



2022 Impact Assessment Report: Achievement of U.S. Plastics Pact Target 3

Internal U.S. Plastics Pact Use

Prepared by the U.S. Plastics Pact, in partnership with RTI International

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Executive Summary

The Impact Assessment Report provides an overview of strategies that would help the U.S. Plastics Pact (U.S. Pact) make significant progress toward its Target 3 goal of a 50% recycling rate for plastics under the U.S. Pact's scope. The main takeaways of this report include:

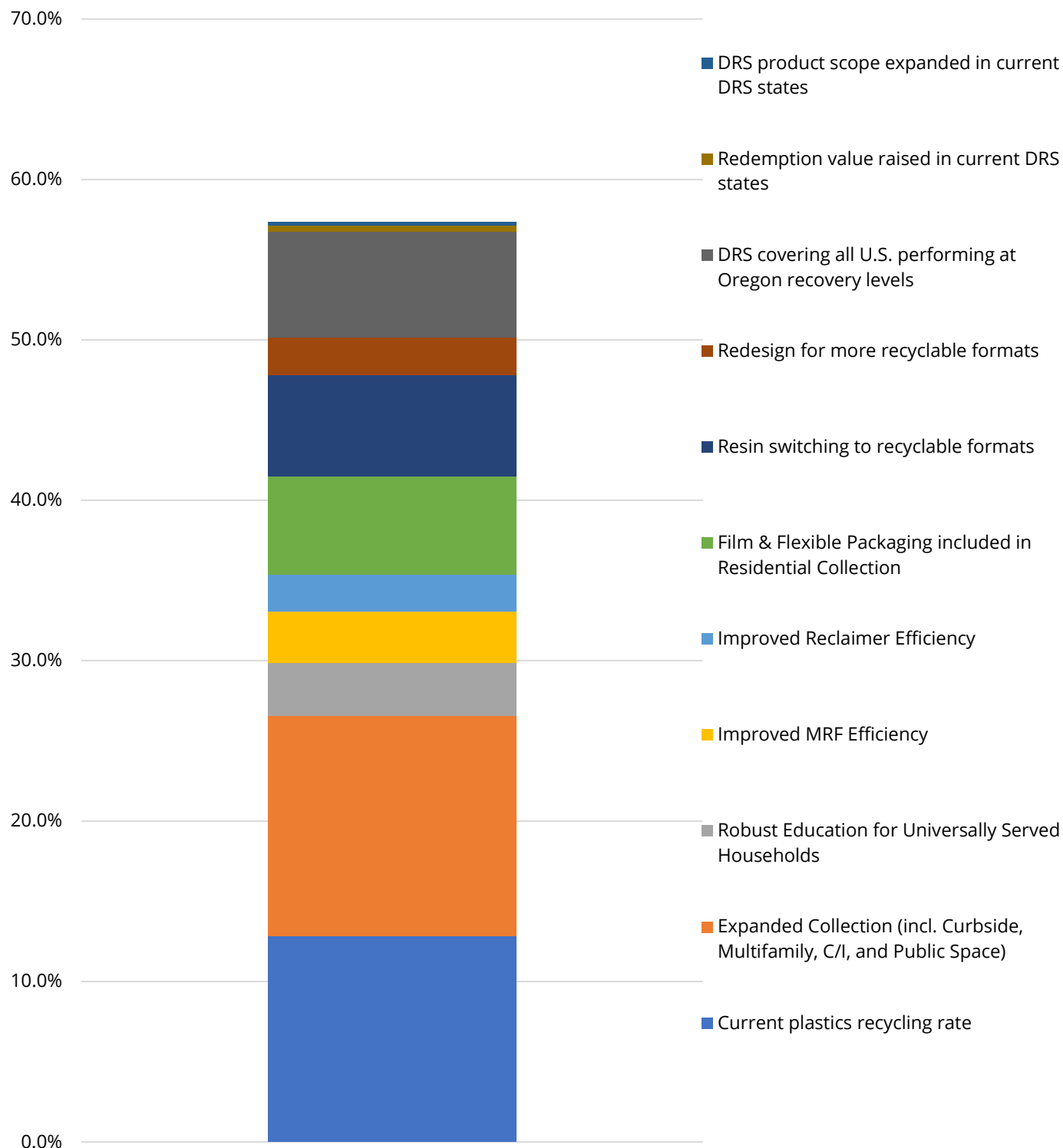
- U.S. Plastics Pact Target 3 instructs U.S. Pact Activators to “Undertake ambitious actions to effectively recycle or compost 50% of plastic packaging by 2025”.
- The 2021 baseline national recycling rate for in-scope plastics was calculated to be 13.3%. Unfortunately, there is insufficient available data to include a national composting rate for plastic packaging, so the baseline recycling and composting rate for the purposes of Target 3 is assumed to be 13.3%. Action needs to be taken to establish a strong base of data for composting so that composting rate contributions can be factored in over time.
- **The U.S. plastics packaging recycling and composting rate needs to increase by 36.7% in order to reach 50%.** However, there is a risk of the current recycling rate dropping to 12.8% by 2025, given estimates of increased packaging generation if the status quo continues.
- Available data indicates that no single intervention will move the national recycling rate by double-digit percentages, indicating the need for a multi-pronged approach to the Target 3 strategy.
- Reaching 50% represents extremely ambitious actions to undertake by the target year of 2025. Achievement of a 50% rate will require concerted action beyond U.S. Pact Activators, in addition to ambitious actions led by the U.S. Pact.
- There is a high level of interconnectivity between targets. In particular, without substantial action on Target 3, Target 4 will also be extremely difficult to achieve.
- The most impactful interventions (those leading to the greatest potential impact on the overall recycling rate) require substantial and sustained system financing, realistically only achievable through the passing of state and/or national Extended Producer Responsibility (EPR) policies covering plastic packaging, and the passage/alteration of Deposit Return System (DRS) legislation.

As well as:

- **U.S. Pact Activators, both individually and using the U.S. Pact as a collaborative platform, should focus and coordinate efforts toward three core system outcomes** to have the best chance of succeeding in the achievement of Target 3:
 1. Supporting the passage of policy, namely National extender Producer Responsibility (EPR) and Deposit Return (DRS) legislation alongside the development of a clear stance on how the system financing can be efficiently applied in the interests of moving the needle on the national plastics packaging recycling rate.
 2. The effective implementation of Targets 1 and 2, representing either real reduction pertaining to plastics deemed as problematic and unnecessary and/or resin switching and/or package redesign that meets the highest level of technical acceptability for recycling or composting.
 3. Establishing a meaningful reduction target for plastics packaging generation to limit the impacts of increased generation on the overall national recycling rate for plastics packaging.
- In addition, U.S. Pact Activators will increasingly need to support reliable data sources, in order to measure progress against individual and collective targets and should establish a means to contribute to the generation of more or improved system data.



Driving the 13.3% recycling rate for plastic packaging to 50%



With the baseline rate estimated at 13.3%, individual levers can be assessed to see how much they might increase the overall recycling rate. In the graphic above, the impact scenarios in this section are presented as if a full system change is achieved – e.g., all eligible households receive curbside recycling, or all MRFs reach the highest levels of processing efficiency.

The graphic shows that the achievement of the 50% target is feasible under a scenario of all levers working at their maximum potential. Clearly, such improvements would occur over time and would happen more slowly or quickly depending on the pace of interventions and U.S. Pact Activator action. Although this means that meeting the 50% target by 2025 will be extremely difficult. Action is required now.

