



WHITE PAPER

# CIRCULAR PLASTICS PARKS

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PLASTIC DIVERSION INITIATIVE

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A large pile of plastic waste, including bottles, bags, and other debris, is shown under a blue sky. A yellow bulldozer is visible in the background, pushing the waste. The entire image has a blue tint.

# CIRCULAR PLASTICS ECONOMY IS **BROKEN**

# 79%

of all plastic waste ever produced has  
been disposed in landfills or dumped to  
the natural environment.

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# INTRODUCTION

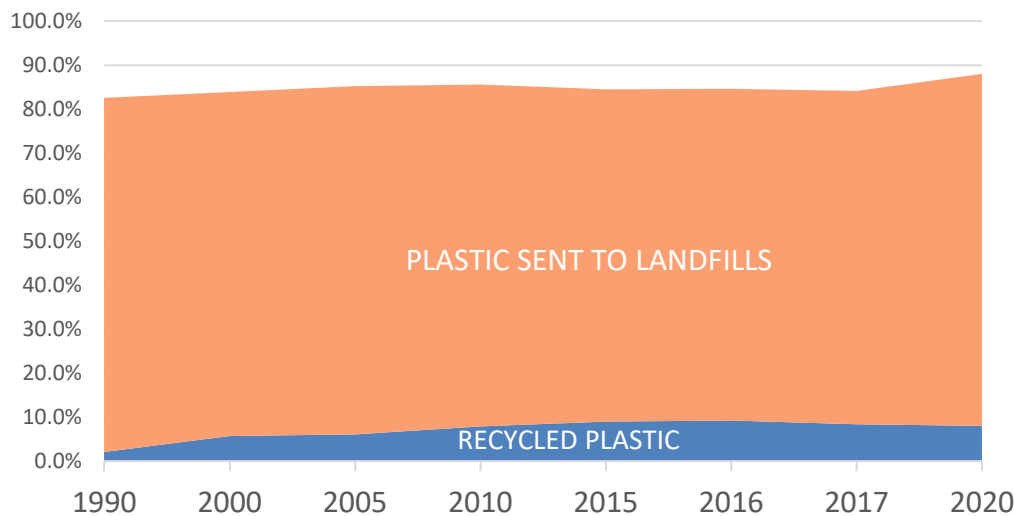
Only 9% of the plastic that's ever been produced has been recycled – meaning 91% has been buried in landfills, burned, or dumped into oceans. The Ellen MacArthur Foundation states that by 2050 there will be more plastic in the ocean than fish. At the same time, hundreds of world's largest corporations who produce more than half of all plastic packaging claim that only 6% of their demand for recycled plastic is currently met. While we wait for this gap to be filled, over 35 million tons of waste are produced annually in the United States alone. The world wastes hundreds of millions of tons of plastic resources, and then produces even more virgin plastic.

The plastic recycling system, and the dominant paradigm for how it operates, is broken. We find these current and future realities to be simply unacceptable and take them as a call to action.

# INEFFICIENCIES OF THE CIRCULAR PLASTICS ECONOMY

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The percentage of plastic recovered across the United States has barely changed over the last 30 years.



In spite of a plethora of technological breakthroughs in the resource recovery industry, nearly 80% of all plastic still ends up in landfills because of market inefficiencies that are driving up the cost of recycled material. These costs can be traced to the three following areas:

## SORTING & RECOVERY

Unfortunately, it is simply cheaper to dispose of plastic than to sort and recover it, especially when markets are highly volatile. 66% of all plastic waste in landfills is post-consumer. While over 30% of plastic bottles (plastic types #1 and #2) are recovered, plastic types #3 through #7 are usually





disposed of in landfills because the cost of sorting is much higher than the price of the recovered material. Some Material Recovery Facilities (MRFs) stockpile mixed post-consumer plastic to wait for higher prices, while most simply cannot afford it and therefore send unsorted plastic directly to a landfill.

Plastic products, especially plastic packaging, also often contain different plastic types that are difficult to separate from each other. This makes the sorting and processing of these materials very expensive or nearly impossible. This plastic material is either burned in incinerators or disposed of in landfills.

## **TRANSPORTATION & LOGISTICS**

Transportation cost is the number one determining factor affecting the price of recycled plastic.

