policy continues to expand and change in order to meet a variety of needs, it will be important to lead an effort to standardize the definitions and measurements

surrounding EPR in order to better understand the drivers of its effectiveness at the individual policy level, and in aggregate on the global scale. Both the challenges and the successes of previous EPR policies may serve as influential, guiding factors in EPR policy consideration in the future. Further, as EPR is applied to new products in different locations, the rate of success in this will, in part, hinge on an ability to anticipate and prevent such challenges.

While full EPR is a positive objective in light of its potential to lead safe disposal through full lifecycle change, it is possible that EPR policies will need to extend some support to producers in order to ensure that such measures are not too much of a burden or so stringent that they are not enacted. In addition to policy instruments that may help shift the burden of waste management and encourage reduction, it will be important to continue to support the ways in which technology may help reduce the risks and burdens of EPR. As consideration of EPR expands, those responsible for administering compliance efforts on the part of producers may continue to seek opportunities to improve efficiency. This might follow along the lines of the EU's current consideration of Radio Frequency Identification (RFID) labeling on for electrical and electronic equipment in order to help standardize measurements and distribute costs proportionately among stakeholders (O'Connell et al, 2013).

In some cases, EPR may hold potential to bring structure and funding into informal waste management processes in order to improve safe sorting and disposal, and reduce health risks. In this way, as EPR is considered in developing countries, it may offer distinct opportunities to bring together environmental concerns and the incentives necessary to support an overarching goal of sustainable development. However, this consideration may also present new variables and risks to complement these benefits, including a heightened possibility of failure due to mistrust, or greater potential for corruption (OECD 2016, 191).

In order to overcome the range of challenges that arise beyond the consideration of best practices when drafting policies, other actors such as nonprofit organizations may support efforts to uphold the ideals of best practices when leading EPR. These organizations may help establish and maintain product collection sites, and may relieve some of the burdens that might otherwise limit industry willingness and ability to comply with EPR obligations. Such complementary efforts may provide the information and resources needed to draft and support efficient EPR policies. Finally, their support for efforts to carry out EPR policies will be important in order to ensure that EPR is able reach its greatest potential to address the serious waste management challenges that exist today.

EPR in the United States

EPR policy in the United States continues to inch forward at the local levels, which in turn seem to influence policy at the state level. While local policy can be a slow means by which to advance, the fact that it has become fairly widespread and accepted suggests that the foundation is there to expand, even while progress at the national level may not be feasible at this point. As EPR policy in the United States hovers just outside of policymakers' consideration as an important aspect of waste management, it will most likely require some sort of spark of success and support, or significant and hard-to-patch failures, in order to transition out of this phase of gradual, policy-by-policy consideration at state and local levels. Such a "spark" may include a groundbreaking, national level EPR policy for some product, or a significant state level success which might include overcoming strong producer opposition or passing a comprehensive framework policy. These may be inspired by a sudden and strong community environmental concern, fought through the continued efforts of nonprofit or community groups, or taken in based on the example of other countries that face similar challenges. At the same time, this pivotal factor may also shine a

negative light on EPR if EPR policy measures are taken down by legal challenges, a wave of producer resistance, or untamable anti-competitive behavior. These successes or failures may set a precedent that changes the extent to which policymakers may consider and producers will comply with EPR policy.

The probability of such a pivotal event with impacts on the national stage is not huge. The likelihood toward one direction or another also depends on a variety of factors, including but not limited to the tone set by national and state governments, which can influence producer receptiveness. It also depends upon the competitiveness of the market for recycled products. If such a movement does not occur, then EPR may continue to be considered on a policy-by-policy basis, unless there might be a pivotal factor that pushes consideration of EPR one way or the other. If policymakers continue to pursue efforts to help EPR advance but it does not see much progress, then it will likely be overshadowed by momentum toward alternatives that place more or less of the burden on producers. EPR policy might also be found to be appropriate for only specific types of products, or perhaps conditioned upon certain industry openness. Moving forward, this depends on how EPR policy is viewed and considered by policymakers around the world, as well. At this point, all parties ought to remain on the lookout for this window of opportunity to consider EPR, or for other options.

EPR Policy Moving Forward in California

In light of the limitations in the capacity for other product stewardship policies to inspire continuous improvement in product collection rates and DfE, EPR policy seems to hold potential as a superior approach toward addressing many of California's waste management goals. Such a policy would allow regulators to set performance standards while also offering producers flexibility in the tools that they use to achieve them. However, EPR policy success will be

contingent upon the extent to which many of California's current challenges related to EPR and product stewardship may be addressed. Over the past few years, several of California's waste management policies have failed to set or achieve sufficient collection goals, in part due to limitations in the relationship between regulators and industries. Challenges related to the perceived standards of achievement for EPR will carry forward into the product stewardship policy proposals that are considered in the future, and regulatory bodies will be expected to approve proposed performance rates and enforce their achievement. In this way, while EPR may offer a potential for progress toward achieving higher standards and goals, enforcement and competition to meet the policy must be strong so as to compel producers to lead efforts to fulfill these obligations.