The core of the graphic on page 5 is the achievement of universal collection from all sources, supported by robust education to maximize participation and capture from these sources. This then brings an enhanced flow of collected plastics to an optimized MRF and reclamation infrastructure, while resin-switching and packaging redesign changes the generated pool of materials toward greater recyclability. Film and flexible packaging also achieves mainstream recycling availability, with all collection, processing, and market issues resolved. Finally, DRS deploys incentives that further maximizes capture across the whole system.

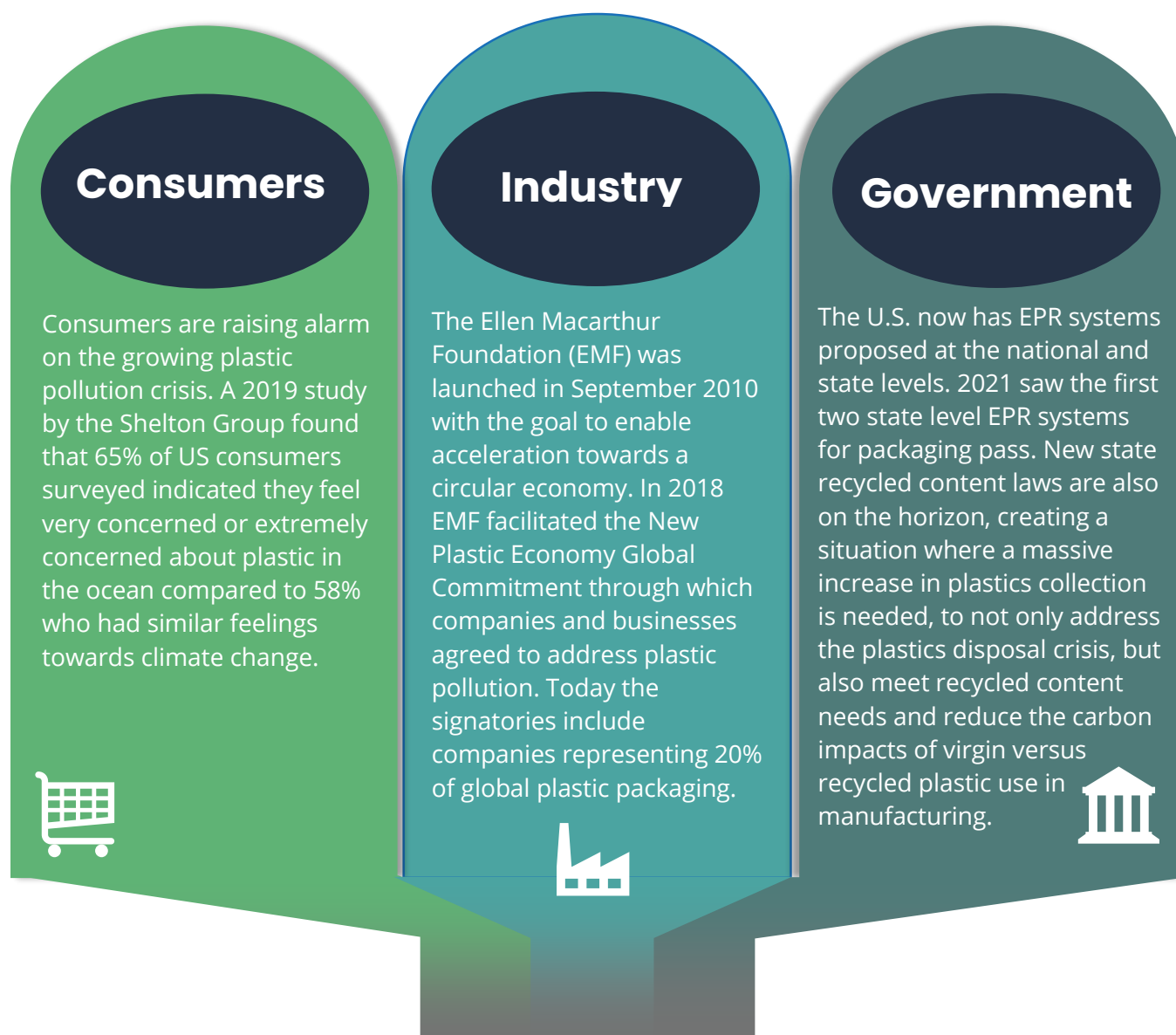
As a caveat, it is possible that the interaction of some levers may reduce the overall impact – e.g., DRS expansions may reduce the projected impact of curbside expansions. More and deeper research would need to be done to understand these cross-impacts and to protect against “double-counting” of recovery increases. However, the analysis does demonstrate the relative impacts of each lever and it underscores that **no one lever by itself would be a “silver bullet” to reach the target**; rather, it is an integrated **portfolio of action** that makes the target achievable.



Introduction

CONTEXT: U.S. plastic recycling rates are stagnant and, in some cases, declining, and the moment to revitalize plastic recycling in the U.S. is now.

The U.S. is at an inflection point with plastic packaging. Recycling systems in the U.S. are not well-equipped for the increasingly complex packaging mix and the plastics recycling rate is largely stagnant. However, a nexus of forces are spurring action to fix the U.S. plastic waste problem:



These forces signify that we are now at a moment for action. The establishment of national Pacts, like the U.S. Plastics Pact underscores that collaborative action now has a platform that did not previously exist.

Target 3: Undertake ambitious actions to effectively recycle or compost 50% of plastic packaging by 2025

The U.S. Plastics Pact launched in August 2020 with four key targets derived from the Ellen MacArthur Foundation's New Plastics Economy Global Commitment and Plastics Pact Network:



TARGET 1

Define a list of plastic packaging that is to be designated as [problematic or unnecessary](#) by 2021 and take measures to eliminate the items on the list by 2025



TARGET 2

100% of plastic packaging will be reusable, recyclable, or compostable by 2025



TARGET 3

Undertake ambitious actions to effectively recycle or compost 50% of plastic packaging by 2025



TARGET 4

Achieve an average of 30% recycled content or responsibly sourced biobased content in plastic packaging by 2025

What does the Target 3 mean?

In mid-2021, with the support of a U.S. Pact workstream comprising several Activator (member) volunteers, the U.S. Plastics Pact established a baseline scope. In summary, this scope is broad and inclusive of all postconsumer plastic packaging (primary, secondary, and tertiary and both consumer and commercial applications). Some ancillary plastic materials such as cups, utensils, straws, plates, bowls, takeout containers, and carry-out bags are also considered in scope. For the time being, additional packaging with some plastic content e.g., poly-coated paper, plastics in durable products, other non-durable plastic products and medical plastics are out of scope.

Using this scope, the workstream calculated a baseline plastics packaging recycling rate for the U.S., leveraging industry sources such as EPA, APR, and NAPCOR data. **This baseline plastics packaging recycling rate is 13.3%.** Unfortunately, there is insufficient available data to include a national composting rate for plastics packaging, so the conclusion of the workstream was that the 2020 baseline recycling and composting rate for the purposes of Target 3 is 13.3%.

In practice this means that the U.S. plastics packaging recycling and composting rate needs to increase by 36.7% in order to reach 50%.