35% of plastic waste in landfills is industrial scrap and commercial plastic waste. This typically high-quality material still ends up in landfills because it often is in less-than-truckload quantity per location, which

makes transportation to processors inefficient and costly.

Brokers and international traders who primarily deal with industrial scraps prefer or demand full-truckload quantities of properly packaged, sorted and ready for shipping material, whereas this material is most often unsorted and non-baled. Local recyclers who pick up less than truckload quantities of material are required to store it for several months before they accumulate a full truckload quantity to make shipping to processors economically viable.

The residential waste stream is also plagued by transportation costs, which as even more steps than the commercial/industrial side. The plastic picked up from curbside residents is taken to a Material Recovery Facility (MRF) and sorted. It is then shipped to a recycling processor to be mechanically recycled into resin. From there it is shipped to manufacturers to be made into new products.

The total cost of shipping is usually a multiple of the cost of material at the source. When brokers are included in this supply chain, it is shipped a few more places (warehousing, etc). This system usually creates a result where the highest value plastic resources can be recovered, processed, and remanufactured into new products, but the less valued plastic resources end up going to landfill.

Continuous collection without a stable market for material leads to stockpiling of plastic in MRFs and recycling centers. With finite storage capacity, unsorted and low-priced plastic is usually disposed, and plastic with higher market potential is temporarily stored. But market instability,





constant disruptions and changing macroeconomic trends create incentive to get rid of plastic as soon as possible, especially when landfill cost is cheaper than storage.

## **SOURCING AND INTERMEDIATION**

End-users of recycled plastic and commodity brokers are constantly searching for reliable and on-going sources of quality material.

The gap between buyers and sellers of recyclable plastic is most commonly filled with brokers who charge a premium for their services. Brokers usually prefer to deal with certain types of easy-to-market material. They also protect information about their sources and customers, which contributes to the lack of transparency in the market and increases the cost of matching supply with demand.



A large pile of garbage, including plastic bottles, cardboard boxes, and other debris, is shown under a blue sky. A yellow bulldozer is visible in the background, pushing the waste. The entire image has a blue tint.

# GLOBAL ECONOMIC TRENDS

ARE EXACERBATING  
THE PROBLEM

In addition to the physical, technical, and micro-economic factors challenging the plastic recycling industry, global economic factors and trends are also exacerbating the problem:

## **VOLATILE PRICES**

Plastic recycling markets are one of the most volatile global commodities because of their correlation with constantly changing crude oil prices. When the price of crude oil goes down, it brings down the cost of virgin plastic (a substitute for recycled plastic), which then drags down the price of recycled plastic. Because the cost of recycling is fixed, any drop in recycled resin prices puts enormous pressure on the recycling industry.

When recycling markets are so volatile, this adds uncertainty and any long-term investments in infrastructure are considered risky. This causes short-term thinking to prevail and reduces long term investment and innovation.

## **PRICE ARBITRAGE**

International traders take advantage of price differences in various markets, which provides an incentive for recyclers to export more than recycle domestically. The more that plastic is exported, there is less incentive to invest in domestic recycling infrastructure. With weaker domestic infrastructure there is even more incentive to export.





## IMPORT BANS

Import bans are devastating for countries that primarily export plastic waste. In 2017/18 China banned the import of most plastic waste, which dramatically impacted the United States. These bans particularly painful when the domestic recycling industry is not strong enough to handle domestic waste and, therefore, so much dependent on exports. We have seen a drastic increase in landfilling of plastic waste since China's ban was implemented.

## PLASTIC PRODUCTION GROWTH

Plastic demand and production is expected to triple by 2050. Such steep growth, especially in countries with poor waste management infrastructure, will dramatically increase the amount of plastic disposed of in the natural environment.

# WHERE DO WE GO FROM HERE?

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It's clear that plastic, due to its durability, flexibility, and low price will remain a dominant material resource. However, when a plastic manufacturer is deciding between virgin and recycled feedstock, the main consideration is the cost of a material. Given the quality of recycled plastic is usually lower than that of virgin plastic, the cost-efficiency of using recycled material must be significant enough for plastic manufacturers to choose the circular option.

Today, recyclable plastic is treated more as trash than a valuable commodity.

With plastic production expected to triple by 2050, continued inefficiency of the plastic circular economy could lead to complete failure and collapse of the system with colossal economic and environmental consequences.

