

The Plastic Pipeline

An Overview of Policies from Around the World



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About the Plastic Pipeline

Ocean plastics is a global catastrophe. Currently, there are 5.25 trillion pieces of plastic waste in the ocean, and at least 1 million tons of plastic enters the ocean every year. While we as consumers can do our part by tossing single-use plastics in the recycling bin, only 9 percent of plastic waste worldwide is recycled and much of the plastic life cycle occurs beyond our scope of control. We need to understand not only what happens that shapes plastic products from cradle to grave, but what can be done to stem the tide of plastic pollution.

Created by the Wilson Center's [China Environment Forum](#) and [Serious Games Initiative](#), The Plastic Pipeline aims to raise public awareness on the plastic product lifecycle and policies that can be enacted to help stem the tide of pollution going into our oceans. Partially supported by the National Geographic Society and Luce Foundation.

The game is open to the public, and has been tested in both the U.S. and Southeast Asia. We have presented it at conferences like Games for Change and SXSW. We are now in the expansion phase, to incorporate more policies and dive deeper into solutions for plastic pollution.



About This Overview

In this overview, we walk through the policies mentioned in the Plastic Pipeline. We use the term policy as an encompassing term for actions that can be taken by industry, communities, governments, environmental groups and other critical stakeholders. The fight against plastic pollution requires all hands on deck and not just governmental action.

In scoping the policies for the Plastic Pipeline, we first had conversations with leading experts and practitioners from around the world and across sectors, including government, industry, nonprofits, and research institutions. We sought clarity on not just the current policies to reign in single-use plastics, but also common misconceptions about plastic pollution strategies. After this process, we tapped plastic policy research, databases, and roadmaps from institutions like [Duke University](#), [Pew Charitable Trusts](#) and the [Ocean Conservancy](#). We then analyzed this mountain of data and insights to select a collection of policies to incorporate in the game. The last step of our research phase was to evaluate the pros and cons of each policy and estimate the political and societal “power” needed to implement them.

Here, we are providing a resource to help teachers and other Plastic Pipeline stakeholders deepen their understanding of the policies included in our game. Check out the research we tapped, and explore ongoing conversations on how these policies relate to the fight against plastic pollution. The Plastic Pipeline is, we hope, the launching pad for increasing dialogue in classrooms and beyond, about how we can decrease single-use plastic pollution and save our oceans--and protect human health.

Locations in the Plastic Pipeline

Each location in the Plastic Pipeline represents a unique area in which policies are being discussed to mitigate plastic pollution.



Plasti City: Local Community and Consumer-Level Action

Addresses plastic waste by banning single-use plastic bags, introducing bag fees, and distributing reusable bags.



Prehistoric Plastics Company: Production-based Policies

Promotes sustainability with eco-design standards, plastic labeling, recycled content requirements, a new plastic tax, and waste dumping rules.



Trash Mountain

Improves waste management through recycling programs, building landfills, fines for non-compliance, and litter capture initiatives.

Plasti City: Local Community and Consumer-Level Action



In the Plastic Pipeline, we wanted players to explore possible policies along the whole "life cycle" of a single-use plastic product - from its creation and use to its disposal. We start the game in the middle, for it is the consumers that are often blamed or burdened with choices on how to best deal with plastic pollution. In reality, the actions of producers upstream and waste management institutions downstream can play an even bigger role in plastic waste reduction. So you will travel to those places too in the game!

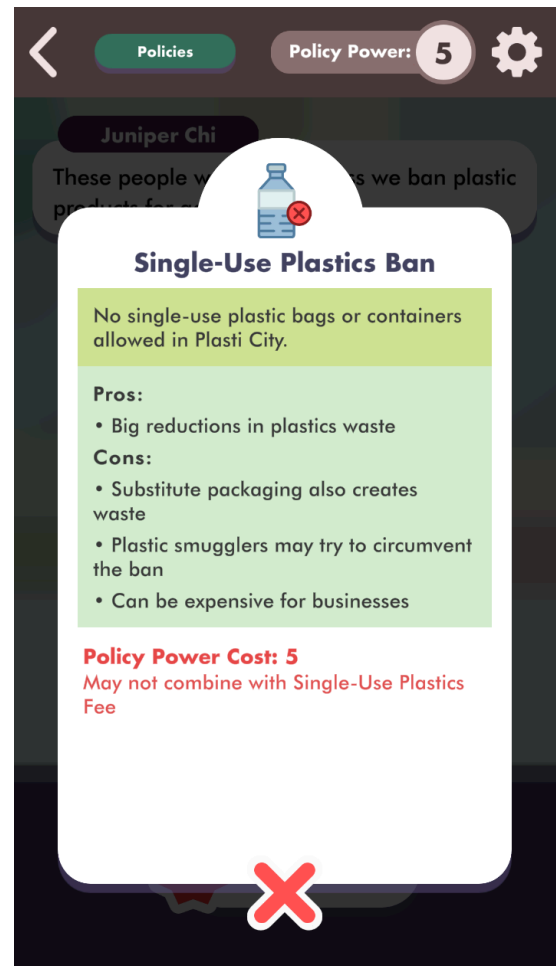
Ultimately, by starting with consumer-targeted policies that players might be familiar with, we hoped it would be easier for them to build upon their existing knowledge. When we surveyed players before the game about plastic policies they knew about, most cited the ones we feature in Plasti City.