The baseline U.S. recycling and composting rate for in-scope plastic packaging was calculated to be 13.3%

Material/Format	Weight generated (1000s of tons)	Weight recycled (1000s of tons)	Recycling Rate	Recycling Rate Source	Date of Data
PET bottles	3,265	868.0	26.6%	NAPCOR	2020
PET in Other Plastics Packaging	730	70.0	9.6%	EPA	2018
HDPE natural bottles	746	202.5	27.1%	APR	2019
Colored HDPE bottles	867	296.5	34.2%	APR	2019
HDPE containers- calculated	733	132.9	18.1%	EPA	2018
HDPE in Other Plastics Packaging	800	0.0	0.0%	EPA	2018
HDPE in Bags, Sacks, and Wraps	640	50.0	7.8%	EPA	2018
PVC bottles	16	0.3	1.6%	APR	2019
Other PVC rigid containers	4	0.0	0.0%	EPA	2018
Other PVC packaging	300	0.0	0.0%	EPA	2018
PVC in Bags, Sacks, and Wraps	70	0.0	0.0%	EPA	2018
LDPE bottles	35	0.4	1.1%	APR	2019
Other LDPE/LLDPE rigid containers	5	0.0	0.0%	EPA	2018
LDPE - plastics plates and cups	20	0.0	0.0%	EPA	2018
Other LDPE/LLDPE packaging	910	0.0	0.0%	EPA	2018
LDPE/LLDPE Bags, Sacks, and Wraps	2,780	370.0	13.3%	EPA	2018
PP Bottles	94	14.9	15.9%	APR	2019
Other PP plastics containers	156	24.7	15.9%	Assumed same as bottles	2018
PP in Other Plastics Packaging	1,010	30.0	3.0%	EPA	2018
PP in Bags, Sacks, and Wraps	570	0.0	0.0%	EPA	2018
PP - plastics plates and cups	160	0.0	0.0%	EPA	2018
PS Other packaging	410	24.8	6.1%	EPA	2018
PS in Bags, Sacks, and Wraps	140	0.0	0.0%	EPA	2018
PS - plastics plates and cups	820	0.0	0.0%	EPA	2018
PLA other packaging	20	0.0	0.0%	EPA	2018
PLA - plastics plates and cups	30	0.0	0.0%	EPA	2018
Other plastic resin other packaging	360	0.0	0.0%	EPA	2018
TOTAL	15,691	2,085	13.3%		

As is evident in the table above, calculating a baseline recycling rate for U.S. Pact in-scope plastics currently relies on a combination of EPA and key industry reports. The data in the table represents the latest information as of the date of this document. See more discussion in section on data challenges below.

If no action is taken to improve plastics recycling rates and the collection and processing system remain stagnant, the expected market growth of plastics packaging will cause the recycling rate per se to fail. The table below shows this scenario and provides the baseline that is used to test the increase potential of ambitious action levers used in this strategy document.

Baseline used to test the increase potential of ambitious action levers used in the Impact Assessment Report

Material/Format	Weight generated (1000s of tons)	Weight recycled (1000s of tons)	Recycling Rate
PET bottles	3606	868.0	24%
PET in Other Plastics Packaging	1007	70.0	7%
HDPE natural bottles	726	202.5	28%
Colored HDPE bottles	832	296.5	36%
HDPE containers	783	132.9	17%
HDPE in Other Plastics Packaging	854	0.0	0%
HDPE in Bags, Sacks, and Wraps	510	50.0	10%
PVC bottles	15	0.3	2%
Other PVC rigid containers	4	0.0	0%
Other PVC packaging	320	0.0	0%
PVC in Bags, Sacks, and Wraps	75	0.0	0%
LDPE bottles	29	0.4	1%
Other LDPE/LLDPE rigid containers	5	0.0	0%
LDPE - plastics plates and cups	21	0.0	0%
Other LDPE/LLDPE packaging	943	0.0	0%
LDPE/LLDPE Bags, Sacks, and Wraps	2659	370.0	14%
PP Bottles	101	14.9	15%
Other PP plastics containers	178	24.7	14%
PP in Other Plastics Packaging	1155	30.0	3%
PP in Bags, Sacks, and Wraps	481	0.0	0%
PP - plastics plates and cups	183	0.0	0%
PS Other packaging	371	24.8	7%
PS in Bags, Sacks, and Wraps	127	0.0	0%
PS - plastics plates and cups	742	0.0	0%
PLA other packaging	59	0.0	0%
PLA - plastics plates and cups	89	0.0	0%
Other plastic resin other packaging	360	0.0	0%
TOTAL	16,236	2,085	12.8%

Maintaining awareness of target interconnectivity is essential to success

It is critical to keep front-of-mind during the process of pursuing strategies directed toward achieving specific targets that the targets cannot be considered as standalone challenges.

For Target 3 this is important in the following ways:

- Substantial action on Target 1 will reduce the burden on Target 3 to an extent, by removing from scope the plastics that will simply not contribute to an overall increase in recycling rate.
- Substantial action on Target 2 will increase the likelihood of movement on Target 3 on the basis that the more packaging that is technically recyclable, the more packaging that stands a chance of being pulled through the system. In other words, if all other factors remained the same, but all plastic packaging became recyclable overnight, the plastics recycling rate could increase dramatically.
- Target 4 is simply not achievable without significant upwards movement in Target 3. While the exact details of this will become clearer as dedicated work is done around a strategy for Target 4, it is well understood that the availability of postconsumer recycled material supply (correlated with low recycling rates) is one of the biggest threats to the achievement of ambitious recycled content goals.

That said, specific efforts directed towards every individual target will nevertheless be necessary to ensure that all of the pieces of the complex system at play, are moving in a complementary direction and that every effort is made to pursue rapid change in this dynamic and challenging environment.

The U.S. Plastics Pact Is Uniquely Positioned...

The U.S. Plastics Pact is committed to undertaking ambitious actions towards a goal recycling rate of 50% for plastics packaging. Ambitious actions are *those that have or show a strong desire and determination to succeed*, and by their nature are intended to satisfy high aspirations and are therefore difficult to achieve.

The goal of this strategy document is to identify and explore impactful levers that can combine to increase the U.S. plastics recycling rate and to outline a recommended approach for the U.S. Plastics Pact's effect on those levers. In short, this depends on policy action that will drive and support the infrastructure improvements that result in higher plastic recycling. The determination shown by Activators between now and 2025 will be what defines success or failure in the terms of the achievement of Target 3.

The U.S. Plastics Pact is uniquely positioned to take ambitious action. A group of 110+ organizations has now come together to drive collective action around plastics circularity in the U.S.

Activators of the U.S. Plastics Pact (as of 4/17/22)



...To Take Ambitious Action

Core to the achievement of the targets is substantial investment in solutions oriented towards improving the recovery of plastics packaging and meeting content goals. **In the short term, results are most likely to be seen in the recycling system.** However, up to and beyond 2025, there are also significant opportunities to invest in and scale the composting system.

Activators represent all aspects of the plastics packaging value chain, and bring together vast collective resources and brainpower, along with unprecedented alignment around publicly stated targets, in order to solve this systemwide plastics packaging challenge.

In addition, given the challenges of data that have become apparent through the course of this project, the U.S. Plastics Pact can also play a pivotal role in overcoming core challenges to bring greater transparency to the plastic materials management value chain. Doing so will enable smarter, more effective planning policy, infrastructure/technology, and corporate strategy-making. Here are some areas, specific to data, where the U.S. Plastics Pact could play a role:

Data deficiency is pervasive across the recycling system. This is true for generation, participation, collection capture, MRF capture, and processor capture. Much of the baseline data for plastics dates back to 2018 and there are difficulties in aligning the categories of resins and formats with the way plastics are specified for collection and processing, let alone as feedstock for recycled content.

