Extended Producer Responsibility & End-of-Life Management: A Policy Analysis Between the United States and the European Union

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ABSTRACT

Waste management remains a rampant environmental issue. At the forefront of waste management are single-use disposable plastics, which are conventional, petroleum-based flexible films that are not designed with end markets in mind and do not easily breakdown in the environment. Not only do they contribute to plastic pollution, but they also cost the economy billions annually. In general, post-use products and packaging pose a major threat to the environment due to flawed recycling infrastructure and inefficient legislative guidelines to ensure producers manufacture sustainable products. This paper performs a policy analysis on extended producer responsibility related legislation for two distinct political entities, the United States and the European Union. Using the CDC's framework on policy analysis, legislation for this study was evaluated based on two criteria: environmental health impact and economic impact.

KEYWORDS

waste management, policy analysis, single-use plastics, circular economy, stewardship programs

INTRODUCTION

Waste management requires producer involvement to maximize post-consumer recycled materials and ensure post-use products reach their appropriate end markets. With over 8 million tons of plastic entering the oceans annually, the end-of-life management of post-use products is more important than ever (RCD 2020). Currently, flaws in modern recycling infrastructure, lack of standardization in the packaging industry, and poor standards established legislation all contribute to inefficiencies in waste management. The issue of waste management is a complex amalgamation of many actors that requires policy promoting extended producer responsibility.

Concepts and Definitions

For the purpose of this paper, it is important to define some key concepts. CPG refers to the consumer packaged goods industry. Single use disposable plastics, or SUDS, are mostly made up of flexible films, which have become the fastest-growing packaging format used by brands today (RCD, 2020). Although lightweight and cheap to manufacture, conventional petroleum-based flexible films lack any real EOL, or end-of-life, management solutions. EOL management ensures post-use products reaching their appropriate end markets while optimizing post consumer recycled content material. Ideal EOL management intends to maximize how much of the post-use product can be recycled to promote a circular economy. The United States' current recycling infrastructure is weak due to lack of standardized packing labeling, need for universal collection and transportation to recycling-composting facilities, as well as shortfalls in producer manufacturing. Producers do not have the incentive to transition to more sustainable bioplastics; even these organic, plant-based plastics require large amounts of land and face economic tradeoffs (Doug). Legislation is a crucial part of the transition away from petroleum-based and non- biodegradable plastics.

Extended Producer Responsibility (EPR) is a policy designed to shift the costs and responsibilities of end-of-life management of post-use products and packaging to producers. Creating a circular economy is difficult in part due to a lack of standardization in recycling infrastructure. Producers often do not design products and packaging with end markets in mind. Stewardship programs are an integral part of EPR legislation in the US, so there exists many third

party stewardship programs and organizations that assist producers with transitioning to more sustainable products. Stewardship organizations also help stabilize end markets for products and packaging. Producers often pay fees to participate in these organizations. Oftentimes, these stewardship programs will discuss funding and economic impact, minimum post consumer recycled content requirements, and public awareness programs to help educate consumers on the environmental costs of a product.

Different Political Systems

This case study will analyze the EPR legislation of two distinct political entities that both play major roles in the plastic pollution problem - the United States, which consists of 50 states, and the EU, which consists of 27 member states. I chose to work with these two entities because of their developed infrastructure, their relatively large generation of plastic waste, and for their ongoing efforts in EPR and SUDS policy. In order to evaluate the entities' policy, it is important to discuss how the different political systems work and interact with themselves at both the state and the federal level. In the EU, there are four main institutions involved in decision making - the European Parliament, the European Council, the Council for European Union, and the European Commission (DG COMM, 2021). The European Commission is the only body of government that can propose new bills and legislation. It is made up of the President, Vice-Presidents, and the College of 27 Commissioners who are nominated by the Council of the European Union. The Parliament and the Council are responsible for approving or rejecting EU laws as well as adopting said law. Furthermore, there are different types of legal acts in the EU, including regulations and directives. Regulations apply directly to all member states whereas directives must be adopted into national law before effective.

In the United States, the government is divided into three branches - judiciary, executive, and legislative branches. The legislative branch's governing body is Congress, which is further separated into the House of Representatives and the Senate, which are made up of elected officials. Bills generated and passed in Congress must then be signed by the President into law, which then the judicial branch helps enforce. Local governments interact with state governments which interact with federal governments, but they do not always align. It is important to recognise that the EU is a political entity responsible for governing 27 individual nations, meanwhile the United

States is a sole nation made up of 50 individual states. This distinction cannot be overstated, however for the purposes of this paper, I have still chosen to perform the case study on these two entities. In recent years, both political entities have exhibited increases in the amount of plastic waste generated per capita, likely due to their developed infrastructure which has driven consumerism. Both entities have also begun shifting the responsibilities of EOL management to producers through EPR and SUDS legislation, making them perfect candidates to perform the policy analysis.