Single-Use Plastic Bags Ban

A single-use plastic bag ban is a prohibition imposed by governments on the manufacture, distribution, and sale of single-use plastic bags by retailers. This ban typically targets lightweight, non-biodegradable plastic bags used for carrying purchases from stores. They are the most common consumer products in the world and a significant source of plastic pollution. In the United States alone, 8 billion plastic bags end up in the environment every year. The goal of the ban is to shift consumers away from these bags towards reusable bags to reduce plastic waste.

In the United States, 12 states and over 500 cities have passed laws or ordinances to ban single-use plastic bags. California was the first state to implement a statewide ban on single-

use plastic bags in 2015, which also included a charge on recycled paper bags and reusable bags. A report from nonprofits Environment America, the US PIRG Education Fund, and Frontier Group found that plastic bag bans successfully reduced plastic litter by at least one-third, although they could also shift customers to other types of single-use bags in some cases. In China, a nation-wide ban on the production, retail, and use of plastic bags thinner than 0.025mm has been in place since June 1, 2008. Additionally, non-degradable plastic bags were banned in major cities by the end of 2020 and in all cities and towns by 2022, with the exemption for fresh produce markets set to be lifted in 2025. Bali, Indonesia has banned single-use plastic bags since July 1, 2019. This ban has been effective mainly in shopping centers and modern stores but not in traditional markets.



Single-Use Plastic Bags Fee

Single-use plastics fees are usually a city-mandated requirement for consumers to be charged when they request a plastic bag from retailers. The fee is typically a small, often five or ten cents per bag, charged directly to the consumer at the point of sale. This policy aims to encourage customers to bring their own reusable bags. Cities can reinvest the revenue generated into local public education campaigns on plastic pollution or recycling and cleanup projects. In the Plastic Pipeline, players cannot combine the fee policy with a single-use plastic ban because if there is a ban in place, there is no way to get a single-use plastic bag.

In 2009, Washington D.C. passed a law establishing a 5-cent fee for single-use carryout bags at certain retail and food-serving businesses. The revenue from the bag fee was deposited into the Anacostia River CleanUp and Protection Fund. A subsequent survey in 2013 showed that households reduced the number of disposable bags used by 60%. In June 2008, China introduced a nationwide regulation requiring all retailers to charge for plastic shopping bags, with fees ranging from 10 to 50 cents RMB. A study in 2012 showed that the regulation caused a 49% reduction in the use of new bags. A more recent example is Singapore's plastic bag fee policy, implemented in 2023, which charges at least 5 cents per bag. This policy has led to a noticeable drop of 50% to 80% in the use of disposable bags since its implementation.



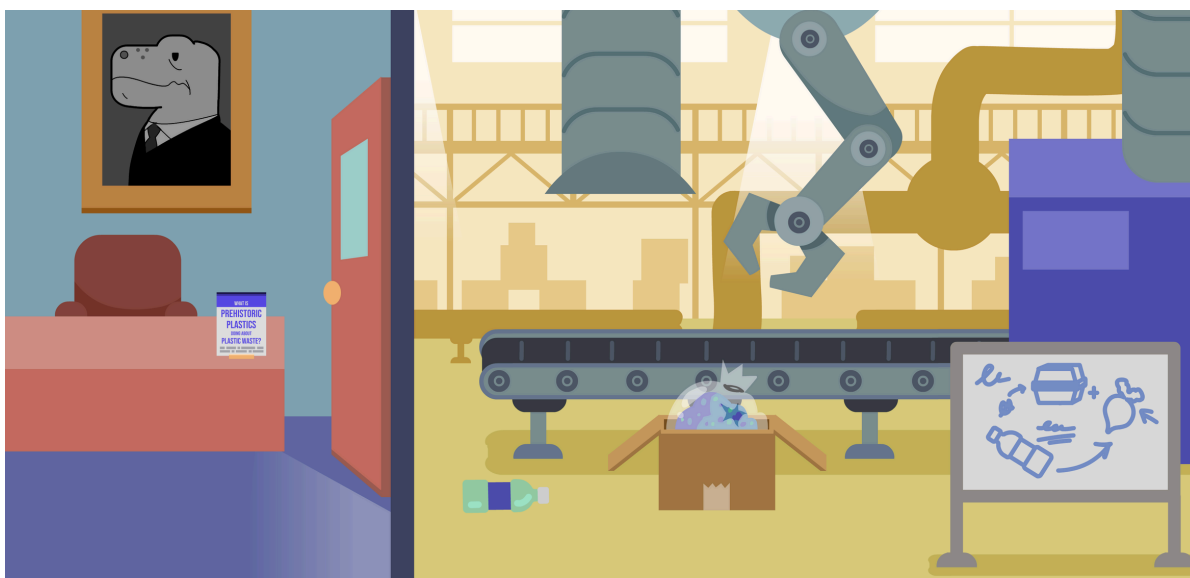
Reusable Bag Giveaway

A reusable bag, such as what you might find in the grocery store, is one policy strategy cities and communities are using to fight single-use bag pollution. By distributing free reusable bags, consumers are encouraged to use those instead of single-use plastic bags. This approach can be vital to launch when introducing a new plastic ban or fee policy to help customers comply more easily.

This policy has primarily been used as a temporary and complementary measure to single-use plastic bag bans or campaigns in the real world. For example, in 2009, the City of Manhattan Beach distributed free reusable bags when it joined Los Angeles County in the Brag About Your Bag campaign to encourage shoppers and businesses to reduce their reliance on single-use plastic bags. Similar city campaigns distributing free reusable bags have taken place in Shanghai, China, and Bali, Indonesia.