The U.S. Pact could contribute by identifying ways to add to and encourage the collection of good data:

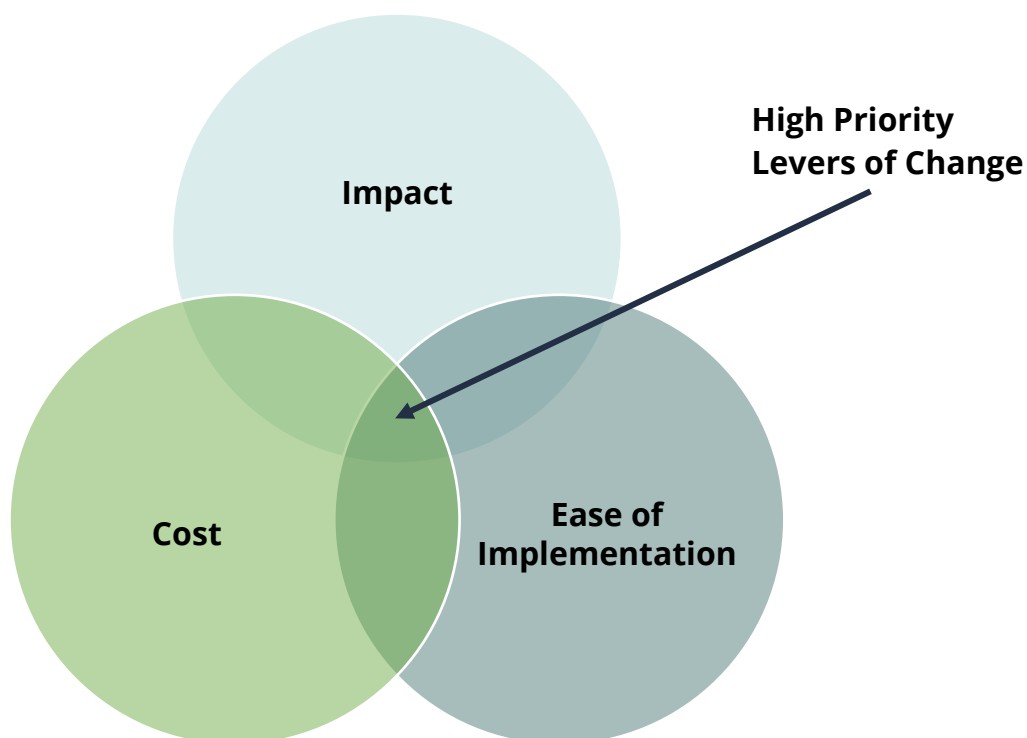
- Leading the coordination of interested groups in influencing the details and timing of EPA's plastics generation and recycling data.
- Fostering more standard nomenclature and data collection methods make harmonization and comparison more feasible.
- Helping fund key research to produce better and more consistently available data, for example on collection and processing, capture rates, and yield losses during reclamation.

Recommendations & Conclusions

A sense of urgency and scale, as well as collective action, are needed to drive recycling rates toward the Pact's Target 3 Goal

Identifying and examining potential interventions is the first step in an iterative process toward improving the U.S. plastic packaging recycling rate. However, realizing measurable impact will require investment in a larger more sustained effort and a commitment to a system's change approach. This approach requires stakeholders to not only identify those levers of change that have the greatest impact but also examine impact against both cost and ease of implementation.

High Priority Levers of Change



Once high priority interventions have been identified, they should be tested through a series of rapid real-world experiments, with an eye toward

- Improving data quality around impact, cost, and ease of implementation, as well as baseline generation, composition, and recovery data, and
- Continually improving the design and implementation, and therefore outcomes associated with the intervention.

The data in this assessment point to the need for a wide portfolio of actions to improve plastics recycling at scale. No one intervention or lever, nor any sole attention on just one or two resin/formats, provides enough improvement on their own to reach the 50 percent target. Activators will need to lead and work collaboratively across a broad array of fronts to make meaningful progress.

With the lead time necessary to make investments, motivate key actors, deploy interventions across a complex system, and achieve policy successes, in the context of annual budget and legislative cycles, action is needed now. Activators should understand that Target 4 of the U.S. Plastics Pact and the individual content goals of brand companies are not achievable without significant progress on Target 3.

Recommendations & Conclusions

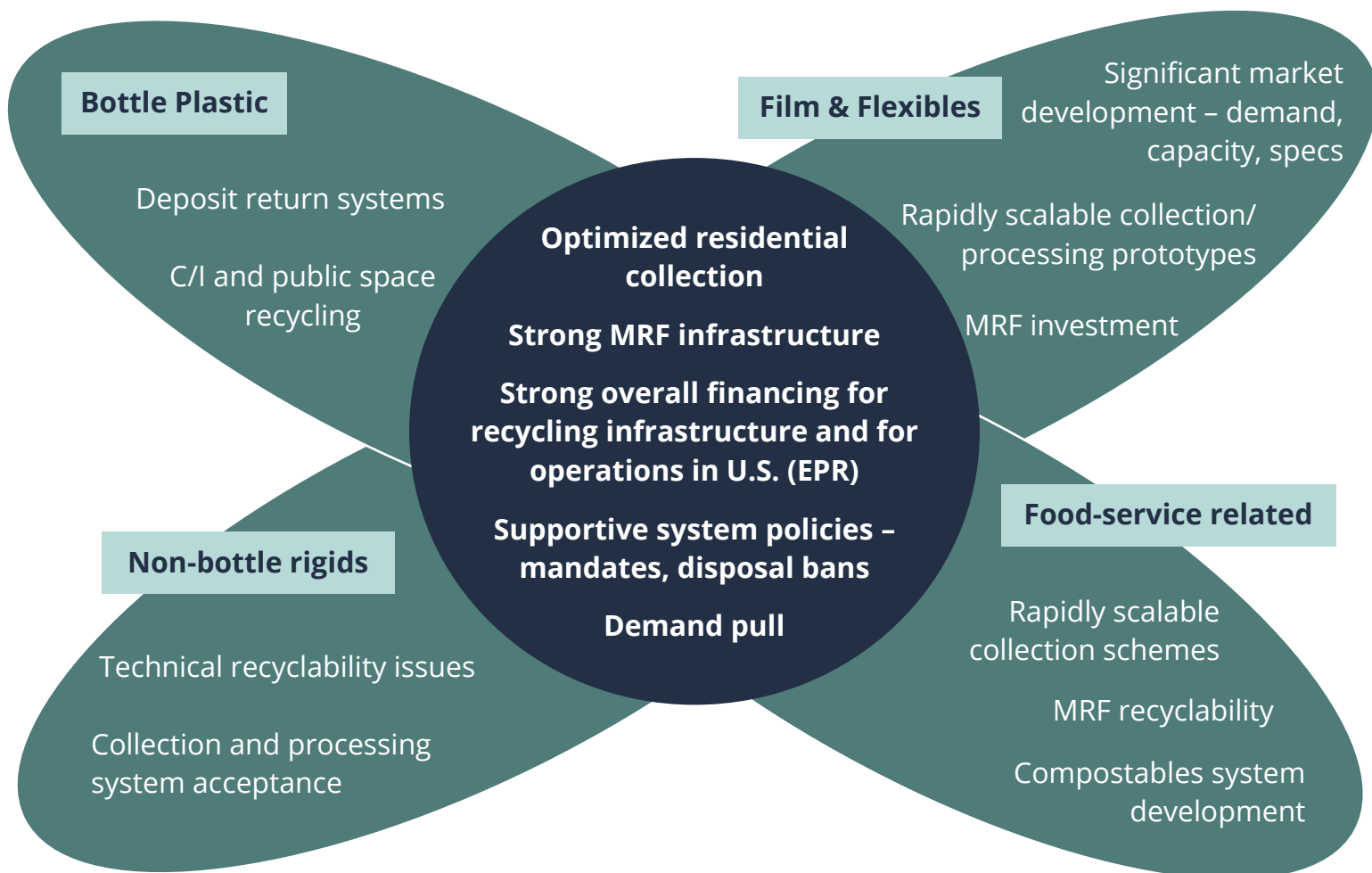
2022 is a critical year for the formation of strategies and the beginning of ambitious, dedicated, focused collective activity to increase plastic recycling in the U.S. **In general terms, action falls into three main categories.**

- **Foster accelerated improvements to collection and processing**
 - Help support and expand existing voluntary collective platforms designed to expand household collection, e.g., The Recycling Partnership’s curbside recycling grant program.
 - Help establish additional new voluntary collective platforms to improve commercial/institutional and public space recycling.
 - Help support and expand collective platforms that improve MRF processing and material acceptance, e.g., The Recycling Partnership’s Film and Flexibles, Polypropylene, and PET Coalitions.