Forging and upholding a policy that places so much of the burden of waste management efforts upon producers may be a significant challenge. One option for inspiring industry agreement to EPR at the state level may be through local level policies that demonstrate popular support and help build the foundation for an industry to comply with statewide EPR. The ongoing campaign for regulation of pharmaceuticals and sharps has offered one strong example of the potential for local-level policies to help build the infrastructure to affirm producer responsibility even in cases of industry resistance. This further helped build the necessary support for EPR measures at the state level. While a dependence upon local level policies as a means of swaying state-level support can be somewhat inefficient and roundabout, it may be an important means of building up the leverage and credibility to mandate more stringent policies that may have a greater long-term effect.

The potential for shifting responsibility through EPR has important implications for policy consideration. However, once the responsibility for waste is delegated, regulatory bodies must be

able to ensure that these expectations are upheld. In order to achieve progress, there are two primary approaches that are available to regulators, including 1) a proactive effort to support policymakers' leverage and credibility, and to foster a competitive market to fulfill EPR obligations; 2) a response to non-compliance that imposes penalties on organizations that have not fulfilled their goals. Ideally, it will be best to have both.

In order to boost its oversight and enforcement efforts, CalRecycle may choose to invest in its regulatory capacity to ensure that only products from registered producers are being sold, retailers are applying fees and offering services appropriately, and proposed goals and reporting systems are accurate and sufficient. This can be tricky, as it may be contingent upon the budget and staff that is available, and aspects of the market and industries that may be difficult to control. However, one option may be to boost efforts to delegate responsibilities to local regulatory bodies, and continued efforts to standardize these. CalRecycle may also choose to invest in community education and awareness about these policies and the need for special disposal of these products, in order to support an increase in the capacity for citizen reporting of potential noncompliance.

At the same time, it is important to recognize that such stringent enforcement efforts may have adverse consequences on industry receptiveness to any form of EPR or other product stewardship agreements, with the expectation that the standards will be more stringent, and thus more costly to meet. In this light, it may be important to consider the conditions for compromise. The results of product stewardship and voluntary policies have largely been disappointing throughout the United States; therefore, policymakers should aim for policies that are as clear and as close to placing the responsibility on the producer infeasible. However, there may be instances in which this is not the most efficient approach, or when this extent of regulation is too harsh or

not possible. In some cases, policymakers may also consider a hybrid policy that makes use of some aspects of EPR, but does not include others.

In order to launch this effort to build credibility and practice with establishing and upholding the terms of these waste management regulations, California may consider reviewing the nature and effectiveness of some of its current policy measures. In this way, it may be able to optimize use of the structures that it already has in place, and it may help refine a model for future policy considerations. One policy that may be reviewed is that of carpet product stewardship. This policy presents a clear case in which the PRO responsible for fulfilling associated responsibilities can be attributed to the fact that this PRO was specifically named within the policy measure, and thus it perceives very little threat of competition or credible enforcement. Consequently, CARE has failed to propose fees that will drive adequate rates of compliance. In this case, CalRecycle or non-profit product stewardship organizations may do best to propose an amendment to this measure in order to create a competitive environment for multiple PROs to potentially fulfill these obligations. Regulatory bodies ought to be able to either select between multiple offers to meet collection requirements, or to grant approval of organizations that different producers may use in order to meet their obligations. This will most likely offer CalRecycle leverage with which to influence increasing performance standards over time, so long as they can ensure competitive collection and lead careful oversight.

California may also look into expanding its application of EPR in following with trends from many other states. One example of a common product category that has been addressed through EPR is electrical and electronic equipment. Full producer responsibility policies for e-waste has been implemented in at least ten states (Nash and Bosso 2013). However, California's e-waste policy makes use of an Advanced Disposal Fee (ADF) that is only focused on "covered"

electronic devices (generally products have a screen at least four inches diagonally across, that can display video). It is important to note that, fourteen years ago, California was a leader in drafting product stewardship policies to address electronic waste (CalRecycle Electronic Waste Management 2017). Yet, today its ADF may not provide enough incentive for producers to pursue DfE efforts, and may not do as much to relieve the state of program management costs. For these reasons, as policymakers across the country have turned to regulate electronics, EPR has been the dominant path of choice.