Furthermore, the bills vary in purpose, some of which involve EPR, EOL, SUDS, and post consumer recycled content requirements; the majority of the legislation used a combined approach of the various bill classifications. The EPR bills typically focus around the establishment of stewardship plans where producers propose the details and means of achieving certain post consumer recycled content requirements or phasing out certain toxic materials. These stewardship plans can be submitted individually by producers or as a part of a stewardship organization. Bills that target SUDS and EOL management typically have post toxicity and post consumer content requirements that producers must follow.

EPR & SUDS Related Legislation Pilot Study

Very little EPR legislation exists at the state level, and little to none at the federal level. There are nine EPR bills that are currently active at the state level in the US and are a product of many actors, most importantly lobbyists from the National Caucus for Environmental Legislators. None of these bills have been passed into law, but it is helpful to illustrate the skeleton of an EPR related bill. The NCEL is a producer responsibility organization which works alongside brands and lawmakers to lobby for environmental policy at the state level. In 2020 alone, these bills included CA SB54, HI HB1316, HI SB1419, MD HB36, MA H878, NY S01185, OR HB2592, WA SB5022, and VT H0142. They share a variety of similar features that can be repurposed for future EPR related legislation, including the mandatory implementation of stewardship plans, sunset dates for specific post-consumer recycled content requirements, and measures of enforcement to regulate producers. Miscommunication and a lack of universal labeling or recycling guidelines is extremely prevalent within the current recycling infrastructure, which creates major costs for the recycling industry. One critical feature of EPR related policy is the

inclusion of a "readily-recyclable" definition. This is the foundation for which recycling goals should be met, and the definition should be clear and comprehensive. Of the US state bills that contain a "readily-recyclable" definition, only few incorporate a component for the exclusion of covered materials that could become unsafe or unsanitary to recycle, which in turn causes major issues for the recycling industry. This helps shift the financial burden of processing these waste products and packaging to the producers, and contributes to the standardization of the recycling industry.

Sunset dates for end market goals also act as another key feature of EPR legislation and hold producers responsible for meeting performance goals defined by a bill. New York bill S01185 is the only EPR bill researched without any clearly defined sunset dates - the bill merely declares the effect of the bill six months after it becomes law. This presents a major flaw in holding producers accountable to meet postconsumer recycling content requirements, and is a prevalent issue that extends to environmental policy worldwide. For example, the Paris Agreement, which is regarded as one of the most effective international environmental efforts, allows individual nations to submit their own plans for climate actions known as Nationally Determined Contribution (UNFCC). Although the agreement is 'legally binding', providing countries with so much leniency on their emission standards and a lack of sunset dates to achieve said goals can lead to inaction. This is why clear legislative timelines are so important, especially with regards to environmental policy. All the other bills have outlined dates for producers to meet specific performance requirements.

Stewardship program requirements are embedded throughout the EPR legislation, the basics of which involve producers registering a detailed stewardship plan with the department, either individually or as a part of a producer responsibility organization. Details of the program vary amongst bills, with some outlining every detail from financing to post-consumer recycled content requirements. A stewardship plan's purpose is to highlight a producer's goals of product and packaging recyclability, compostability, and/or reusability. Elements of the plan typically include a list of the producers/brands covered, performance goals for a minimum post-consumer recycled material content, a financing method, descriptions of plan implementation, public UNFCC outreach/education actions, and coordination across all programs to avoid customer confusion. Stewardship programs are an essential part of EPR legislation which emphasize the performance goals and means of implementation of said goals - it is beneficial to the legislation

to include stewardship programs in future EPR legislation. However, they are not included in policies that do not promote EPR.

The final important feature of any foundational EPR bill is a measure of enforcement. In a society dominated by capitalism, monetary punishment seems to be an influential incentive for producers to meet established goals. The majority of the researched legislation had enforcement measures in the form of penalties and fees that violating producers have to pay per offense. Furthermore, civil penalties can also be incurred if a producer violates any guidelines outlined in the bill.

In my critical analysis of the currently active EPR bills, it became apparent that toxicity standards are widely neglected components, and can incur costly intervention. Furthermore, toxic labels prevent optimization of post-consumer recycled content. Any mention of toxicity standards is brief and acts more as expository descriptions of its environmental impact. Other mentions of toxicity are accompanied by suggestions of decentivization by means of penalties and fees, but the legislation is vague with its recommendations. Toxic substances are also excluded from "readily recyclable" definitions in a few of the bills. EPR legislation should expand upon producer toxicity requirements. The detailed inclusion of funding and means of enforcement are the final features of effective EPR related legislation.

The main piece of legislation targeting plastic use in the EU is directive 2019/904. The directive contains EPR components as well as post-consumer recycled content requirements, bans certain SUDS, and contains portions dedicated to increasing collection services. It helps ensure that all post-use products make it to their appropriate end markets.