- **Actively support policies that provide a sustainable financing and regulatory platform for increased plastic collection, including Extended Producer Responsibility (EPR) and Deposit Return Systems (DRS)**
 - While having the greatest singular impacts of all of the potential system levers, providing the regulatory and financing basis to drive the scaled change in collection, policies are a long-term strategy involving creation of political will, annualized legislative cycles, and periods of administrative implementation after bill passage. As such, these impactful policy levers may not yield results until very late in the U.S. Pact’s five-year initial time frame, or possibly well after.
 - The sooner U.S. Pact Activators engage in activities to pass policy, the sooner the policies can deliver results toward the 50% target and to the creation of available supply to meet the content requirements of Target 4.

- **Make real and substantial progress on Targets 1 and 2**
 - Prioritize recyclability design components in packaging decisions.
 - Utilize Plastic IQ, and other tools to inform circular packaging innovation.

The graphic below provides “food for thought” in the kinds of systems improvements that are shared between four main plastics formats, and those that are more impactful for that format individually.



Strategy & Impact Assessment Development

The U.S. Plastics Pact took the following approach to the development of a strategy for Target 3:

Assembled Dedicated Workstreams

- The U.S. Plastics Pact assembled two dedicated workstreams during 2021, comprised of specially selected Activator volunteers, to oversee this critical work.
 - The first, "*Scope & Data*", was tasked with establishing a baseline scope for the U.S. Plastics Pact and a corresponding recommendation with regards to data supporting the Target 3 strategy.
 - The second, "*Target 3 Strategy*" was tasked with participating in meetings with RTI to support and oversee their activities and deliverables.

Partnered with RTI

The U.S. Plastics Pact contracted to work with RTI on the following deliverables:

1. **Baseline Research**—Building from the U.S. Pact's existing body of research and analysis, a mixture of primary and secondary research was used to cull and examine data sources along the plastic waste value chain from generation to the processing/reclamation of packaging waste. We collectively identified several "levers of change" that could influence the overall recovery of plastics in the system. Data was collected from research reports, news announcements, solid waste websites, and stakeholder consultations to examine and quantify the effectiveness of each lever. *In cases where data was not possible to obtain, estimates were generated based on industry experience.*
2. **Modeling Interventions**—An excel-based *Impact Assessment Tool* (IAT) was developed to assess and compare the impact of each of the levers of change.
3. **Developed Recommendations**—Levers of change or interventions with the greatest potential to affect U.S. recycling rates over the next five years were identified. Interventions were selected based on their *potential for impact*, balancing quick wins that build momentum with larger long-term initiatives. Activator companies of the U.S. Plastic Pact were convened, and their collective knowledge was harnessed to understand the difficulty of implementing a select set of interventions. These insights were combined with learning from the data to arrive at recommended actions to take.
4. **Overlaid Additional Data and Due Diligence to Produce Lever Projections**
During the strategy development process, the Impact Assessment Tool helped deliver key insights and data points to project the impacts of different levers. Important gaps in the IAT were closed through additional engagement with key industry stakeholders and accessing additional data from The Recycling Partnership's Paying It Forward model and its experience working directly with communities and MRFs. This allowed a more focused and robust exploration.

Key Strategy Levers (Interventions) Explored in Detail

The following table lists the impact levers that were assessed and provides a basic description of the key recycling system elements each lever is intended to address.

Lever	Impact Description
Expansion of single-family Curbside Recycling	There are approximately 19.5 million single-family homes that are eligible for curbside but not currently receiving service. Expanding at-home access to recycling strengthens capture of the plastics from these households.
Expansion of multi-family Collection	An estimated 13 million multi-family households lack on-property recycling access, which is a significant barrier to plastics collection from this sector.
Improved and consistent education for residential recycling	Many curbside and other collection programs lack resources to inform and motivate households to recycle plastics at a high level. Robust, consistent, and well-funded education can address plastics confusion and can raise capture rates.
Addition of film and flexible packaging collection for all households	Film and flexible formats are substantial elements of the U.S. Plastics Pact scope and household generation. If collection, processing, and market barriers can be addressed, these materials could contribute significantly to the 50% target.
Expansion of recycling for commercial and institutional (C/I) generators	Less well understood in terms of available data, there are strong indications that generators like restaurants, office buildings, schools, and retail are substantially underserved with recycling collection. Improving recycling access could increase recovery of key resins and formats.
Expansion of public space recycling	Although smaller as a generation source than residential and C/I, public spaces can be significant generation spots for PET bottles and other bottle and container formats.
Improvements to material recovery facility (MRF) processing	Not all inbound collected plastics from collection systems make it into outbound plastic bales inside MRFs and there can be additional issues of cross-contamination. Addressing MRF yield loss and quality issues can improve available resin for recycled content targets.
Improvements to Reclaimer processing	Reclaimers also experience yield losses not only because of extraneous materials in bales but also inefficient processing of desired resins. The companion to improving MRF yields is to help reclaimers maximize capture of inbound resin.
Switching non-recyclable to recyclable formats	Substitutions of commonly accepted resins and formats for non-accepted collection materials raise the overall pool of materials available to be recycled and addresses the drag on the 50% target from non-recyclable elements.
Redesign of packaging	Packaging better in sync with MRF and reclaimer processing would improve capture rates and reduce yield loss in those facilities.
Expansion of Deposit Return Systems (DRS)	Per capita recovery rates for key resins/formats are substantially higher in DRS states than those without. Expansion scenarios include adding new deposit states, raising the redemption fee in deposit states, or expanding the scope of covered formats, all then expanding the power of the recycling incentive that DRS systems provide.
Establishment of Extended Producer Responsibility (EPR)	The collection system improvements described above (and potentially the MRF improvements) are greatly facilitated if a consistent, high level of system financing is put in place. Providing the recycling system with higher levels of key investment and operating capital would spur infrastructure expansion that makes the 50% target significantly more feasible.