California is currently leading the “Future of Electronic Waste Management” project that has brought stakeholders together to consider the merits and challenges of using different policy approaches and addressing certain types of products (CalRecycle 2017f). EPR has been one of the proposals considered, yet it has been noted that this type of policy may be challenging to pass. Under the current policy, CalRecycle has taken on the overhead costs for local jurisdictions, and the “covered” e-waste products have been profitable for the recycling industries. For these reasons, there may be hesitance regarding a transition toward EPR (Willd-Wagner 2017). However, there is clearly significant need for the CalRecycle to do more, and to at least reach the level of achievement that other states have already obtained.

In the case of electronics, manufacturer consensus may be an important factor for providing confidence in the feasibility of EPR and supporting its potential achievements in California. A lack of manufacturer consensus has held up e-waste policy proposals on the national stage since 2003 (University of Wharton 2016). In California, CalRecycle has also remained hesitant to propose formal e-waste policy in recent years. The Consumer Technology Association is currently working to support a national approach that involves manufacturer obligations to ensure safe e-waste disposal (CTA 2016). If this agreement may offer sufficient support toward achieving

California's e-waste disposal goals, then California may be able to embrace it as an example for other states that have not yet passed e-waste legislation.

California's ability to shape and support EPR policies will be contingent upon regulatory credibility and the leverage with which they forge these agreements. If the state is not able to support a viable enforcement presence that drives competition and pushes product stewardship organizations to set high EPR goals, and to fulfill these objectives, then EPR policy may not be the best path forward. As the types of products that require disposal changes over time, new waste management technology develops, and scholarship regarding EPR improves, it will be important to continue to re-evaluate EPR's ability to identify and address the most relevant waste management challenges and their social and environmental impacts. In some cases, support for a change to or from EPR policy may come from nationwide movements, such as that of the Consumer Technology Association (CTA 2016). At the same time, local-level efforts will continue to serve as an important means of testing which types of products that can be most effectively addressed through EPR, and the different forms that the policy may take. The local level may serve as an important platform for sharing information about policy measures, as well as for residents to express a need that they perceive, without facing all of the barriers that might exist at the state level.

Looking forward, California may continue to review and amend some of its existing EPR and product stewardship policies, and to consider new proposals that come from grassroots movements (today, this may include movements for regulation of pharmaceuticals and sharps), or policies that come from national or international trends (such as EPR for packaging). However, such progress may be slow and inefficient in the long term. As California becomes more experienced with EPR policy regulations, it ought to continue to consider the means by which EPR

can be established more efficiently, directly at the state level, and even potentially through a framework policy. However, California must take care to avoid Maine's experience on this front, in which policymakers moved to embrace a framework for EPR before the policy had gained public confidence and, as a result all of the policies brought under consideration for several years, faced intense public scrutiny and saw very little progress.

At the national level, as consideration of EPR policy seems to have come to a standstill, California will have to weigh the role that it wants to play in leading EPR, and whether or not it is willing to take on many of the costs of this role at the forefront of policy discovery. EPR policy leaders may be forced to take on higher relative costs of these initiatives through a process of trial and error. However, they may help set up the infrastructure and the knowledge base in order to support EPR in the future. The costs of not doing this may be fairly significant both in California, if its products are not managed in a safe manner, and beyond, if the lack of California's model legislation prevents other states from achieving safe waste management legislation.

California has historically played a significant role as a leader in waste management policy, and a decision not to pursue such an approach in this case may have significant impacts on the ability to address these issues of waste, as well as the precedent that exists for other states and industries. Additionally, if California fails to take any action in order to improve its existing product stewardship policies, and then these policies achieve relatively low rates of success, it may overshadow consideration of the potential for product stewardship or EPR, on a broader scale. In light of California's historically progressive approach toward expanding policy consideration, and its overall success so far, there is reason to hope that EPR might continue to be considered, which will help refine means of shaping policies in order to overcome the issues of competition and

enforcement, and will inspire innovative solutions in order to address significant waste management challenges.

Conclusion

As the demand for waste management services grows alongside the population and the global economy, it will be increasingly important to support 1) efforts to recognize a product's end-of-life value and its potential to be used as a resource; 2) consideration of the social and environmental impacts that products may have throughout their lifecycles and; 3) a means of managing the resources that remain at a product's end-of-life in a socially, environmentally, and economically responsible manner. Policies that can help align the experiences of actors throughout the product lifecycle with the costs that they incur will most likely serve as an important guide in this process.

Product stewardship policies may apply various levels of obligations in order to distribute the responsibility for end-of-life waste management. However, product stewardship policies that support a full obligation on the part of the producers to finance and carry out optimal waste management holds distinct potential to lead important improvements in product design and resource recovery. In this way, Extended Producer Responsibility policies that shift the full burden to producers may be the optimal end goal.