Methodology

The most crucial feature of this policy analysis is the scaling rubric I use to evaluate the various policies. Initially, I intended to use the rate of plastic waste generation per capita for each entity, but the most recently available data was from 2019. This would not be a reliable metric because there would be no frame of reference to evaluate the true impact of legislation. This restricted my scale development to only a qualitative analysis. In a literature review by author Fabian F. R. Morgado, he discusses his analysis on the current practices and limitations of contemporary scale development. Morgado analyzes 105 publications, discussing his suggestions for reliable scale development.

According to Morgado's research, there are three current practices in scale development that include item generation, theoretical analysis, and psychometric analysis. Item generation is the theoretical support for the initial item pool, theoretical analysis evaluates content validity, and finally psychometric analysis assesses construct validity and reliability(Scale Development). To develop the rubric-scale this paper uses for the policy analysis, I conducted a literature review and discussed the different political systems involved in the legislative process. I used the database Legiscan to collect EPR related bills for the US and I used the database Eur-Lex to access legislation for the EU.

The criteria for what makes an effective policy differs depending on the type bill. For my policy analysis, I selected only bills that were passed after 2017, or bills that were passed after the 114th US Congressional session. I used three keywords in my search for current policy, including "recycle", "waste", and "plastic". I developed a rubric-scale that has 3 levels ranging from not effective to most effective. For my analysis, I only relied on qualitative metrics because of my lack of access to plastic waste generation rates in recent years. Examples of noneffective environmental legislation highlight a lack of solid sunset dates as one of the most widespread limitations to policy. Another key component, along with solid sunset dates for bills, is the inclusion of toxicity requirements and universal labeling. Furthermore strict performance goals and enforcement measures for producers are critical features of effective EPR related policy. Portions of these bills are dedicated to explaining adjustment periods both for producers and the department, department responsibilities, and financing aspects. This qualitative scale is still in its rudimentary stages.

METHODS

For this paper, I performed a policy analysis on legislation related to EPR and EOL management in order to understand how different nations are tackling the issue of plastic waste. EPR policy heavily influenced the EOL management of post-use products and packaging for single use disposables. When designing my policy analysis, I relied heavily on the framework provided by the Center of Disease Control and Prevention. The CDC is a part of the Department of Health, a cabinet department under the United States' Executive Branch. It is a reliable source of information operating under the US Federal Government which provides a rigorous framework for performing policy analyses that can be used for both environmental and public health related

policies. When conducting a policy analysis, the CDC suggests that it is important to review the literature, conduct an environmental scan, and compare the best strategies with other communities (CDC, 2021). The environmental scan for this study discusses the legislative processes for each political entity, how their different levels of government interact with each other, and any potential obstacles for EPR related policy. Furthermore, policy analyses require a comprehensive discussion of all policy options, followed by an evaluation of which policies are best (CDC, 2021).

The environmental scan highlights the legislative processes for both political entities, the United States and the European Union, as well as potential obstacles for any EPR related policy. It also discusses how the different levels of each government interact with each other. This policy analysis also identifies the different EPR policy options and analyzes the health impact, implementation costs, and feasibility. Finally, this study intends to rank the various policy options and determine which are most effective.

Environmental Scan

For the environmental scan of the two political entities used in this paper, the United States and the European Union, I must examine the distinct political systems in place. At the federal level in the United States, Congress acts as the legislative body and is further divided into the House of Representatives and the Senate (ObamaWhiteHouse, 2015). A bill is introduced in the House of Representatives where it endures committee revisions, amendments, budget debates, and where it finally receives a vote (ObamaWhiteHouse, 2015). It must then complete the same process in the Senate, and in turn will be sent to the President of the United States for final approval or rejection (ObamaWhiteHouse, 2015). A simple majority is required for both of the legislative bodies, however, the Senate can filibuster in which case a supermajority, or two thirds of the vote, is required (ObamaWhiteHouse, 2015). At the state level, legislatures are made up of elected representatives who consider issues brought forth by the governor or community members to later become law. All US states except for Nebraska consist of a bicameral state legislature where a bill can be introduced in either house, followed by a committee action, second and third readings held in the house of origin, and then a vote. Once again the whole process must be repeated in the other chamber, after which the bill is returned to the house of origin for amendments and finally sent to the governor for final approval or rejection.

In the European Union, the legislature is divided into three main institutions including the European Commission, the Council, and the European Parliament (The European Union, 2021). There are two main types of legally binding policies for EU Member States, regulations and directives. Regulations are laws that apply to all Member States. Directives are laws that can apply to all or just some Member States, but they require converting them into national laws. Likewise, it is up to the individual countries to achieve a directive's goal. During the legislative process, the European Commission is responsible for submitting proposals to the Council and the European Parliament. If they cannot accept the proposal at either the first or second readings, then a conciliation committee convenes. If the committee agrees upon the text by the third reading in both institutions, the act is adopted. Member States further act as sovereign independent nations.