Prehistoric Plastics Company: Production-based Policies



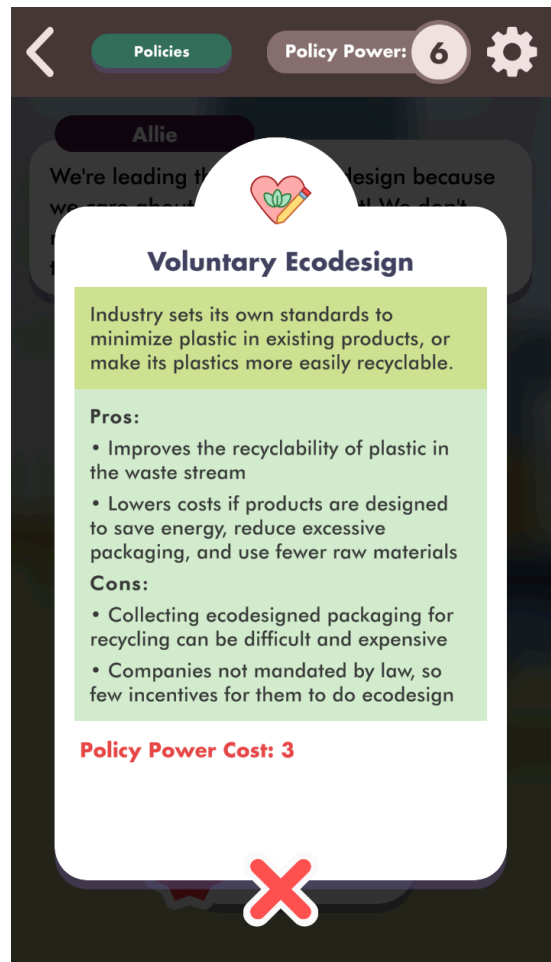
This section of the game focuses on opportunities in the upstream production-level for manufacturers to take voluntarily or--in response to national and state plastic waste policies-- mandated actions to decrease single-use plastic packaging. Many countries are starting to adopt national-level legislation to incentivize or force companies to take more responsibility for their waste. Turning off the tap of plastic production is viewed by many advocates as key in reining in plastic pollution. Country negotiators at the UN Global Plastic Treaty talks are having vigorous debates on what requirements industry must meet to turn off the tap of plastic production.

Voluntary Ecodesign

Companies adopting voluntary ecodesign (also called circular design) standards invest in the development of innovative packaging that minimizes plastic content. With the right ecodesign, these changes can improve the overall recyclability of plastic packaging in the waste stream. Besides reducing excessive packaging, ecodesign can also help companies save energy and use fewer materials, offering economic as well as environmental benefits.

Many companies and consulting organizations have published innovative packaging guidelines, either general or industry-specific in an effort to promote manufacturers to use less plastic in package designs. Examples of closed-loop organizations include Upstream Innovation by the Ellen MacArthur Foundation and

For Better Not Worse by ECOS. Businesses across industries have also launched initiatives to advance and enhance their circular packaging targets. In 2022, Coca-Cola announced an industry-leading goal to make 100% of its packaging recyclable globally by 2025 and to use at least 50% recycled material in its packaging by 2030. In the technology industry, Lenovo has introduced several products with zero-waste packaging and committed to using recycled materials for 90% of its plastic packaging for PC products and 60% for smartphone packaging. In Indonesia, a collaboration on eco-packaging has been established by the packaging start-up Foopak Bio Natura, joining forces with the Anomali Coffee company and a local NGO, the Earth Keepers Indonesia, to promote the use of food and beverage packaging that is easier to recycle and compost. Other Indonesian NGOs are working on a business model to design reusable and refillable packaging. Such efforts hold the promise of helping Indonesia meet its National Action Plan goal of reducing plastic waste leakage into the ocean by 70% by 2025.



Plastic Labeling

Plastic labeling policies require manufacturers to accurately label packaging by the type of plastic it contains. The most common is the ASTM International Resin Identification Coding System that includes numbers to label the main types of plastic. The number is printed inside the recycling triangle symbol to help consumers in sorting waste. However, the recycling triangle symbol can be misleading as it implies the packaging can and will be recycled.

There are seven types of plastic in this labeling system, but only numbers 1 (PET) and 2 (HDPE) are marketable enough to be widely recyclable. In contrast, numbers 3 (PVC), 6 (PS), and 7 (Other) are generally not recycled due to the lack of markets for these hard-to-recycle plastics. Numbers 4 (LDPE) and 5 (PP) are recyclable depending on local policies. To avoid misleading consumers, some experts have proposed using a solid triangle.

In the United States, while there are no federal regulations requiring the use of the ASTM labeling system, 36 states have enacted legislation to use these codes. Nonetheless, the requirements vary between states regarding the specific symbol used and the types of containers that must be labeled. In China, a labeling guideline based on the ASTM system was published by the government in 2008, but the labeling practice remains voluntary. In December 2020, the European Commission established an Implementing Regulation that requires menstrual hygiene products, wet wipes, tobacco products, and beverage cups that contain plastic to be labeled to inform consumers about the presence of plastics in the products and negative impacts of improper disposal.



Plastic Labeling (Cont.)