Aside from these potential merits, the choice between EPR and other forms of product stewardship may depend on the nature of the product and the historical context for these policies. EPR continues to face significant challenges both in achieving support as a proposed policy measure, and in fulfilling its objectives once it has been passed. These challenges may stem from 1) public hesitation or industry resistance regarding the uncertain or potential burden of EPR; 2) a lack of competition or credible enforcement to drive efforts to fulfill these obligations; and 3) some limitations in the data available to confirm the effectiveness of EPR.

Despite the challenges that some pioneers of EPR, such as California, are facing, the theoretical merits of EPR seem to continue to hold true, and to offer an important opportunity in many cases. While it may not be optimal, it may be important to allow EPR to grow through local-level policies and to gradually spread as information about them, and confidence in the opportunities that they present, increases. In some cases, it might also be necessary to consider changing or amending policies in order to ensure that they are as effective and efficient as possible. However, regulatory bodies must be committed to offering them the support that they need in order to succeed. This will especially include efforts to foster competition among disposal entities, to actively oversee enforcement, and to share best practices.

As EPR policy continues to expand and grow, it will be important to consider its ability to address questions that may arise in the future. First, under what conditions is EPR most effective? Second, how might EPR policy structure and requirements be improved so as to support a better understanding of the conditions to its effectiveness? These questions will be central to guiding policymakers to recognize when and how they ought to support EPR. Understanding the conditions under which EPR policy ought to be supported will help state agencies such as CalRecycle evaluate the resources that they dedicate to this possible means of financing and diverting waste. On the global stage, it will also answer questions regarding EPR's potential to help develop waste management infrastructure where it may be lacking.

It is clear that any decisions regarding an EPR policy proposal ought to be made wholeheartedly. The success of EPR will be contingent upon the willingness and capacity to invest in this policy and its enforcement. EPR will only be able to achieve its theoretical potential to the extent that producers efficiently fulfill their obligations in order to help relieve the social, economic, and environmental burdens of waste.

References

- “A Memorandum of Understanding for Carpet Stewardship.” Memorandum, January 2002. <http://www.deq.state.or.us/lq/pubs/docs/sw/MemoCarpetStewardshp.pdf>.
- Atasu, A. and R. Subramanian. “Extended Producer Responsibility for E-Waste: Individual or Collective Producer Responsibility.” *Production and Operations Management*. 21 (2012):1042-1059. Accessed April 21, 2017. doi: 10.1111/j.1937-5956.2012.01327.x.
- Bay Area News Group. “Supreme Court: Big Pharma must pay for prescription drug disposal in Alameda County.” *East Bay Times*. May 26, 2015. Accessed April 21, 2017. <http://www.eastbaytimes.com/2015/05/26/supreme-court-big-pharma-must-pay-for-prescription-drug-disposal-in-alameda-county/>.
- Biddle, D. “Recycling for Profit: The New Green Business Frontier.” *Harvard Business Review*. 1993. Accessed April 21, 2017. <https://hbr.org/1993/11/recycling-for-profit-the-new-green-business-frontier>.
- Bio IS. “Development of Guidance on Extended Producer Responsibility (EPR).” *Report for the European Commission DG Environment*. Bio Intelligence Service, Paris: 2014. http://ec.europa.eu/environment/waste/pdf/target_review/Guidance%20on%20EPR%20-%20Final%20Report.pdf.
- Brüggemeir, G. “Enterprise Liability for Environmental Damage: German and European Law.” In G. Teubner et al. 1994. *Environmental Law and Ecological Responsibility: The Concept and Practice of Ecological Self-Organisation*. John Wiley & Sons Ltd.,70-78.
- California Department of Pesticide Regulation. “Pesticide Container Recycling Programs for Registrants of Agricultural/Structural Use Products.” Last modified 2013. http://www.cdpr.ca.gov/docs/mill/container_recycling/pest_container.htm.
- California Environmental Protection Agency Air Resources Board. “Waste Management Sector – Background.” Last modified 2016. <https://www.arb.ca.gov/cc/waste/waste.htm>.
- “California Governor’s Budget 2015-2016.” *Environmental Protection: 3970 Resources Recycling and Recovery*. 2016-2016. <http://www.ebudget.ca.gov/2015-16/StateAgencyBudgets/3890/3970/department.html>.