Framework to Evaluate Policy Options

It is helpful to appreciate how these levels of government interact with each other in the distinct political entities because they inform the legislative process. Understanding how the legislature works in both political entities is critical to this study because it helps us evaluate any potential obstacles for passing EPR related policy. Policy analyses also require an identification of the possible policy options. What are the classifications and frameworks of different EPR related bills? The Product Stewardship Institute (PSI) has conveniently categorized the current US EPR legislation by product. There are 15 different categories for EPR legislation, from general framework bills to bills designed for niche products such as solar panels. The PSI is a 501(c)(3) tax exempt nonprofit organization and an equal opportunity employer. The organization is responsible for the majority of the current EPR legislation in the US. Furthermore, this study uses a Legislation Library provided by the PSI, which acts as a database for all EPR related legislation in the US. The Product Stewardship Institute's Legislation Library is the sole provider of US EPR related legislation and information for this study.

There are a few instrumental pieces of EPR related legislation in the EU that help mitigate waste from post-use products and packaging. The European Commission highlights numerous Directives which make up the EU's EPR policy as well as others that regard hazardous waste and waste management. Likewise, the European Organization for Packaging and the Environment, or EUROPEN, provides a factsheet of EPR in the EU. EUROPEN strives to promote sustainable

packaging by promoting EPR legislation, and its overview of EPR is helpful while trying to evaluate the policy options. For policy comparison, this study uses EUR-Lex, an official website of the EU which publishes Directives and other pieces of EU legislation. It comes directly from the EU and is a credible source for primary government documents.

This study only focuses on bills that have already been enacted into law. A large portion of the US bills provided by the PSI Legislation Library are still in some phase of the legislative process, however, this study is restricted to EU EPR related policy that has already been enacted into law. In order to maintain consistency, this policy analysis only features already enacted legislation from both political entities. We must recognize that this will influence the perspective of EPR related policy as well as limit the scope of this policy analysis. It is important to acknowledge that this limitation prevents a fully comprehensive overview of the EPR in the EU. Furthermore, this policy analysis only concerns state and federal policy, and will not include local bills. Local policy typically addresses specific logistical issues for local policy implementation. For the purposes of this study, it is advantageous to evaluate overall common features of EPR policy, rather than more nuanced local policy.

Ranking the Policy Options

Ranking the various policy types is the final component of the policy analysis and allows us to draw conclusions about which policy type is the most effective. It is important to consider the bill's scope and content of action. The CDC provides three fundamental criteria as a framework for policy analysis: public health impact, feasibility, and economic impact. The CDC defines feasibility as a bill's likelihood of being enacted, however, this study is not concerned with policy that has not already been enacted. Therefore, this policy analysis will rely on the first and the third criteria provided by the CDC.

Because this study emphasizes environmentalism, it will extrapolate the first criteria of policy analysis to both public health and environmental impact. An example of a policy's public health impact can include the prohibition of certain toxic chemicals in products. Environmental impact has a broader scope, and can refer to any policy effect that may contribute to overall sustainable practice, such as setting minimum post consumer recycled content requirements to

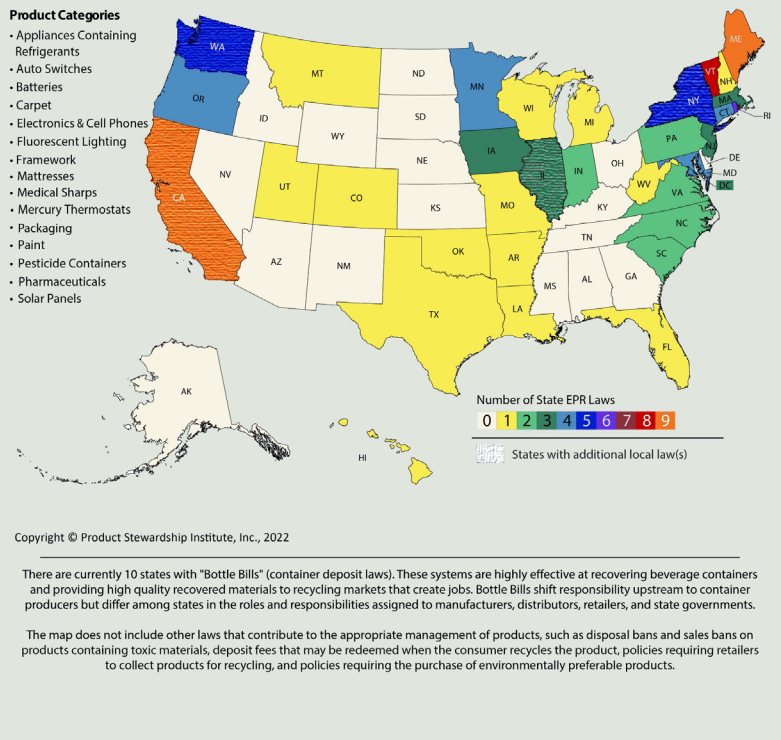
optimize recycling practices. How does a policy contribute to the protection of the environment and public health?