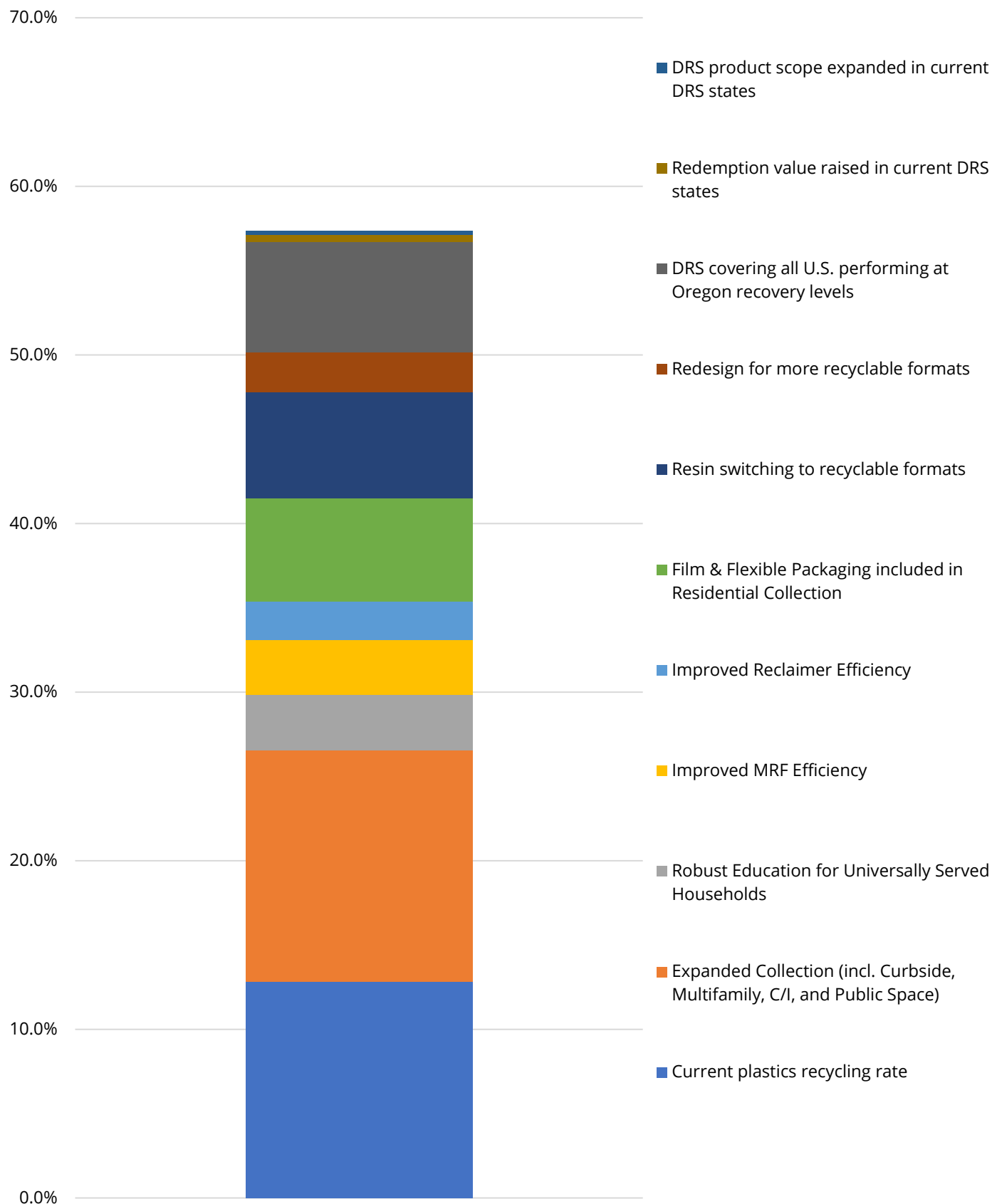
Impacts of Key Levers

With the baseline rate estimated at 13.3%, individual levers can be assessed to see how much they might increase the overall recycling rate. In the graphic above, the impact scenarios in this section are presented as if a full system change is achieved – e.g., all eligible households receive curbside recycling, or all MRFs reach the highest levels of processing efficiency.

The graphic shows that achievement of the 50% target is feasible under a scenario of all levers working at their maximum potential. Clearly, such improvements would occur over time and would happen more slowly or quickly depending on the pace of interventions and U.S. Pact Activator action. Although this means that meeting the 50% target by 2025 will be extremely difficult. Action is required now.

The **core of the graphic is the achievement of universal collection from all sources**, supported by robust education to maximize participation and capture from these sources. This then brings an enhanced flow of collected plastics to an optimized MRF and reclamation infrastructure, while resin-switching and packaging redesign changes the generated pool of materials toward greater recyclability. Film and flexible packaging also achieves mainstream recycling availability, with all collection, processing, and market issues resolved. Finally, DRS deploys incentives that further maximizes capture across the whole system.

As a caveat, it is possible that the interaction of some levers may reduce the overall impact – e.g., DRS expansions may reduce the projected impact of curbside expansions. More and deeper research would need to be done to understand these cross-impacts and to protect against “double-counting” of recovery increases. However, the analysis does demonstrate relative impacts of each lever and it underscores that **no one lever by itself would be a “silver bullet” to reach the target**; rather, it is an integrated **portfolio of action** that makes the target achievable.



Details on Levers and Impacts

Expansion of curbside recycling

This lever closes the gap for 19 million remaining households in the U.S. that could receive curbside recycling services but currently do not. By itself, under existing participation and capture rates, with materials going to MRFs and reclaimers at current levels of efficiency. This would raise the national plastic recycling rate by 1.8 percent. It would be further boosted by strong, consistent outreach and the possible addition of film and flexible packaging to mainstream collection.

Expansion of multifamily on-property collection

This lever completes the provision of on-property access to recycling for multi-family households. As a baseline without increased recovery that would come from strong, consistent education and film and flexibles collection, this lever raises the plastic recycling rate by 1 percent.

Expansion of commercial/institutional collection

Providing recycling services to thousands of restaurants, schools, retail shops, universities, office buildings, and other non-residential sources could, by itself, increase the plastics recycling rate by more than 10 percent. To reach that level, plastics recycling would need to be universal across all C/I generators, with recycling services on par with trash services. Most C/I generators use private hauling services as cost-plus to trash, so significant incentives and mandates across the U.S. would be needed to spur C/I plastics recycling.

Expansion of public space collection

Individually, a recycling bin at a park, sports field, beach, or downtown pedestrian area recovers much less than a bin provided to households but providing universal recycling in all public spaces could reinforce recycling behavior and be key for resin formats like PET bottles. This lever could expand plastics recycling by 0.6%.

Robust education for universally served households

As much as 50% of plastics are lost in curbside, drop-off, and multi-family programs due to lack of participation, confusion, contamination, and poor capture behavior (in which participants recycled only part of their recyclables). Education and outreach are chronically underfunded and spotty, reliant on a system of strapped community budgets that produces patch-worked localized messaging. Boosting, maintaining, and standardizing plastics recycling education across the country could raise plastic recycling rates by 3.3%.

DETAILS ON LEVERS AND IMPACTS CONTINUED

Improved MRF efficiency

Collected plastics often encounter MRF sortation that is not optimized for highest material capture. Improving MRF capture efficiency through investment, technical assistance, and equipment interventions could raise plastic recycling rates by 3.2%. If this sector's performance is not addressed, it would diminish the increase in plastics collection from levers described above.

Improved reclaimer efficiency

If MRFs can be made more efficient in plastics capture but then MRF plastics bales encounter inefficient reclaimer processing, the potential increase in postconsumer resin yield could fall short. Addressing reclaimer performance could help raise plastics recycling rates by 2.3%.

Film & flexibles universally collected from residential sources

Film and flexible plastics packaging face a significant range of design, sortation, and market challenges but if they can be overcome through strongly financed, consistent effort, residential collection of these materials could increase plastics recycling by 6.2%.