Specific labels for biodegradable and compostable plastic packaging also exist. These labels are meant to help consumers choose potentially less polluting packaging. The label can also be misleading, as not all cities or states have facilities that can compost or biodegrade these materials. Governments can set guidelines or mandatory policies to ensure the accuracy and compliance of these labels, as well as require consistency in labeling across various products. In January 2024, [Washington State](#) enacted a law to establish new labeling requirements for biodegradable products, including plastics, to prevent misinformation. The China National Light Industry Council published the [Guidance on Classification and Labeling of Degradable Plastic Products in 2020](#), which aims to define and label degradable plastics.



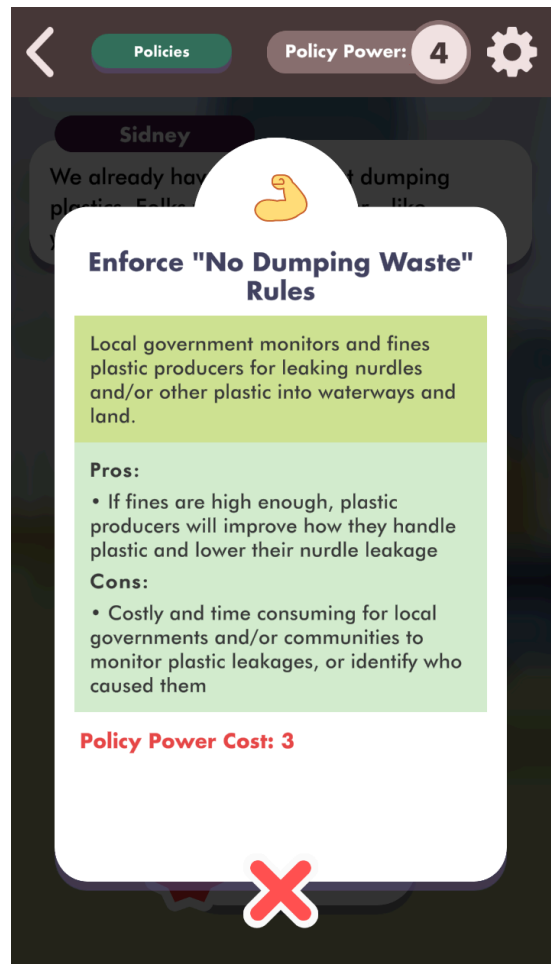
Enforce "No Dumping Waste" Rules

Local government enforcement agencies typically fine violators of "No Dumping Waste" rules or laws. However, tracking down midnight dumpers can be challenging. Even more problematic is tracking down the sources of microplastic and nurdle leakage into the environment.

Severe fines and legal consequences can incentivize plastic producers to enhance their handling practices and reduce plastic leakage. However, nurdles—tiny plastic pellets used to manufacture plastic products— have largely been ignored and not classified as pollutants. This oversight is particularly concerning, as an estimated 200,000 metric tons of nurdles find their way into oceans annually, contributing significantly to marine pollution.

Anti-dumping nurdle laws and regulations are relatively new. Diane Wilson, a Texas fisherwoman, and her volunteers monitored and gathered evidence for years on the rampant leakage of nurdles from a Formosa Plastics plant in Calhoun Texas. In 2019, they won a dramatic legal victory with a consent decree mandating 50 million in penalties for past pollution and fines if they did not clean up previous pollution or maintain zero discharge of plastic.

The US Clean Water Act makes it illegal to discharge pollutants into US waterways without a permit, but nurdles were initially not included in the category of pollutants. California became the first state to pass a law in 2007, classifying nurdles as pollutants to be regulated under the Clean Water Act, but other states have yet to pass specific regulations for nurdles or microplastics.



Enforce "No Dumping Waste" Rules (Cont.)

In the summer of 2024, a Plastic Pellet Free Water Act was introduced in the House of Representatives to require the US EPA to issue a rule that prohibits the discharge of plastic pellets and other types of plastic into waterways. The EU is also proposing legislation to regulate nurdles. There are no internationally agreed protocols for preventing or cleaning up nurdle spills. Encouragingly, the International Maritime Organization passed recommendations on how ships should package and prevent leakage of nurdles, as well as guidelines for clean up and assessing responsibility for spills. Environmental advocates and scientists are advocating that the UN Global Plastic Treaty include global standards for reducing nurdle leakage.

China's 2020 updated Solid Waste rules strengthened monitoring of illegal dumping, including plastics. But similar to many countries, this legislation does not target microplastics and nurdles.



Minimum Recycled Content Standards

National governments can set minimum recycled content standards to require plastic packaging manufacturers to use a specific percentage of post-consumer recycled content into their new packaging. This policy lowers plastic waste directly and helps build and stabilize recycled material markets. This industry-targeted mandate can foster business investment into plastic recycling and collection, as well as innovations in packaging.

In October 2020, California became the first state to mandate that all plastic beverage bottles contain a specified amount of recycled plastic. The law requires plastic beverage bottles to contain an average of 15% recycled plastic, which will increase to 25% in 2025

and reach 50% by 2030. Similar mandatory recycled content standards for plastic beverage containers have been established in Washington, New Jersey, and Maine. Furthermore, mandatory recycled content standards for plastic bags[1] have been implemented in California and Washington. Similar regulations have been promulgated in the EU and Canada, among a few other countries, but there are still no such regulations in China or Southeast Asian countries.