The final criteria for the CDC's policy analysis framework is the economic and budgetary impact, which refers to both the overall costs and the cost relative to the perceived benefits. This is a critical component of any EPR bill because of the shifting costs and responsibilities of EOL management.

RESULTS

The different policy options are roughly defined by the product categories provided by the PSI. Throughout the EPR related legislation from both the US and the EU, bills are generally distinguished by the category of products they target. EPR intends to hold producers accountable for ensuring post-use products and packaging reach their proper end markets. It requires producer investment to transition the costs associated with waste management and recycling infrastructure away from government funded programs and facilities. Because EPR is case specific, it is appropriate that the PSI has categorized the legislation by product type. Likewise, the major pieces of EPR related legislation in the EU are categorized by product type. Both political entities also have more general framework bills as well, but this study will elaborate on potential shortcomings of this policy option.

It is important to consider the different bill components when performing a policy analysis. Ultimately this study is concerned with the effectiveness of each policy option. To reiterate the CDC's framework for policy analysis, we must evaluate the policy's health impact, feasibility, and economic impact.



Identifying Policy Options

There are 14 different product categories for EPR related legislation in the US. The final outstanding category is the general framework bill. All of these bills exist at the state level, and none of which are federal. The PSI's Legislation Library currently lists 12 US bills under the "batteries" product category. California's Rechargeable Battery Recycling Act, or AB 1125, requires retailers to establish take-back systems for rechargeable batteries at no cost to the consumer. Another component of AB 1125 requires retailers to inform consumers of the opportunities for collection services that they provide. There is also an entire article dedicated to key definitions which can help inform target requirements and producers of their scope of responsibility. Furthermore, this bill recommends phasing out certain hazardous chemicals in rechargeable batteries to the greatest extent possible.

There is only one piece of US EPR related legislation under the PSI's "Carpet" product category. California's Carpet Stewardship Law, or AB 2398, aims to increase the reuse and postconsumer carpets. It is important to acknowledge that there are two amendments to this bill. Like the previous US EPR related bills, there is a section defining key concepts that will inform

standards for producers, collectors, and treatment facilities. There is also a section on civil penalties for violating the policy. The most notable feature of AB 2398 is the requirement of manufacturers to submit carpet stewardship plans to the department, either individually or through a third-party stewardship organization. For example, the Carpet America Recovery Effort, or CARE, is the nonprofit third-party stewardship organization for the carpet industry responsible for submitting stewardship plans for manufacturers that are compliant. Stewardship plans establish guidelines and address logistical concerns for achieving EPR. Valid stewardship plans must achieve the targets of the bill, incorporate goals to increase postconsumer carpet, discuss the mechanisms to achieve postconsumer recycled content goals, provide a funding mechanism, include education efforts, and contain processes that allow for independent audits to be conducted. There are 24 pieces of legislation under the electronics product category, according to the Product Stewardship Institute. The states that have EPR related legislation for electronics include Connecticut, District of Columbia, Hawaii, Illinois, Indiana, Maine, Maryland, Michigan, Minnesota, Missouri, New Jersey, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin.

The mattress product category has four pieces of active EPR related legislation from California, Connecticut, Oregon, and Rhode Island. This study will focus on the most recently enacted bill for simplification, Oregon's Mattress Stewardship policy, or SB 1576. The bill requires producers to register stewardship plans that detail their mechanisms for proper EOL management of discarded mattresses. Producers must also finance these collection and recovery services. Elements of stewardship plans include the discussion of financing mechanisms for stewardship organizations, general goals to increase post consumer recycled content, proposed measures to achieve outlined waste management standards, and education outreach efforts to inform consumers about the environmental costs of the mattress industry. Similarly to the other US EPR related legislation, SB 1576 dedicates a section to civil penalties based on frequency and intensity of violations. Likewise, another section describes the department's means of enforcement as well as penalties for manufacturers and retailers.

The only state with any EPR related legislation in the medical sharps product category is California, which has one state bill and nine local ordinances. This study will analyze California's state Pharmaceutical and Sharps Waste Stewardship bill, or SB 212, for simplicity. It is important

to acknowledge the large role local governments play in achieving the goals defined by state or federal legislation. Like the US EPR related bills that we have previously discussed, this bill's main focus is for manufacturers and distributors to implement stewardship plans either individually or through stewardship organizations. SB 212 states that these stewardship plans must include, "a program budget, an annual budget, annual report, and other specified information to CalRecycle," (SB 212). Furthermore, Article 5 titled Financial Provisions requires producers and stewardship organizations to cover all administrative and operational costs involved with plan implementation. There is also an article on enforcement, however, it is nonspecific and only suggests that the department take "disciplinary action" against violating entities. The mechanisms for producers and stewardship organizations to reach target goals are left mostly up to themselves, like many of the previous EPR bills. Likewise, many of the standards for proper collection and treatment for postconsumer medical sharps are defined by CalRecycle.