Fundamental and structural changes are thus required to stop plastic waste and increase the efficiency of the plastic circular economy before it is too late.







# OUR SOLUTION

# CIRCULAR PLASTICS PARKS

Our solution is to divert plastic waste from landfills to highly efficient Circular Plastics Parks designed to conserve, recycle, and redirect plastic resources back into domestic manufacturing supply chains. Circular Plastic Parks will have the following structure:

## **PLASTIC CONSERVATION CENTER**

Facility where plastic without existing markets or a lack of quantity can be recovered, conglomerated for processing and/or conserved for future use.

## **RECYCLING INFRASTRUCTURE**

A network of cutting-edge mechanical and chemical recycling facilities built around PCC to fully recycle and/or convert recovered plastic resources.

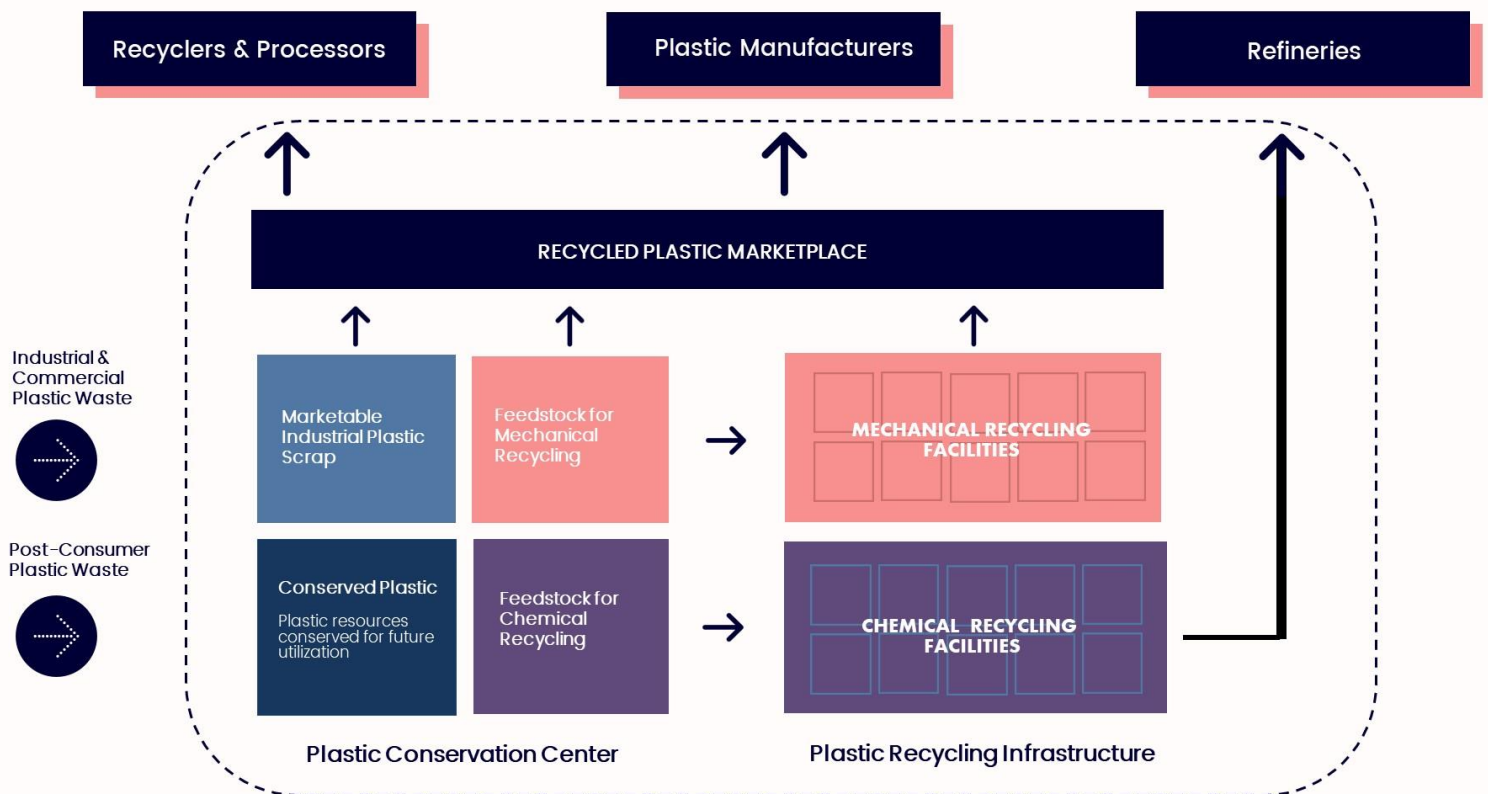
## **RECYCLED PLASTICS MARKETPLACE**

A platform that connects plastic recycling infrastructure with plastic manufacturers/end-users and develops new markets for recycled plastic.



# CIRCULAR PLASTICS PARK

## IS HIGHLY EFFICIENT, ZERO-WASTE ECOSYSTEM







## PLASTIC CONSERVATION CENTER

Post-consumer, industrial and commercial plastic waste will be diverted from landfills to the Plastic Conservation Center (PCC).

PCC will occupy central position within circular plastics Park and will provide the recycling infrastructure with inexpensive or free feedstock, while also conserving some part of unrecycled resources for future use.

Unlike MRFs, the PCC facility will be accepting only one type of material – plastic. In fact, PCC will stand between MRFs and landfills and will help recover what MRFs couldn't or didn't want to recover. The PCC will accept mixed rigid post-consumer plastic, as well as industrial and commercial plastic waste (except heavily contaminated and hazardous solid waste that must be landfilled by the law). PCC will increase the volume and

range of plastic it accepts gradually, in line with increases in conservation and recovery capabilities of the Park. PCC's focus will be on landfill plastic, not on plastic that is otherwise recovered or recycled by the industry, in other words, not the 9% of plastic that is recovered, but the 91% that is being incinerated or disposed of in landfills.

PCC will develop and put into practice new methods and technologies for long-term "above ground" conservation of large quantities of plastic waste without jeopardizing health and safety standards. Such conservation technology will help keep plastic out of landfills and preserve it until scalable recycling solutions are developed and deployed.

Since landfill space is still available and is relatively inexpensive, conservation technology as an alternative to landfill disposal is being overlooked by the industry. While the industry is focused on collection and recycling technologies, PCC's primary focus will be on innovations in long-term storage and conservation of plastic resources.