Mandatory Ecodesign

Mandatory ecodesign for plastics are regulatory requirements for manufacturers to design packaging using less plastic. These regulations aim to minimize the environmental impact of plastic products from production to disposal. In 2024, the EU updated its Ecodesign for Sustainable Products Regulation introducing more eco design criteria for a broader range of products. Like other mandatory eco design policies, the EU regulations aim to make sustainable products the norm for the packaging industry. Mandated eco design is a key piece in Extended Producer Responsibility (EPR) policies. EPR legislation targeting plastic is based on the polluter pays principle, making plastic producers and brand owners responsible for the end-of-life management of their plastic packaging.



In the US, California's Plastic Pollution Prevention and Packaging Producer Responsibility Act, and similar laws in Maine, Colorado, and Oregon, require manufacturers to redesign their plastic packaging to be easier to reuse or recycle. New York's proposed Packaging Reduction and Recycling Infrastructure Act aims to halve plastic packaging waste in 12 years. China has promoted producer responsibility since 2016, focusing on electronics, automotive, and battery products but not yet for plastic waste. Vietnam's National Action Plan targets a 50% reduction in marine plastic litter by 2025, with the food and beverage sector needing to reduce landfill waste by 80%. The Philippines' EPR Act RA 11898, enforced in 2023, mandates companies with significant revenue to account for their plastic output, using internal reductions and plastic credits.

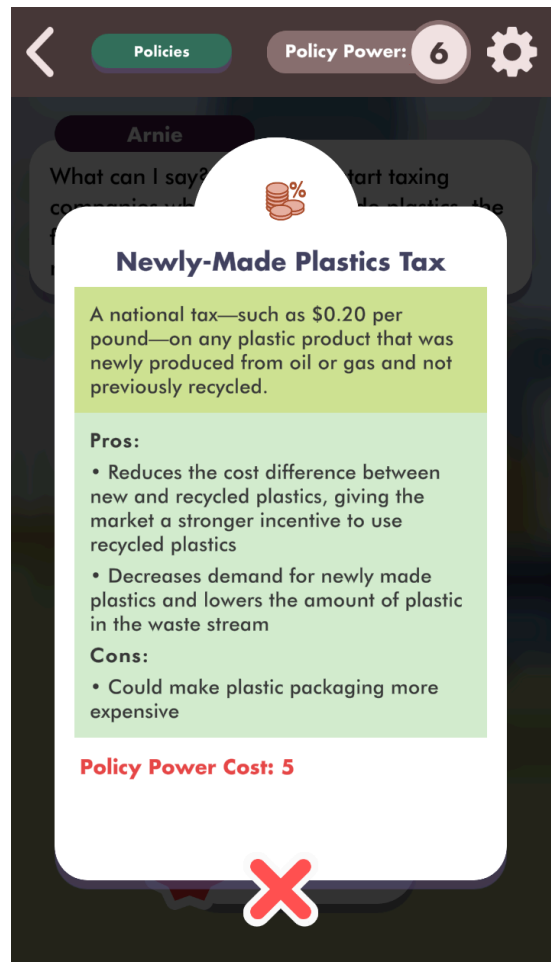
Newly Made Plastic Tax

This policy explored in the Prehistoric Plastics Company refers to a tax on packaging made from virgin plastic--material created from natural gas or crude oil-derived resin and does not contain any recycled content. Increasing the cost to manufacture single-use packaging using virgin plastic could encourage manufacturers to invest in innovative recycling technologies and develop alternative materials. The goal is to decrease plastic production, which would lessen waste, curb pollution, and promote a circular economy for more sustainable packaging production and consumption.

Most policies on plastic taxes around the world focus on fees for specific single-use plastics (especially bags). No country has implemented a national virgin plastic tax on the upstream plastic producers, but the tax is being discussed and proposed at national and international levels.

In the US Congress, a [2023 bill](#) proposed taxing manufacturers of virgin plastics for single-use products, [starting at 10 cents per pound](#). The European Union implemented a [plastic tax in 2021](#) that focuses on downstream waste, mandating EU member states to pay €800 per ton of plastic packaging waste that is not recycled.

Some stakeholders have advocated that the UN Global Plastic Treaty include a [global plastic pollution fee on plastic producers](#). The funds could be used to fund better waste management infrastructure and recycling [in Global South countries](#) and large-scale R&D for ecodesign of plastic packaging and alternatives.