Resin switching

A large-scale switch of key formats from resins that have impractical and difficult to recycle to resins that are already mainstream recyclables could raise the plastics recycling rate by 6.3%. To achieve that level of impact, the switch would need to be wholesale across all formats currently in PS or PVC to PET, HDPE, and PP, and the recycling rates for those materials would need to be doubled or more (which rely on the collection, education, and MRF/reclaimer interventions described above). Lower rates of resin switching would maintain a large presence of unrecyclable formats in the U.S. Plastics Pact scope.

Redesign

Efforts to redesign packaging to be more compatible with recycling collection, MRF processing, and reclaimer operations could increase plastics recycling by as much as 2.4%, presuming collection and processing systems are also optimized. This lever includes highly scaled efforts to address composites, additives, non-recyclable or detrimental components, and other features of plastics packaging that hinder recycling.

Deposit Return Systems (DRS) added to all states at Oregon recovery levels

Ten states have deposit return systems that all perform at different levels due to redemption values, convenience issues, the scope of products covered, and other factors. Oregon has consistently enjoyed very high redemption rates that drive overall very high levels of recycling for key resins/formats across the state. Projecting Oregon-level performance in a scenario in

which all remaining 40 non-deposit states implement DRS would increase plastics recycling rates by 6.6%.

Deposit Return Systems (DRS) redemption values increased in existing DRS states

Most current states with DRS use 5 cents as the deposit rate, which has not changed since the programs were established, in some cases more than three decades ago. Some states are now considering raising the deposit rate to 10 cents. If all of the 5 cent states take this action and thereby achieve redemption rates on par with 10 cent states, it would increase the plastics recycling rate by .4%

Deposit Return Systems (DRS) product scope expanded in all existing DRS states

Some DRS states have a significantly limited scope of products covered by deposit compared to others. Legislative activity in a few limited-scope states is picking up and if all states would implement a deposit scope on par with the broadest DRS systems, it would increase the plastics recycling rate by 0.2%.

Impacts of Expanded Producer Responsibility (EPR)

Unlike DRS systems, Extended Producer Responsibility policies do not directly establish collection infrastructure. However, EPR does provide an ongoing source of system financing that supports large-scale collection and efficient processing. As such, EPR can be seen as **the** key mechanism that drives the collection and processing impacts outlined above, including providing the substantial resourcing necessary to make film and flexible packaging a mainstream collected material. In short, EPR would:

- Provide extensive capital necessary to expand critical infrastructure
- Provide ongoing operating capital that allows implementation of optimized, best management collection, and processing operations
- Help expand and standardize collection lists, reducing consumer confusion
- Provide harmonized and much higher levels of education and outreach
- Reward design-for-recycling and recycled content achievements
- Optimize flows of recycled resins back to packaging formats

This system effect of EPR can be explored at least partially by comparing plastics recycling rates in countries with EPR compared to the current estimated U.S. rate. It is difficult with existing data to separate the impacts of DRS and EPR in these cases; almost all EPR systems are combined with DRS across available examples.

The U.S. Pact outlines in the [Roadmap to 2025](#) support for EPR, DRS, and postconsumer recycled content mandates. For more specifics on what these policy frameworks mean to the U.S. Pact, see the [U.S. Plastics Pact Supportive Policies Benchmark](#) document in Basecamp, created by the Policy & the Pact Workstream.

Commentary on Other Policy Lever Impacts

Beyond DRS and EPR systems, believed to be two of the most impactful policy levers, additional policy options are available for U.S. Plastics Pact Activators to consider. Although no analysis was conducted at this time through the Wireframe or other mechanisms, this section provides some general commentary on these potential policy levers.

Landfill Disposal Bans

A prohibition on the landfilling of certain types of recyclable plastic has been implemented in a handful of U.S. states, mostly as a result of legislative activity in the 1990s and early 2000s. Disposal bans are not always strongly enforced due in part to the difficulty of assigning culpability for violations by specific waste generators at points of ultimate disposal (e.g., combined loads delivered to a landfill or incinerator). The intent of bans is to drive recycling diversion with an ideal outcome that generators develop separated collection programs. As such, for the purposes of this Strategy document, the projected effects of widespread implementation of disposal bans on the 50% recycling target are reflected in the previous data on increases in collection from residential and non-residential sources.

Disposal bans can be viewed as a driver of these increased collections, but they will require the development of political will by legislators to impose potentially unfunded mandates on plastics generators. To that end, disposal-related or other kinds of recycling mandates could be more successful if they are paired with funding.

Source Separation Mandates/Recycling Ordinances

There is a history of some communities and some states in the U.S. passing and implementing legal requirements for waste generators to separate recyclable materials from waste and/or ensure that they are recycling. The bulk of this activity occurred in the 1990s in the wake of increased attention on landfilling and waste issues and the passage of widespread state solid waste laws. A trickle of additional implementation has continued around the country where political will and compelling rationales have overcome resistance to regulation.

Pay As You Throw

Pay-as-you-throw is primarily a locally implemented policy that provides financial incentives to residential generators designed to reduce waste generation and increase recycling. After a period of strong implementation in a few areas of the country (e.g., the Northeast), there has been little to no activity in PAYT adoption. With this lack of momentum and the effort that would be required to engender political support in enough communities to produce scaled change, PAYT was not included as a key lever for this Strategy. However, the collection increases with robust education/outreach described in the Collection System Optimization section are a good surrogate for what PAYT could achieve if adopted at scale.

Appendix 1:

Data Sources, Structure & Limitations

RESEARCH HIGHLIGHTED A LACK OF COHESIVE, CONSISTENT DATA ON RECYCLING IN THE U.S.

Data Strength		
	Single Family Residential	Although this presents the strongest data availability across the U.S., the data is inconsistent and not harmonious.
	Multi-family Residential	Far less has been characterized from multi-family HHs and represents a strong need for improvement of data quality.
	Commercial & Institutional	Some data exists around commercial and institutional waste stream, but it limited and inconsistent.
	Public	There is a critical lack of data around waste generated in public spaces. This needs to be filled in the long term.

A Sampling of Data Used & RTI International's Impact Assessment Tool

Policy		Infrastructure		Industry	
Lever	Data Sources Used	Lever	Data Sources Used	Lever	Data Sources Used
Increased Landfill Disposal Cost	EREF ; CalRecycle	Curbside Expansion	Worcester Polytechnic Institute	Resin Switching	EMF
Landfill Ban	NC Dept of Environment and Natural Resources	Expand Onsite Drop Off Collection	Client confidential	Voluntary Packaging Redesign	PRCC
Pay As You Throw	WasteZero & EcoMaine ; City of Raleigh	Expand Recycling in Public Places	City of Phoenix, Skumatz Economic Research Associates	Material Reduction	
Recycling Ordinance	Minnesota Pollution Control Agency ; Primary Research; San Antonio	Automatic Enrollment in Curbside Collection	Burns McDonnell ; EESI	Switch to Reuse	EMF
Source Separation Mandates	Waste 360	Improve Sorting Technology	PRCC ; Anonymous MRF Operator	Packaging Technology to Improve Sortation	GAA Analysis; BBC
MF Recycling Ordinances	San Antonio; Anonymous City, TRP	Improve Processor Yields	Association of Postconsumer Plastic Recyclers Design for Recyclability Program	Recyclability Certification Schemes	
EPR	WWF Network ; Eco Emballages ; Recycle BC	Expanded MRF Capacity	GAA Analysis	Minimum Recycled Content	EMF
Product Bans	University of Sydney, School of Economics	Expanded Chemical Recycling Capacity	RTI Analysis		
Product Taxes	New York University				
DRS	Container Recycling Institute ; OBRC				
Outreach/ Education	Zero Waste DC				

Methodology

To complete this task, RTI employed a research methodology first developed over 50 years ago and has been improved and codified in subsequent iterations. This research methodology:

- **Framed.** The best project outcomes always come about from a deep understanding of the need. RTI met with the U.S. Plastics Pact and discussed key components required within the model and the overall need that it fulfills.
- **Explored.** RTI utilized a wide collection of secondary research sources to understand the data availability for plastic waste generation, collection, sortation, and recycling, and understand the impact of different levers that can be used to increase the recycling rate. To do this, RTI relied upon a variety of sources, including academic articles, waste reports, conference proceedings, and municipal reporting, to name a few. A full list of sources is available within the Impact Assessment Tool.
- **Investigated.** Secondary research was augmented via primary research across the value chain to obtain information that was not publicly available.
- **Analyzed.** RTI used the findings from the research process to develop a model specific to the needs of the U.S. Pact. This model was then coupled with insights regarding the difficulty implementing various levers from the U.S. Plastic Pact's Activator Companies to develop robust conclusions.