PCC will also utilize cutting-edge, AI-based sorting technologies to separate plastic for mechanical recycling. After recyclable plastic is recovered, the remaining resources (mechanically unrecyclable material) will be cleaned, shredded and conserved for chemical recycling. Plastic supply in excess of chemical and mechanical recycling demand will be conserved for future use. Plastic that cannot be sorted with the use of technology, will be sorted manually, which will create thousands of new jobs



## PLASTIC RECYCLING INFRASTRUCTURE

Plastic recycling infrastructure built in the Park will recycle plastic resources sorted and conserved at the PCC. The infrastructure is the network of mechanical and chemical recycling facilities located in close proximity to one another and to the Plastic Conservation Center. The combination of mechanical and chemical recycling will help achieve a zero-waste output while recouping the maximum value from available resources.

Collaboration and interactions between all businesses in the Park will create a synergy effect. Proximity to large and consolidated feedstock will help achieve “economies of scale” and increase the efficiency

## MECHANICAL RECYCLING

Mechanical recycling facilities will process various types of post-consumer and industrial/commercial plastics sorted at the PCC. Recyclers specializing in mechanical recycling, especially #3 through #7 plastic, will operate in the Park.





Having multiple recyclers in the same ecosystem capable of processing all types of plastics will make sorting of mixed rigid plastic economically viable. When the amount of plastic suitable for mechanical recycling exceeds the demand and capacity of the recycling infrastructure of the Park, such mechanically recyclable plastic will be offered on an open marketplace to outside recyclers. The objective is to recycle as much as possible mechanically and conserve the rest for chemical recycling or further use.

## **CHEMICAL RECYCLING**

Chemical recycling facilities will be leveraged to recycle all other plastic in the Park, i.e. plastic that is not suitable for mechanical recycling. Plastic-To-Plastic (PTP) and Plastic-To-Fuel (PTF) facilities will help convert otherwise unrecyclable plastic waste to easily marketable clean plastic and fuel. Another byproduct, the synthetic gas, will be used in generation of heat and power for the entire Park. Chemical recycling facilities will benefit from access to free feedstock available in the Park. With the increase in chemical recycling capacity (by adding more chemical recyclers), the recycling infrastructure of the Park will be able to absorb more plastic waste without conserving resources at a PCC.