Trash Mountain

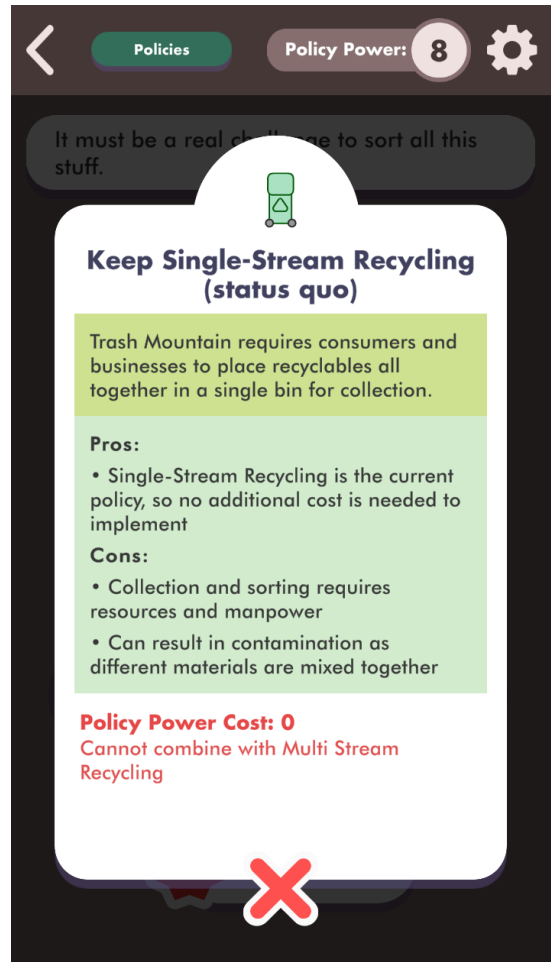


This section of the game takes players to a waste sorting plant, which determines the final resting place for the mountains of single-use plastic waste that cities are generating. In interviewing the workers players dig into some policies that could shrink these the towering plastic mountains of waste. Well-sorted waste opens up opportunities for more recycling, but lack of funding and resources for plastic sorting and recycling means more plastic waste ends up in landfills, incinerators or leaking into the environment.

Single-Stream Recycling

Single-stream recycling is a waste collection system in which consumers place all recyclable materials—such as plastic, glass, and metals—into a single bin for pick up. Recycling trucks transport this mixed waste to a facility where the materials are sorted by automated machinery and manual labor. Consumers find this system easy, but it often leads to aspirational recycling (“wishcycling”) with non-recyclable materials added into the bins. Another downside is a greater potential for contaminated waste, such as broken glass or paper, which then must be landfilled.

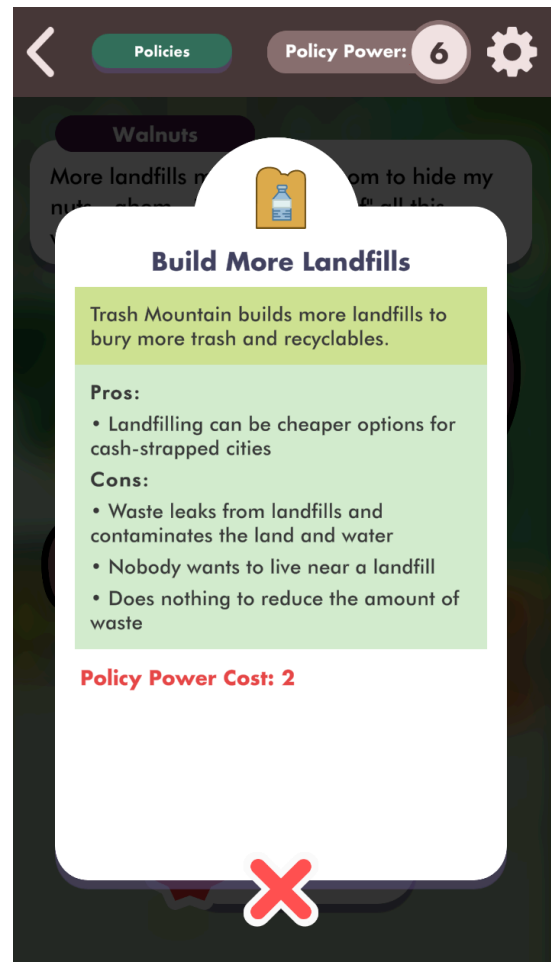
US cities like San Francisco, Seattle, Austin, and Philadelphia introduced single-stream recycling policies in the 1990s, but some, like San Francisco, are now moving away from it due to high contamination and stagnating recycling growth. For 40+ years China imported mixed waste from overseas for informal private businesses to sort manually. In 2018, China banned waste imports and launched a pilot project in 46 cities to devise comprehensive waste sorting and collection systems, aiming to better manage the country's growing mountains of plastic and other waste. To divert waste from overflowing landfills and increase recycling, the government has set a target to achieve garbage sorting in over 90% of residential communities by the end of 2024 and 100% by 2025. Shanghai and Beijing made waste sorting mandatory for all citizens in 2019 and 2020, respectively.



Build More Landfills

Burying waste in landfills is the oldest type of waste disposal. In developed countries, landfills have become more strictly regulated to prevent waste leakage and control odors. In the United States, the number of landfills dropped from 8,000 in 1988 to 2,535 in 2024 due to negative perceptions, limited land, and stricter regulations. In 1960, landfills took in 94% of the waste generated in the United States. In 2018, only 50% of US waste was directed to landfills. While the number has dropped, a US Department of Energy study estimates that 86% of all the single-use plastic waste generated in the United States ends in landfills. The problem of plastic waste straining the US landfill system is driving proposals for more national and state plastic waste reduction laws. Many of these proposed or recently passed laws are targeting Enhanced Producer Responsibility and other policies to reduce single-use plastic production.

Like the United States, China also faces cities struggling with growing trash volumes and landfills reaching capacity. To ease this pressure, China aims to raise urban trash utilization to 60% and incineration levels to 65%. In Southeast Asia, inadequate landfills and recycling systems lead to 90% of rubbish being illegally dumped or burned.