- California Integrated Waste Management Board. "Attachment 3: Analysis of Priority Product Selection." Board meeting. September 19, 2007.
- California Integrated Waste Management Board. Strategic Policy Committee. "Producer Responsibility: Overview of Policy Consideration." June 5, 2007.
- California Legislative Analyst's Office. "An Analysis of the Beverage Container Recycling Program." April 29, 2015.
<http://www.lao.ca.gov/reports/2015/res/recycling/beverage-container-042915.aspx>.
- California Product Stewardship Council. "Who is CPSC?" Last modified October 28, 2015. http://calpsc.org/mobius/cpsc-content/uploads/2015/10/who_is_cpsc_govt_2015_10_28.pdf.
- California Public Resources Code. "Architectural Paint Recovery Program." (2010), Chapter 420:2, 48700-48706.
http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PRC&division=30.&title=&part=7.&chapter=5.&article.
- CalRecycle. "2017 CARE Carpet Stewardship Plan Request for Approval." 2017.
<http://www.calrecycle.ca.gov/Actions/Documents%5c112%5c20162016%5c1788%5c2017%20CARE%20Carpet%20Stewardship%20Plan%20RFA%20-%20signed.pdf>.
- Californians Against Waste. "How California's Bottle Bill Works." Last modified 2015.
<http://www.cawrecycles.org/how-the-california-bottle-bill-works/>.
- CalRecycle. "Carpet Stewardship Program Overview." March 29, 2017.
<http://www.calrecycle.ca.gov/Carpet/Program.htm>.
- CalRecycle. "Compliance and Enforcement." Last modified 2017.
<http://www.calrecycle.ca.gov/Enforcement/>.
- CalRecycle. "CalRecycle 2015 Enforcement Report." 2015.
<http://www.calrecycle.ca.gov/Publications/Documents/1580/201601580.pdf>.
- CalRecycle. "Economic Impacts of EPR Programs." Last modified 2017.
<http://www.calrecycle.ca.gov/EPR/Impacts/default.htm#Government>.
- CalRecycle. "EPR Checklists." *Product Stewardship and Extended Producer Responsibility (EPR) Resources*. Last modified February 8, 2016.
<http://www.calrecycle.ca.gov/EPR/Resources/default.htm#Checklists>.

- CalRecycle. “EPR Compliance. Product Stewardship and Extended Producer Responsibility (EPR).” February 17, 2017.
<http://www.calrecycle.ca.gov/EPR/Enforcement/default.htm>.
- CalRecycle. “Listservs.” Last modified 2017.
<http://www.calrecycle.ca.gov/Listservs/>.
- CalRecycle. “Policy and Law. Product Stewardship and Extended Producer Responsibility (EPR).” February 5, 2016.
<http://www.calrecycle.ca.gov/epr/PolicyLaw/default.htm>.
- CalRecycle. “State of Disposal in California.” March 2015.
<http://www.calrecycle.ca.gov/Publications/Documents/1524/20151524.pdf>.
- CalRecycle. “State of Recycling in California: Updated 2016.” February 2016.
<http://www.calrecycle.ca.gov/Publications/Documents/1554/201601554.pdf>.
- CalRecycle. “State of Recycling in California: Updated 2016.” February 20, 2016.
<http://www.calrecycle.ca.gov/Publications/Documents/1556/201601556.pdf>.
- CalRecycle. “The Future of Electronic Waste Management in California.” Last modified February 17, 2017. <http://www.calrecycle.ca.gov/electronics/Future/Default.htm>.
- Carpet America Recovery Effort. “Informational Update: California Carpet Stewardship.” Stakeholder webinar, February 10, 2016.
https://carpetrecovery.org/wp-content/uploads/2016/02/CARE_Assessment-Increase-Program-Update-Webinar-2.10.16-.pdf.
- Center for Disease Control and Prevention. “Improper Disposal of Hazardous Substances and Resulting Injuries --- Selected States, January 2001 – March 2005.” 54:36 (2005): 897-899. Accessed April 21, 2017.
<http://www.cdc.gov/MMWR/preview/mmwrhtml/mm5436a2.htm>.
- Chandrappa, R. and DB Das. “Solid Waste Management: Principles and Practice.” (Berlin; New York: Springer, 2012).
http://www.springer.com/cda/content/document/cda_downloaddocument/9783642286803-c2.pdf?SGWID=0-0-45-1336211-p174308664.
- Consumer Technology Association. “Consumer Technology Association Launches New State E-Cycling Pilot Program.” Last modified December 5, 2016.
<https://www.cta.tech/News/Press-Releases/2016/December/Consumer-Technology-Association-Launches-New-State.aspx>.