There are only two packaging related EPR legislation in the US. The bills were enacted in 2021 in both Maine and Oregon, and require packaging producers to submit stewardship plans through third party stewardship organizations. This policy analysis will focus on Maine's Act to Support and Improve Municipal Recycling Programs and Save Taxpayer Money, or LD 1541, because of its widespread support and praise as the US's first EPR bill for packaging. Like the previous US EPR related legislation, LD 1541 dedicates a section to key conception and definitions. Like California's AB 2398 on carpet EPR and Oregon's SB 1576 on mattress EPR, LD 1541 focuses on the establishment of stewardship plans by producers and the stewardship organizations that producers are in. The components of the stewardship plan requirement include mechanisms for participating municipalities to receive assistance, the establishment of a packaging stewardship fund, additional financial assurance plans that direct funds to the department, a budget proposal for the projected costs of stewardship programs, and a contract with bidders to conduct a statewide recycling needs assessment. LD 1541 defines the packaging stewardship fund as a private fund that shall help finance participating municipalities, operational costs, administrative costs, and investments to infrastructure and educational outreach programs. Furthermore, the bill contains measures of enforcement through annual reports by producers and representative audits of recyclable material by stewardship organizations. However, the bill lacks any penalties for producers who violate the stewardship plan requirements. Without specific penalty violations, there is a sense of ambiguity in terms of measures of enforcement, and there is less accountability for violating producers.

In the EU, EPR related legislation is limited to a few crucial Directives(European Commission). EU Directives still require the individual member states to design laws to satisfy waste management requirements, which affords Member States the liberty to determine the means for achieving EPR targets. The Waste Framework Directive(WFD) acts as a general overview of EPR for EU Member States; it contains key definitions and obligations for nations to establish waste management plans. Although it promotes EPR by permitting Member States to take "legislative or non-legislative measures to ensure that any natural or legal person who professionally develops, manufactures, processes, sells or imports products (producer of the product) has extended producer responsibility," the WFD only provides targets . Within the bill there are specific recyclability and material recovery targets for EU nations, however it does not provide the mechanisms for these nations to achieve said goals. The bill's specific targets for 2020 included increasing the minimum weight of preparing for re-use and recycling of waste materials from households by 50% as well as increasing the minimum weight of material recovery from non-hazardous construction waste by 70% (Waste Framework Directive). Another specific goal of the WFD states that "by 2025, the preparing for re-use and the recycling of municipal waste shall be increased to a minimum of 55 %, 60% and 65% by weight by 2025, 2030 and 2035 respectively,"(Waste Framework Directive). The directive calls for the separation of commonly recycled materials from households as well as hazardous waste requirements for producers. Finally, the WFD has "end of waste" criteria to help ensure that post-use products meet their proper end markets. This involves optimizing post-consumer recycled content material and requires producer investment in recycling infrastructure.

The other EPR related policies in the EU are product specific, including the Directive on packaging and packaging waste, the Directive on waste electrical and electronic equipment, the Directive on batteries and accumulators, and the Directive on end-of-life vehicles. The Directive on batteries and accumulators contains material prohibitions on cadmium and mercury for producers. Furthermore, this directive includes collection targets for Member States to reach for batteries and accumulators, along with other restrictions regarding their disposal. Similar to the WFD, the "Penalities" article in this bill is vague and calls for Member States to "take all necessary measures to ensure that they[rules] are implemented,"(Directive 2006). Collection scheme components of the bill require distributors to take back waste battery products at no cost. Once again, the bill seems more open-ended with the means through which Member States shall achieve their goals.

The Directive on batteries and accumulators aggressively transferred the financial burden of these waste products to the producers. The Directive on waste electrical and electronic equipment (WEEE) focuses on the electronics product category as defined by the PSI (Product Stewardship Institute). Its objectives are to improve their efficiency and decrease their environmental impact for electrical and electronic equipment (EEE). Other components of the bill include guidelines for proper EEE treatment for disposal and requirements for producers to raise user information of environmental costs of products. Furthermore, the bill extends producer responsibility to ensuring treatment facilities have the information required for reuse and proper disposal of EEE. The WEEE, like the previous directives, grants Member States the legislative freedom to achieve the aforementioned targets. Similarly, the article regarding penalties is short and vague. Article 22, titled "Penalties" calls for Member States to take the necessary measures to achieve the directive requirements.