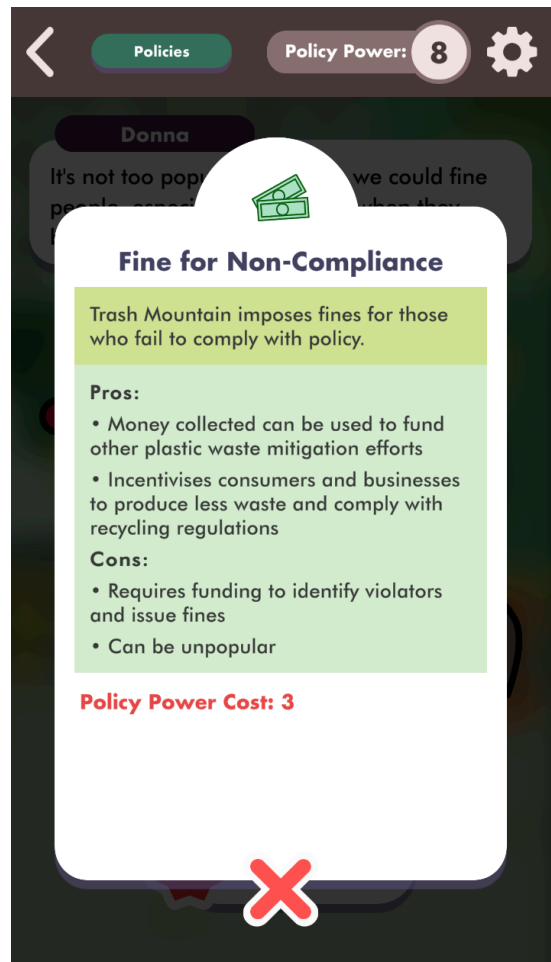


Fine for Noncompliance

Fines for noncompliance on plastic policy are financial penalties imposed on companies or individuals who fail to adhere to regulations aimed at reducing plastic waste and promoting sustainability. Fines can enhance recycling rates, improve the implementation of bag bans, and strengthen waste generation of plastic producers.

In the US, California and New York City impose fines on retailers for non-compliance with single-use plastic bag bans, with penalties increasing depending on the number of violations. Diane Wilson, a Texas fisherwoman, successfully won a consent decree against Formosa Plastics mandating \$50 million USD in penalties if they didn't clean up the billions of nurdles they leaked into the Gulf of Mexico.

In China, the 2020 revisions to the Solid Waste Law allow local authorities to fine offenders 10,000 to 100,000 yuan (US\$1,545 to \$15,460) for using non-degradable plastic bags and other single-use products. Southeast Asia also has strict regulations, with Thailand banning single-use plastic bags in major retailers since 2020 and implementing fines for non-compliance, including a ban on styrofoam and single-use plastics in national parks with fines up to 100,000 baht (\$3,000).



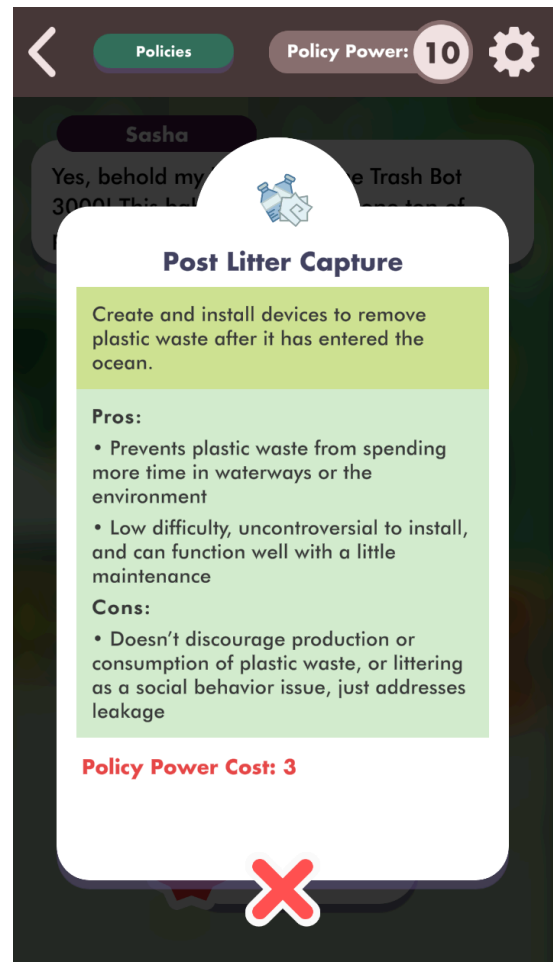
Post Litter Capture

Post Litter Capture is an environmental management strategy aimed at collecting plastic and other waste pollution after it has already entered the environment but before it causes significant harm or spreads to distant locations. This end-of-pipe approach is part of a broader effort to reduce environmental pollution, particularly in urban and suburban areas where litter is a common problem.

In the United States, PLC policies and practices are being implemented through a combination of municipal, state, and federal efforts. These efforts are often collaborative, involving government agencies, non-profit organizations, community groups, and private sector partners.

Many cities, such as New York City, Los Angeles, and San Francisco, have robust street sweeping programs that operate regularly to remove litter from streets and sidewalks. These programs are essential for preventing litter from entering storm drains and waterways, which ultimately lead plastic waste to the ocean.

In 2018, the Ocean Cleanup Foundation, a Dutch environmental start-up, launched a floating system of nets off the coast of San Francisco, California in an attempt to clean the Great Pacific Garbage Patch. Though initial results and prototypes struggled to gather plastic effectively, later prototypes from 2021 have been more successful in cleaning up some massive plastic patches. . Ocean Cleanup Foundation has also worked on tackling riverine plastic pollution in the Chao Phraya and the Mekong. Though the foundation continues to refine prototype designs and fundraise to maintain operations, these efforts are prohibitively expensive.

