Beneficial Reuse and the Circular Economy

A Compelling Opportunity across the Waste Management Value Chain

Q1 2023

Harris Williams

Table of Contents

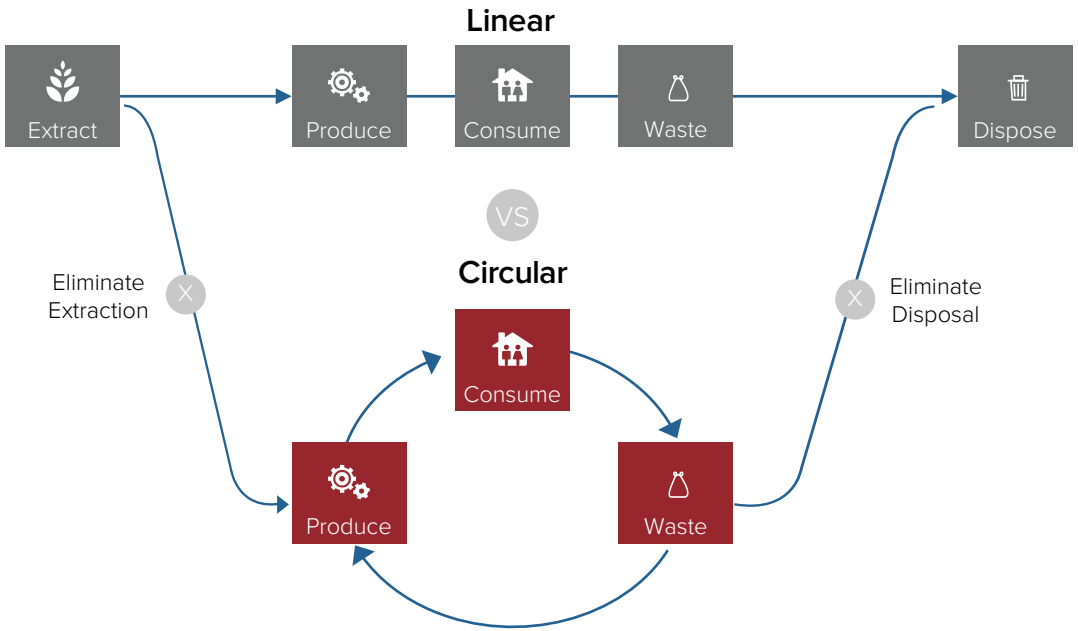
What is the Circular Economy?

As traditional business models give way to modernized structures and approaches, an entirely new economic framework is beginning to take shape: the circular economy. In place of the take, make, and waste model long deployed by businesses, the circular economy stands to revolutionize how we approach the production, procurement, and use of materials throughout the economy.

The circular economy aims to replace an outdated, linear approach with a model that maximizes the beneficial re-use of materials, unlocks new avenues of growth for businesses, and minimizes negative externalities such as climate change, resource scarcity, and waste. A truly circular economy touches virtually every part of the world's economy, and, in turn, virtually all businesses are poised to benefit if its potential is unleashed.

Traditional, Linear Model versus a Circular Economy[1]

The traditional take, make, and use model fails to extract the complete value of materials, resulting in significant cost and operational inefficiencies, waste, and environmental and societal damages



A circular economy reintegrates used materials into the economy to maximize resource productivity, eliminate the unnecessary harvesting of limited resources, and minimize negative externalities

Industries Critical to a Circular Economy

1. Circle Economy website

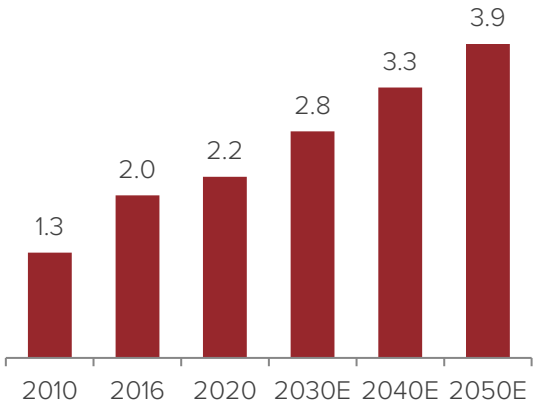
The Growing Waste Problem…

Every year, the global population generates more than 2 billion tons of waste. This behavior has massive effects on our planet, resulting in harmful emissions and the pollution of our soil, air, oceans, and groundwater. Unfortunately, this trend shows no sign of slowing down, as global annual waste generation is projected to increase by ~75% by 2050 unless major changes take place[1].