Appendix 2: U.S. Plastics Pact Activator Engagement

RTI used the insights from the U.S. Plastic Pact's Activator network to understand the difficulty of enacting select levers

September 2021, the U.S. Plastics Pact and RTI engaged over one hundred different Activator organizations to help gain an understanding of the difficulty in enacting a select number of interventions, including:

- Deposit Return Systems (DRS)
- Extended Producer Responsibility (EPR)
- Improved Sorting Technology
- Landfill Bans
- Multi-Family Recycling Ordinances
- Switch to Reuse

The levers were selected as they represented likely candidates for dramatically addressing plastic waste and are likely front of mind for Activators. The Activator organizations were split into 10 different groups of approximately ~7-10 Activators and asked to rank the difficulty of enacting these 7 levers collectively. During the session, comments were collected in addition to the ranking. A full ranking of all seven levers was completed in 9 of the 10 break-out rooms. These 9 sessions were then used to understand in general how Activators, who are considered to have an increased understanding of the challenges and needs in U.S. recycling, perceived the difficulty of enacting various interventions.



During the Session comments were collected for each potential lever

Infrastructure Levers

Note: These comments were made during the session. Duplicates are not removed to show reoccurring themes.

Improved Sorting Technology

- Expensive; potentially the fastest lever for realization because it doesn't rely on policy.
- Money and space are issues; non-profit waste hauler believes this should be at the top; market forces are going to act on this strongly. Folks can't currently get the materials they need. The mechanics of this are easier.
- If there's improved technology, there's still having to re-educate consumers.
- Sorting technology will take money, but we know what to do and how if we can unlock the money for rapidly scaling.
- Significant cost to install; older MRFs need to be rebuilt to accommodate new equipment; there's a financial incentive for MRF operators to invest in improved technology.
- Funding for infrastructure; end market

Curbside Recycling

- Main barrier to curbside is funding. Increased access to curbside doesn't necessarily mean increased recycling rate
- Increased access to curbside doesn't necessarily mean increased recycling rate
- Hard to make municipalities pay. Not hard if you move to a full EPR.
- Requires collaboration with municipalities.
- How do you do curbside better? Focus is on what's in the bin and that it makes sense to collect it. Need good separation from consumer. Real change has to come from manufacturer. Cleaning is as difficult as sorting. Curbside CAN be collected, but residents don't necessarily put it out there. It's not profitable to recyclers.
- Expansion of curbside will need Federal funds; if they don't have it now, it's likely a budget limitation.
- Needs funding and action at federal level. Less difficult due to experience but hard to implement. Hard to educate everyone, higher level of stakeholder engagement.
- Depends on infrastructure/geography, contracting/staffing/support, and high cost to roll out.

Policy Levers

Note: These comments were made during the session. Duplicates are not removed to show reoccurring themes.

Multi-Family Ordinances

- Requires an ordinance. Education and cost to run are biggest barrier.
- Not all cities have policy control over multi-family recycling services.
- Requires ordinance.
- Consumers behavior; government local lobbying ordinance; cost
- Ordinance required - hard to pass across multiple governments.
- Enforcement - property managers would rather pay the fine than follow the legislation.
- Education component is huge and success dependent on sorting.
- Push-back from property owners, complicated enforcement; multi-family should be easier - ought to be about social justice.

Deposit Return Systems (DRS)

- National-level legislation would be hard; infrastructure and associated costs are high.
- Requires infrastructure.
- Passing legislation may be difficult but implementation will be different.
- Infrastructure is a barrier; consumer adoption; accessibility; cost
- The consumer behavior is the hardest part to make happen; anything that needs consumer change is harder. recycling mark is also hard to read.
- For deposit return, need to consider the impact of less material going in curbside.
- For certain materials can increase collection cost – barrier.

Landfill Bans

- A landfill ban would not necessarily push the materials to recycling...could go to incinerator.
- Bans are unpopular, thus extremely difficult to implement.
- Market forces are going to act on this strongly. Folks can't currently get the materials they need. The mechanics of this are easier.
- How is this implemented right now? Haulers need to comply to not allow the material in, look to consumers to do the pre-sorting. This is a policy leaver and has elected officials involved. In between Sorting and Reuse. It comes down to political will, then infrastructure and consumers to comply.
- Lots of opposition from solid waste industry.
- Need infrastructure to meet the landfill ban.
- Local politics makes landfill bans difficult; fair enforcement is a challenge.

Policy Levers Continued

Extended Producer Responsibility (EPR)

- Time to implementation is long; more stakeholders are involved, meaning potentially more resistance. EPR could help fund the other levers.
- EPR can help fund recycling infrastructure; EPR could help fund and push forward the other levers.
- EPR at the national level is a lot harder than at state level.
- EPR on top of mountain for time horizon to 2025. At the national level, this one will take time.
- Universal/national is really hard across all of them; EPR - enabler for other levers.
- EPR at the national level is a lot harder than at state level; EPR could help fund and push forward the other levers.
- Policy is going to be most impactful but hardest and longest.
- State by state EPR may be easier than Federal; want to know which states should be the focus to reach the tipping points? Probably big states not smaller.

Industry Levers

Switch to Reuse

- Requires regulatory approval for food packaging; not enough information for companies to make the decision.
- Requires complete remake of the system.
- This will be more challenging because consumers tend to like convenience, taking the extra step, practically it can be more challenging.
It is doable for manufactures, but the adoption for consumer is more difficult part.
- Reuse may be easier because companies should be switching voluntarily - corporate strategies.
- Reuse potential for different packaging may not have a major impact, then issues with public health, education, etc.; Switching to reuse seems intangible, need something more concrete, guidance.
- Consumer acceptance is the key hurdle for reuse models; might catch on if its mainstream enough.

Acronyms

APR	Association of Plastic Recyclers
C&I	Commercial and Institutional
CI&I	Commercial, Industrial, and Institutional
COVID-19	Coronavirus disease 2019
DRS	Deposit Return System
EMF	Ellen MacArthur Foundation
EPA	Environmental Protection Agency
EPR	Extended Producer Responsibility
EU	European Union
HDPE	High-density Polyethylene
HH	Household
IAT	Impact Assessment Tool
LDPE	Low-density density Polyethylene
LLDPE	Linear Low-density density Polyethylene
MF	Multi-family
NAPCOR	National Association for PET Container Resources
PET	Polyethylene Terephthalate
PLA	Polyactic Acid
PP	Polypropylene
PS	Polystyrene
PVC	Polyvinyl Chloride
SF	Single-family
TRP	The Recycling Partnership
U.S.	United States
MRF	Material Recovery Facility