- Dunn, Cynthia. *CalRecycle, Materials Management and Local Assistance Division*. Interview by author. Phone. Sacramento, April 5, 2017.
- Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.). "Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change." *Intergovernmental Panel on Climate Change*. 2014. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press).
https://www.ipcc.ch/pdf/assessment-report/ar5/wg3/ipcc_wg3_ar5_full.pdf.
- Environment Canada. "Approaches to EPR and Stewardship." Accessed via CalRecycle. Last modified 2017. <http://www.calrecycle.ca.gov/EPR/About.htm#Approaches>.
- Gardner, P. "Extended Producer Responsibility for Packaging and Printed Paper in the United States." *Journal of Industrial Ecology*. 17 (April 2013) 2: 170-171. 10.1111/jiec.12015.
- Garrison, J. "Recycling fraud drains California's cash." *Los Angeles Times Blog*. Last modified October 8, 2012.
<http://latimesblogs.latimes.com/lanow/2012/10/recycling-fraud-drains-californias-cash.html>.
- Graham, A. *California Product Stewardship Council, Board Member*. Interview by author. Phone. Huntington Beach, March 17, 2017.
- Halog, A. "Cellular Respiration Model Project." *University of Queensland*. 2015.
<https://www.gpem.uq.edu.au/images/buttons/HalogImage.jpg>.
- Hickle, Garth T. "An Examination of Governance within Extended Producer Responsibility Policy Regimes in North America." *Resources, Conservation, and Recycling*. 92 (2014): 55-56.
<http://www.sciencedirect.com/science/article/pii/S0921344914001761>.
- Hickle, Garth T. "Comparative Analysis of Extended Producer Responsibility Policy in the United States and Canada." *Journal of Industrial Ecology* 17:2 (2013): 249-261. <http://onlinelibrary.wiley.com/doi/10.1111/jiec.12020/epdf>.

- Hoorweg, D., P. Bhada-Tata, and C. Kennedy. "Environment: Waste Production Must Peak this Century." *Nature* 502 (2013) 7473: 615-17. doi:10.1038/502615a. <http://www.nature.com/news/environment-waste-production-must-peak-this-century-1.14032>.
- Hoorweg, D. and P. Bhada-Tata. "What a Waste: A Global Review of Solid Waste Management." *The World Bank: Urban Development & Local Government Unit. World Bank Group*. 15 (2012). <http://documents.worldbank.org/curated/en/302341468126264791/pdf/68135-REVISED-What-a-Waste-2012-Final-updated.pdf>.
- Hydro-Québec. "Life cycle assessment at Hydro-Québec." Accessed April 21, 2017. <http://www.hydroquebec.com/sustainable-development/documentation-center/life-cycle-analysis.html>.
- Jackson, J. "Extended Producer Responsibility in Canada, Europe and the United States." In *European and Canadian Environmental Law: Best Practices and Opportunities for Co-operation*. Canadian Environmental Law Association. January 2007. http://www.cela.ca/sites/cela.ca/files/uploads/555_EU_Ch2_EPR.pdf.
- Kalimo, H., R. Lifset, A. Atasu, C. Van Rossem, and L. Van Wassenhove. "What Roles for Which Stakeholders under Extended Producer Responsibility?" *Review of European Community & International Environmental Law*. 24 (2015) 1:40-57. <http://onlinelibrary.wiley.com/doi/10.1111/reel.12087/epdf>.
- Kobold, D. *California Product Stewardship Council, Chair of the Board; County of Sacramento, Waste Management Program Manager; National Stewardship Action Council, President*. Interview by author. Phone. Sacramento, March 16, 2017.
- Kroepelien, K.F. "Extended Producer Responsibility – New Legal Structures for Improved Ecological Self-Organization in Europe?" *Review of European Community & International Environmental Law*. 9 (2000) 2: 165-177. <http://onlinelibrary.wiley.com/doi/10.1111/1467-9388.00248/pdf>.
- Lennett, D. "California Orders Changes to Thermostat Collection Program." *Natural Resource Defense Council*. October 7, 2016. <https://www.nrdc.org/experts/david-lennett/california-orders-changes-thermostat-collection-program>.
- Lifset, R. A. Atasu, and N. Tojo. "Extended Producer Responsibility: National, International, and Practical Perspectives." *Journal of Industrial Ecology*. 17 (2013) 2: 162-166. <http://onlinelibrary.wiley.com/doi/10.1111/jiec.12022/epdf>.