Global Waste Generation is Increasing Rapidly[1]…

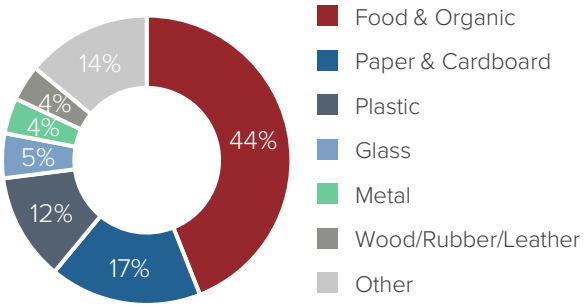
Billions of Tons

The total amount of waste generated is expected to grow to 3.9 billion tons by 2050E under a business-as-usual scenario



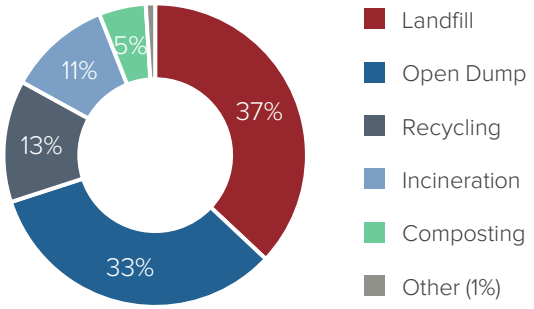
…And Consists of Valuable Resources[1]…

The vast majority of waste consists of valuable resources that can be recycled and beneficially reused



…But Is Consistently Disposed of in Landfills/Dumps[2]

~70% of the 2+ billion tons of annual waste currently ends up in a dump or landfill, never to be reused



~45%
Of Global Greenhouse Gas Emissions Are from Production and Use of Products and Food[3]

~70%
Of Global Waste Is Disposed of into Landfills or Open Dumps[2]

~$120B
Value of Plastics Lost after a Single Use per Year[3]

~35M
Tons of Food Enter Landfills Each Year[4]

1. World Bank reports: What a Waste 2.0
2. Microsoft's Achieving Operational Zero Waste report
3. Ellen MacArthur Foundation: Financing the Circular Economy
4. EPA Food: Material-Specific Data

…Is Addressed by the Circular Economy…

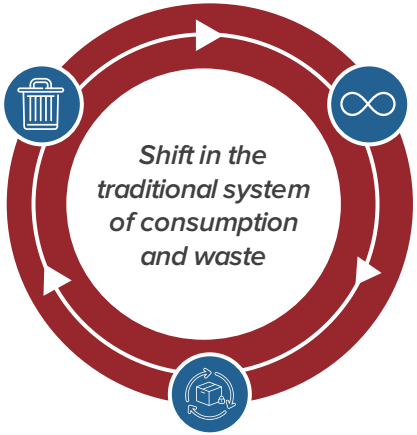
The circular economy is crucial to deliver on waste management, climate, and many other ESG-related goals. Moving past the current take-make-waste model toward a circular model presents numerous society-wide environmental and economic benefits, including the elimination or reduction of waste entering landfills and associated greenhouse gas emissions.

The circular economy has the potential to reshape how the economy is constructed and how businesses operate. In action, the circular economy is governed through three major principles:

- Eliminate waste and pollution
- Circulate products and materials (at their highest value)
- Regenerate the environment

How the Circular Economy Addresses Climate Change[2]

Designs out waste and pollution to reduce GHG emissions across the value chain



Keeps products and materials in use to retain the energy embodied within them

Regenerates natural systems to sequester carbon in soil and products

Benefits of the Circular Economy[1]

Environmental

Reduced Greenhouse Gas Emissions
Implementing circular economy principles globally could reduce greenhouse gas emissions by 30% by 2032

Reduced Waste
The amount of waste produced can be significantly reduced through circular economy models

Reduced Resource Consumption
Reducing natural resource consumption through circular principles could decrease use of these resources by 70%

Economic

Economic Growth
The Circular Economy could generate an additional $4.5 trillion of economic output by 2030