The next important piece of EPR legislation is the Directive on end-of-life vehicles, or the ELV Directive. Fundamentally, this bill intends to optimize post consumer recycled content and reduce the overall waste of EOL vehicles. Under the ELV Directive, producers and manufacturers are required to provide dismantling information to treatment facilities. Certain health and environmental impacts of the bill include the requirement of Member States to ensure toxic metals in vehicles are not placed on the market, the establishment of reuse and recovery minimums by average weight per vehicle, and the standardization of the coding of component materials. These components promote the proper management of EOL vehicles, help maximize post consumer recycled content, and protect the public from hazardous chemicals. The ELV Directive also contains minimum technical requirements and definitions for Member States to follow. So-called "economic operators" are required to set up collection systems, however, unlike the previous EU directives, this bill maintains a large portion of the recovery responsibilities to the Member States. They must ensure the proper treatment of EOL vehicles at facilities as well as reaching recovery and recycling minimum targets. The ELV Directive's budgetary aspect lacks guidance and neglects to provide the means for financing Member State involvement.

The final critical piece of EPR related legislation in the EU is the Directive on packaging and packaging waste(PPW), which aims to unify EU policy concerning packaging waste. Like the other EU legislation, it dedicates an article to key definitions as well as technical requirements for postconsumer products to be considered reusable, recoverable, and recyclable. The PPW Directive also contains specific recovery and recycling requirements for packaging waste,

Ranking Policy Options

According to the CDC's framework for policy analysis, there are three fundamental criteria to consider when evaluating legislation: public health and environmental impact, feasibility, and economic impact. This portion of the study will compare the previously mentioned EPR related bills, and assess them using the CDC's framework. Each piece of legislation from both the US and the EU will now be analyzed according to the CDC's criteria.

In the US, California's Rechargeable Battery Recycling Act, or AB 1125, requires producers to provide collection services for postconsumer rechargeable batteries free of charge to the consumer. Furthermore, producers must phase out, to the greatest extent possible, hazardous chemicals in rechargeable batteries. Both of these bill components contribute to protecting the public health and mitigating environmental impact. AB 1125 succeeds through its comprehensive consideration of the CDC's first criteria for policy analysis, public health and environmental impact. It protects both the public and the environment through the prohibition of certain toxic chemicals in rechargeable batteries, meanwhile optimizing recovered and recycled materials of postconsumer products. However, AB 1125 falls short when it comes to aspects of economic impact. It does not necessarily provide any mechanisms for producers to account for any costs associated with providing collection services; it requires producers to absorb collection costs and responsibilities. Likewise, there are no guidelines for postconsumer rechargeable battery treatment.

The next piece of legislation this study will analyze is California's Carpet Stewardship Law, or AB 2398. It succeeds in mitigating the environmental impact of the carpet industry by prioritizing the optimization of post consumer recycled materials. The bill is also successful through its thorough discussion of funding mechanisms and acknowledgment of its overall financial impact. AB 2398 states that through stewardship plans, manufacturers must, "Include a funding mechanism, consistent with subdivision (c), that provides sufficient funding to carry out the plan, including the administrative, operational, and capital costs of the plan,"(CA Carpet, 2010). There is also a requirement for manufacturers to add a five cent per square yard assessment to help fund CARE. Furthermore, aspects of the bill provide logistical support for producers and stewardship organizations. Although there are no public health aspects of the bill, it emphasizes reducing the environmental impact of the carpet industry.

Oregon's Mattress Stewardship bill, or SB 1576, uses vague language and does not provide any specific postconsumer recycled material standards for producers. In terms of the first criteria for policy analysis, it falls short of comprehensively considering the environmental and public health impacts of EOL management of discarded mattresses. Although SB 1576's stewardship plan requirements account for the transition of financial responsibilities to mattress producers, its lack of specific recovered and recycled materials standards undermine the bill's analysis of the environmental impact of the mattress industry. Features of SB 1576 provide logistical leeway and strengthen the bill's feasibility aspect for producers. Regarding the final criteria of policy analysis, SB 1576 succeeds by offering comprehensive solutions to how stewardship organizations can finance collection and treatment services.

California's Pharmaceutical and Sharps Waste Stewardship bill, or SB 212, aims to establish stewardship programs for producers. It focuses on establishing collection programs and transferring the costs of EOL management to producers. SB 212 is generic with its content regarding public health and environmental impact, the first criteria for policy analysis. It does not contain any specific post consumer recycled content standard requirements and lacks a discussion on postconsumer waste treatment for medical sharps. In terms of feasibility, SB 212 contains extended sunset dates for stewardship programs to submit. Finally, SB 212's content regarding economic impact, the last criteria for policy analysis, lacks specific recommendations for producers and manufacturers of medical sharps to finance these stewardship plans. Although the bill requires producers to cover all administrative and operational costs of the stewardship plan, it falls short of comprehensively addressing the budgetary impact for producers.

Next is Maine's Act to Support and Improve Municipal Recycling Programs and Save Taxpayer Money, or LD 1541, which excels in two of the criteria provided by the CDC for policy analysis. Requirements embedded throughout the bill provide exemptions for smaller producers based on total gross revenue. These help contribute towards the bill's feasibility aspects for producers. However, LD 1541 lacks specific postconsumer recycled content standards for producers, which can contribute towards improper end of life management of products. These standards are necessary to incentivise producers and stewardship organizations to reach recovery and recycling targets.