- Lifset, R. and T. Lindqvist. "Producer Responsibility at a Turning Point?" *Journal of Industrial Ecology*. 12 (2008) 2: 144-147.
<http://re.indiaenvironmentportal.org.in/files/Producer.pdf>.
- Lindqvist, T. "Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems." (IIIEE, Lund University: 2000).
- Lindqvist, T. and R. Lifset. "Extended Producer Responsibility, can we take the concept of individual EPR from theory to practice?" *Journal of Industrial Ecology*. (2003) 7: 3-6.
<http://onlinelibrary.wiley.com/doi/10.1162/108819803322564299/epdf>.
- Maine Department of Environmental Protection. "Implementing Product Stewardship in Maine." January 15, 2011.
<http://www.maine.gov/dep/waste/publications/legislativereports/documents/2011psreportfinal.pdf>.
- Mayers, K. and S. Butler. "Producer Responsibility Organizations Development and Operations." *Journal of Industrial Ecology*. 17. (2013) 2: 277-289.
- Metz, B., O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds). "Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change." *Intergovernmental Panel on Climate Change*. (Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2007). https://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4_wg3_full_report.pdf.
- Nash, J. and C. Bosso. "Extended producer responsibility in the United States: Full speed ahead?" *Journal of Industrial Ecology*. 17 (2013) 2:175–185.
<http://onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2012.00572.x/full>.
- Nicol, S. and S. Thompson. "Policy Options to Reduce Consumer Waste to Zero: Comparing Product Stewardship and Extended Producer Responsibility for Refrigerator Waste." *Waste Management & Research*. 25 (2007): 227-233.
<http://journals.sagepub.com/doi/pdf/10.1177/0734242X07079152>.
- O'Connell, M., S. Hickey, M. Besiou, and C. Fitzpatrick. "Feasibility of using radio frequency identification to facilitate individual producer responsibility for waste electrical and electronic equipment." *Journal of Industrial Ecology*. 17 (2013) 2:238-248. <http://onlinelibrary.wiley.com/doi/10.1111/j.1530-9290.2012.00573.x/abstract>.

- Organisation for Economic Co-operation and Development. “Extended Producer Responsibility: A Guidance Manual for Governments.” (OECD Publishing: 2001). http://www.keepeek.com/Digital-Asset-Management/oced/environment/extended-producer-responsibility_9789264189867-en.
- Organisation for Economic Co-operation and Development. 2016. “Extended Producer Responsibility: Updated Guidance for Efficient Waste Management.” (OECD Publishing: 2016). http://www.keepeek.com/Digital-Asset-Management/oced/environment/extended-producer-responsibility_9789264256385-en#.WPsE-RMrJQI.
- Organisation for Economic Co-operation and Development. “Fact Sheet: Extended Producer Responsibility.” Accessed April 21, 2017. <http://www.oecd.org/env/waste/factsheetextendedproducerresponsibility.htm>.
- Organisation for Economic Co-operation and Development. “The State of Play on Extended Producer Responsibility (EPR): Opportunities and Challenges.” *Global Forum on Environment: Promoting Sustainable Materials Management through Extended Producer Responsibility (EPR)*. June 17-19, 2014. <https://www.oecd.org/environment/waste/Global%20Forum%20Tokyo%20Issues%20Paper%2030-5-2014.pdf>.
- Organisation for Economic Co-operation and Development. “Working Group on Waste Prevention and Recycling.” *Environmental Policy Committee*. September 26, 2005. <http://www.oecd.org/environment/waste/35438706.pdf>.
- Official Journal of the European Union. “Directive 2008/98/EC of the European Parliament and of the Council.” 312. November 19, 2008. <http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=EN>.
- Product Stewardship Institute. “Carpet.” Last modified 2016. <http://www.productstewardship.us/?Carpet>.
- Product Stewardship Institute. “Case Studies of Cost Savings Following Enactment of Extended Producer Responsibility Laws.” 2009. http://c.ymcdn.com/sites/www.productstewardship.us/resource/resmgr/imported/p_s_financial_benefits_case_studies.pdf.
- Product Stewardship Institute. “Definitions.” Last modified 2016. <http://www.productstewardship.us/?page=Definitions>.

- Product Stewardship Institute. "Developing Framework Legislation." 2010.
http://c.ymcdn.com/sites/www.productstewardship.us/resource/resmgr/imported/Framework_Factsheet.pdf.
- Product Stewardship Institute. "Mattresses." Last modified 2016.
<https://productstewardship.site-ym.com/page/Mattresses>.
- Product Stewardship Institute. "Our Story." Last modified 2016.
<http://www.productstewardship.us/?page=OurStory>.
- Product Stewardship Institute. "Paint." Last modified 2016.
https://productstewardship.site-ym.com/page/PSI_and_Paint.
- Product Stewardship Institute. "State EPR Laws Map." Last modified 2016.
http://www.productstewardship.us/?State_EPR_Laws_Map.
- Product Stewardship Institute. "Thermostats." Last modified 2016.
<http://www.productstewardship.us/page/Thermostats>.
- Product Stewardship Institute. "The PSI Blog." Last modified March 30, 2017.
<https://productstewardshipinstitute.wordpress.com/>.
- Resource Recycling. "Carpet Stewardship Program Grilled in California." January 10, 2017. <https://resource-recycling.com/recycling/2017/01/10/carpet-stewardship-program-grilled-in-california/>.
- Sanborn, H. and C. Flowers. "What's Up and What's Next in the World of EPR." *Sacramento State College*. 2014.
http://www.csus.edu/envs/documents/epr%20article_wasteage.pdf.
- Sanborn, H. and D. Kobold. 2016. "EPR That Works." *National Stewardship Action Council*. Presented to the North American Hazardous Materials Management Association. October 13, 2016.
<http://www.nahmma.org/resources/2016%20Conference%20Proceedings/Kobold%20EPR%20That%20Works!%20Presentation%20NSAC%202016-10-06.pdf>.
- Saphores, J.M., Nixon, H., Ogunseitan, O.A., and Shapiro, A.A. "Household Willingness to Recycle Electronic Waste- An Application to California. Environment and Behavior." *UC Irvine*. 38. (2006) 2: 183 - 208.
<http://escholarship.org/uc/item/0466s7dt>.
- Senate Committee on Governmental Organization. "Solid Waste: New Tires: Disposal Fees." 1995-1996. ftp://leginfo.ca.gov/pub/95-96/bill/asm/ab_2101-2150/ab_2108_cfa_960429_171137_sen_comm.html.