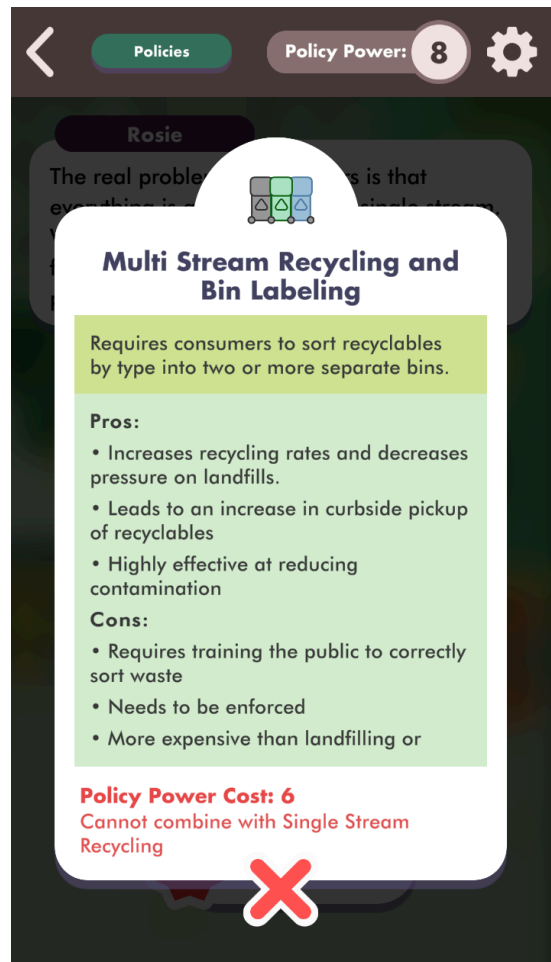


Multi-stream Recycling and Bin Labeling

Multi-stream recycling requires consumers to separate various types of recyclables into differently labeled bins. Sorting waste into more categories helps reduce contamination during collection and sorting and facilitate more materials getting to recycling. Better sorting also helps decrease pressure on landfills, but its dependency on consumer participation and knowledge can make implementation difficult.

In the US, a number of major cities are transitioning away from single-stream recycling to multi-stream waste collection systems. San Francisco has successfully achieved a 50-60% diversion rate away from landfills per year using the “Fantastic Three” stream program with black bins for trash going to landfills, blue bins for commingled recyclables, and green bins for food waste and other compostables.

In China, Shanghai has led the country’s waste sorting efforts with its strict waste management regulations in 2019. This program became the national model. Households are required to separate waste into four different categories: dry, wet (kitchen waste), recyclable, and hazardous. This effort is also paired with non-compliance fines: individuals could be penalized up to 200 RMB and companies up to 50,000 RMB. One high-tech innovative multi-stream collection for consumers are smart bins in Indonesia and Singapore that are built in neighborhoods to help consumers better sort waste and help improve the supply of recyclable materials.



Found in Multiple Sites

Public Awareness Campaign & Public Education

Public education campaigns aim to educate the consumers on why and how to choose products that produce less plastic waste. These campaigns teach consumers to make better choices, thereby increasing demand for packaging that uses less or no plastic or can be recycled. While the campaigns alone might not immediately change consumer habits, they enhance consumer awareness about reducing plastic waste and encourage more sustainable consumption behaviors in the long run. In practice, cities have launched plastic packaging education campaigns to get public support for new single-use plastic ban or fee policies.

Education about single-use plastics, and ways to mitigate it, is conducted in many ways by different organizations, often targeting students. For instance, Students for Zero Waste Week by the National Marine Sanctuaries is an annual, school-driven, week-long campaign aimed at raising student awareness about the negative impacts of single-use plastics and encouraging them to find ways to reduce waste in their communities. Plastic Free China, a Guangzhou-based NGO dedicated to single-use plastics policy and business advocacy, runs regular consumer campaigns to discourage customers from using single-use utensils when ordering food takeaway. Another Chinese environmental NGO, Friends of Nature, created a course called



Public Education (cont.)

“Waste & Life,” which is promoted in schools in Beijing and used by hundreds of teachers across the country. Similarly, in Bali, local environmental organizations including Bye Bye Plastic Bags and Green-Books.org have created their own plastic education campaigns to integrate environmental awareness into school curriculums.

The grassroots group Indonesia Plastic Bag Diet launched city-level education and advocacy campaigns on the harms of single-use plastic bags. They successfully catalyzed plastic bag bans in over 100 cities after initiating the #Pay4Plastic regulation trial in 2016 with Indonesia’s Ministry of Environment and Forestry.

← Policies Policy Power: 8

Sherlock

Someone needs to help them or multi-strategy approach

Public Education

Trash Mountain creates an advertising campaign to educate the public on how to recycle their plastic waste, including which materials are or are not recyclable.

Pros:

- Increases public awareness of the plastic crisis, leading to more support for policies
- Works well in decreasing plastic leakage when paired with concrete policy measures

Cons:

- Requires money and effort
- Ineffective if not done in tandem with

Policy Power Cost: 2

X

← Policies Policy Power: 8

I wonder how accurate this is?

Public Education

Prehistoric Plastics creates an advertising campaign to educate residents on why and how to choose products that produce less plastic waste.

Pros:

- Teaches consumers to make better choices, increasing demand for packaging that uses less plastic or can be recycled

Cons:

- Not very impactful on its own

Policy Power Cost: 2

X