## MARKETPLACE

To achieve a circularity, the recycled plastic produced in the Park will have to reach end-users on the marketplace. The Marketplace can be realized as a technology platform that will market mechanically recycled plastic resources and “green” fuel to plastic manufacturers and refineries outside of the Park ecosystem. The marketplace will also serve the PCC by marketing aggregated industrial and commercial plastic waste and sorted post-consumer plastic. More importantly, the platform will help develop new markets for recycled resin. With only 6% of demand for recycled plastic being met, the marketplace will create easy supply and help meet growing demand

The platform will use blockchain technology for supply chain transparency and tracking of plastic resources from source to end-use. The government and the private organizations can then use this data to offer incentives/rewards and diversion credits to those who send resources to the Park (instead of landfills) and those who use recycled material in the manufacturing of plastic products



# INTRODUCING RESOURCE PARKS

The Circular Plastic Parks will be efficient only when a Plastic Conservation Center, an integrated recycling infrastructure and a commodity marketplace are in close proximity because it's the only way to eliminate transportation and transaction costs, achieve economies of scale and operational synergy.

Recycling infrastructure, especially chemical recycling, requires access to a huge feedstock, which will be available at the PCC.

Conglomeration of plastic resources at PCC will make mechanical recycling of lack-of-quantity plastic economically viable. Similarly, a PCC will be efficient (will require less floor space) only if surrounded by the infrastructure that will help recycle conserved resources. The Marketplace will help close the loop by marketing recovered resources to end-users and developing new markets for recycled plastic.







## RESOURCE PARK

Circular Plastics Park can be branded as “RESOURCE PARK” and reproduced in multiple states and countries forming a national and global network of circular plastics Parks.

The Resource Park can initially include a Plastic Conservation Center, a couple of mechanical and one chemical recycling facility, and the marketplace. The Park can then be expanded to include multiple recycling facilities and even plastic product manufacturers.

Resource Parks will also drive innovation and serve as a magnet for circular tech startups, entrepreneurs, and venture capital, which in effect may lay the foundation for a much larger, Silicon Valley-type ecosystem only for green technology.

# CONCLUSION

**Economic inefficiencies will lead to more plastics being disposed of in landfills.**

High transportation, sorting, and processing costs exacerbated by market disruptions, low crude oil prices, and global pandemic will only increase the amount of plastic waste disposed in landfills and the natural environment.

**We can increase the efficiency of the Circular Plastics Economy by building highly efficient Circular Plastics Parks**

Circular Plastics Parks will help conserve and recover plastic resources. Efficiency will be achieved by eliminating transportation and transaction costs, as well as the cost of sourcing and intermediation, while significantly increasing the output. Proximity to large and consolidated feedstocks will help achieve “economies of scale” and further increase the efficiency. Moreover, collaboration and interactions between businesses in the Park will create multiple synergies.

**Circular Plastics Parks will create thousands of new jobs, attract innovation and investment**

Circular Plastics Parks will employ thousands of workers in communities across America and will help bring back jobs that have been lost due to prolonged inefficiency of the circular economy. High concentration of technologically advanced recyclers will fuel innovation and attract green tech startups and venture capital.



A sea turtle is swimming in the ocean, surrounded by floating plastic waste, including a large crumpled plastic bag and a small blue container. The text is overlaid on this image.

# THE GREATEST THREAT TO OUR PLANET IS THE BELIEF THAT SOMEONE ELSE WILL SAVE IT.

- Robert Swan



## PLASTIC DIVERSION INITIATIVE

The Plastic Diversion Initiative was launched by a collective of organizations and individuals in celebration of the 50th Anniversary of Earth Day with a mission to divert recyclable plastic from landfills and the natural environment while creating thousands of new jobs across America.

Plastic waste is a common problem and we can solve it when we work together, which is why we need the support of every individual, corporation, federal and local government, non-profit organization and private foundation. Partner with us in building the Circular Plastics Parks in the United States and across the world to stop plastic waste and effectively divert plastic from landfills and the natural environment.