- StewardEdge. "How an EPR System Works." *We Can Do Better, VT*. 2011. <http://www.wecandobettervt.com/126/how-an-epr-system-works>.
- The World Bank. "Global Waste on Pace to Triple by 2100." Last modified October 30, 2013. <http://www.worldbank.org/en/news/feature/2013/10/30/global-waste-on-pace-to-triple>.
- The World Bank. "Small and Medium Enterprises (SMEs) Finance." *The World Bank: Understanding Poverty: Financial Sector*. September 1, 2015. <http://www.worldbank.org/en/topic/financialsector/brief/smes-finance>.
- The World Bank. "Waste Not, Want Not – Solid Waste at the Heart of Sustainable Development." *The World Bank: Who We Are: News*. March 03, 2016. <http://www.worldbank.org/en/news/feature/2016/03/03/waste-not-want-not---solid-waste-at-the-heart-of-sustainable-development>.
- UN-HABITAT. "Solid Waste Management in the World's Cities." *London: Earthscan Ltd*. 2010. https://thecitywasteproject.files.wordpress.com/2013/03/solid_waste_management_in_the_worlds-cities.pdf.
- University of Wharton and Electronic Recyclers International, Inc. "How U.S. Laws Do (and Don't) Support E-Recycling and Reuse." *Wharton University of Pennsylvania*. April 6, 2016. <http://knowledge.wharton.upenn.edu/article/how-u-s-laws-do-and-dont-support-e-recycling-and-reuse/>.
- U.S. Environmental Protection Agency. "Advancing Sustainable Materials Management: Facts and Figures 2013." *Office of Resource Conservation and Recovery*. June 2015. https://www.epa.gov/sites/production/files/2015-09/documents/2013_advncng_smm_rpt.pdf.
- U.S. Environmental Protection Agency. "Global Mitigation of Non-CO2 Greenhouse Gases: 2010-2030." September 2013. <http://www.epa.gov/climatechange/EPAactivities/economics/nonco2mitigation.html>.
- U.S. Environmental Protection Agency. "Household Hazardous Waste." *Solid Waste*. June 15, 2016. <https://www3.epa.gov/region9/waste/solid/house.html>.
- U.S. Environmental Protection Agency. "Learn About the Safer Choice Label." *Safer Choice*. April 6, 2017. <https://www.epa.gov/saferchoice/learn-about-safer-choice-label>.

- U.S. Environmental Protection Agency. "Resource Conservation and Recovery Act (RCRA) Laws and Regulations." Last modified 2016. <https://www.epa.gov/rcra>.
- Wiley Rein LLP. "California Carpet Experience Shows 'Visible Fees' May Not Be the Product Stewardship Panacea." 2017. <http://www.wileyrein.com/newsroom-newsletters-item-California-Carpet-Experience-Shows-Visible-Fees-May-Not-Be-the-Product-Stewardship-Panacea.html>.
- Willd-Wagner, S. *CalRecycle, Electronic Waste Recycling Program*. Interview by author. Phone. Sacramento, April 12, 2017.
- Wilson, David C., Ljiljana Rodic, Prasad Modak, Reka Soos, A. Carpintero, K. Velis, Mona Iyer, Otto Simonett (eds). "Global Waste Management Outlook." *United Nations Environment Programme*. 2015. <http://www.unep.org/ietc/InformationResources/Events/GlobalWasteManagementOutlookGWMO/tabid/106373/Default.aspx>.
- World Trade Organization. "Eco-Packaging; Overview of Recent Work in Other International Fora." *Committee on Trade and Environment*. March 5, 1998. WT/CTE/W/75.
- Yale University Center for Industrial Ecology. "About the Center." *Yale University*. Last modified 2014. <http://cie.research.yale.edu/about-center>.