The Waste Framework Directive (WFD) is the first piece of EU EPR related legislation this study will analyze. Evaluating the bill's environmental or health impact is the first criteria under the CDC's framework for policy analysis. The WFD contains components designed to

decrease the negative environmental and health implications associated with waste management, such as requirements to mitigate hazardous materials and increase the minimum amount of recycled materials. Finally, according to the WFD, the costs of waste management shall be managed by the individual Member States and borne by the producer. Means of enforcement for member states are vague and left completely in their jurisdiction.

The Directive on batteries and accumulators is the next piece of EU policy this study will consider. The first criteria for this study under the CDC's framework for policy analysis is health and environmental impact, which has a heavy emphasis throughout this bill. Minimum hazardous metal requirements for producers highlight the bill's priority to reduce both environmental and health impacts. There are also features of the bill that aim to educate consumers on the adverse effects of toxic metals like mercury and cadmium which are prevalent in rechargeable batteries. For example, Article 20 titled, "Information for end-users" requires that Member States shall keep users informed, particularly through the use of information campaigns. The third and final criteria, overall economic impact, is covered by Article 16 titled "Financing," in which the bill discusses how Member States must ensure producers finance costs from the "collection, treatment and recycling of all waste portable batteries and accumulators collected,"(Directive 2006). It goes on to state that producers and involved third parties shall finance the aforementioned public information campaigns.

The WEEE encompasses many aspects of public health and environmental impact of EEE, which is the first criteria under the CDC's framework for policy analysis. Articles dedicated to minimum collection rate requirements and ensuring the proper disposal of post-use products contribute towards this bill's success. The WEEE requires producers of EEE to accept post-use products from private households free of charge; it recommends that producers establish their own means for collection services or join a collective scheme. It also has a collection rate minimum requirement for Member States to achieve, with specific exceptions for Bulgaria, the Czech Republic, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia and Slovakia(Directive 2012). These nations have less ambitious collection rate targets due to their lack of EEE consumption and infrastructure necessary for EOL of these products.

In regards to the Directive on PPW's public health and environmental impact, components such as standardizing the methodologies for life-cycle assessment and establishing an identification system for packaging waste help strengthen the recycling infrastructure. By increasing rates of collection, recovery, recycling, and reuse as a whole, this policy helps promote

a circular economy. The issue of EOL management must be viewed holistically, because of the numerous factors involved. This bill succeeds by addressing all of these factors, from cradle to grave. The PPW Directive lacks specificity with its guidance, especially regarding preventative measures for packaging waste. It states that, "Member States shall ensure that, in addition to the measures to prevent the formation of packaging waste taken in accordance with Article 9, other preventive measures are implemented.

DISCUSSION

Ultimately, the issue of SUDS and plastic waste management requires the cooperation of multiple levels of government and stricter guidelines for EPR. Because EOL management is case-specific, it requires the involvement of producers across all industries. The Directive on Packaging & Packaging Waste is the most comprehensive EPR policy that is currently active. It ranks high for the first criteria and medium ranking for the last criteria. This is due to its specific post consumer recycled content requirements and strict prohibitions on the use of heavy metals.

Key Components

Overall, key features of any successful EPR related legislation include specific post consumer recycled content requirements, prohibitions on hazardous chemicals, well distributed collection services, and technical definitions. Stewardship plans are the most crucial component of EPR related legislation in the US.

In the EU, Directives help unite all Member States under a common goal. However, in leaving the mechanisms at the will of the individual nations, it allows for vague misunderstandings. The EU EPR related legislation used in this study shared similar features. For example, each piece of EU legislation used has a portion discussing the steps individual Member States shall take in order to report information to the Commission. This helps ensure that individual nations are achieving minimum target requirements. Likewise, all of the EU policy dedicates an article to key definitions, which is significant because they often help inform technical aspects of policy as well. The majority of the EU policy examined had means of enforcement and penalties, if not an entire article dedicated to it.

Future Directions

This study is limited to policy that has already been enacted. This restricted the analysis criteria to just environmental and health impact as well as economic impact. Likewise, the scope of this study was limited to state legislation in the US and federal directives in the EU. For future research on effective EPR related policy, it would be beneficial to evaluate bills that have not yet been enacted into law in order to analyze the feasibility of being enacted. Likewise, it is important to observe how individual member states have translated EU directives into national law.

ACKNOWLEDGEMENTS

Thank you Patina Mendez, Sangcheol Moon, Chelsea Andreozzi, and the rest of the ESPM 175 instructors for providing consistent guidance and motivation. This project would not have been possible without you all and for your immense support, and I cannot express how much credit you all deserve. Furthermore, I must thank Amanda Nicholson from the Product Stewardship Institute for granting me access to the PSI's Legislation Library. This database provided a large portion of the bills that were used in this study.

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