Job Creation
Transitioning to a circular economy could result in a net increase of 6 million jobs globally by 2030

Business Resiliency
By adopting circular principles, businesses use fewer virgin materials and more recycled products

Increased Customer Loyalty
Circular models gain insight into customer usage patterns, resulting in better customer service and brand loyalty

1. Futureplanet's 7 Benefits of the Circular Economy report
2. Ellen MacArthur Foundation

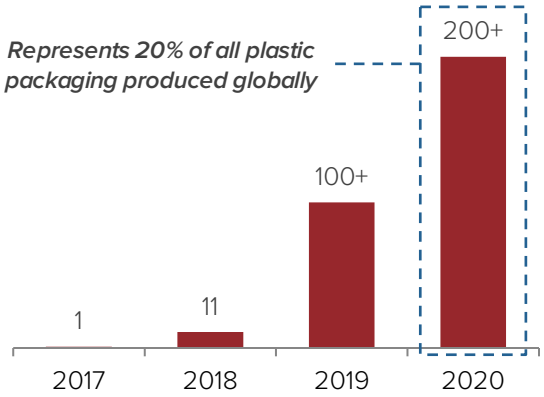
…With Rising Corporate and Government Buy-In

Heightened investor focus, growing customer advocacy, intensifying ESG mandates, and increasing government regulations on waste disposal make establishing a circular, closed-loop waste model strategy an important business decision. The question on climate change is no longer if companies should rise to the challenge, but, more importantly, how and when corporations can address climate change and sustainability concerns. Corporations and governments play a critical role in these significant environmental issues, given the influence they have on their suppliers, customers, and the economy. The encouraging news is that key stakeholders are stepping up to the challenge. Based on Climate Impact Partners' 2022 annual report, 42% of companies in the Fortune Global 500 have now delivered a significant climate milestone or are committed to do so by 2030.

Shifts in corporate strategy and legislative policy present significant opportunities for third-party providers with services designed to help customers achieve some of these climate goals. Companies across the waste management value chain (waste collection, hauling, sorting, recycling, etc.) provide a unique value proposition to these larger corporations as innovation and powerful long-term tailwinds take hold.

Momentum of Plastics Circularity Commitments[1]

Number of Companies Globally with Transformative 2025 Plastics Circularity Commitments



Recent Corporate and Government Support for a Circular Economy[2]

Corporate Support

adidas

Adidas launched its Social Plastic Program and Three Loop Strategy in 2020. The Three Loop Strategy is composed of 1) eliminating the use of virgin polyester in favor of upcycled plastic waste, 2) creating shoes that are designed to be remade, and 3) create biodegradable shoes that will disintegrate into its surroundings.

Walmart

Walmart's organics program, launched in 2009, is composed of 78 haulers and 352 outlets to recycle food waste for animal feed, anaerobic digestion, and composting. Since inception, the organics program has recycled the equivalent of more than 25,000 semi-truck loads of inedible food.

Government Support

Developed in part with the European Union's ("EU") circular economy action plan, the EU adopted a plastic strategy in 2018 focused on transforming the way plastic products are designed, produced, used, and recycled. The strategy will contribute to reaching the 2030 Sustainable Development Goals and other policy objectives.

France adopted its comprehensive Anti-Waste Law in 2020 aimed at tackling critical environmental and social issues. Specifically, the law focuses on eliminating waste and pollution from the design stage, and transforms the system from a linear to a circular economy model by phasing out single-use plastics and encouraging more circular practices.

1. Ellen MacArthur Foundation: Financing the Circular Economy
2. Corporate websites

Waste Management and the Circular Economy: Value Chain

Waste Generators

Solid and liquid waste generation by households, restaurants, manufacturers, etc. through the consumption of food and products, among other sources

Participants:

1. Manufacturing facilities
2. Households
3. Stores & Restaurants

Waste Pickup & Hauling

Collection, transportation, and transfer of solid and liquid waste from waste generators to processing facilities

Participants:

1. Waste Pickup / Servicing
2. Solid Waste Haulers
3. Liquid Waste Haulers

Waste Processing

Diverse set of businesses providing solid and liquid waste processing services, with a focus on developing innovative new technologies and facilities to recover and re-use waste

Participants:

1. Recycling Facility
2. Composting Facility
3. Anaerobic Digestors

Material Re-Use

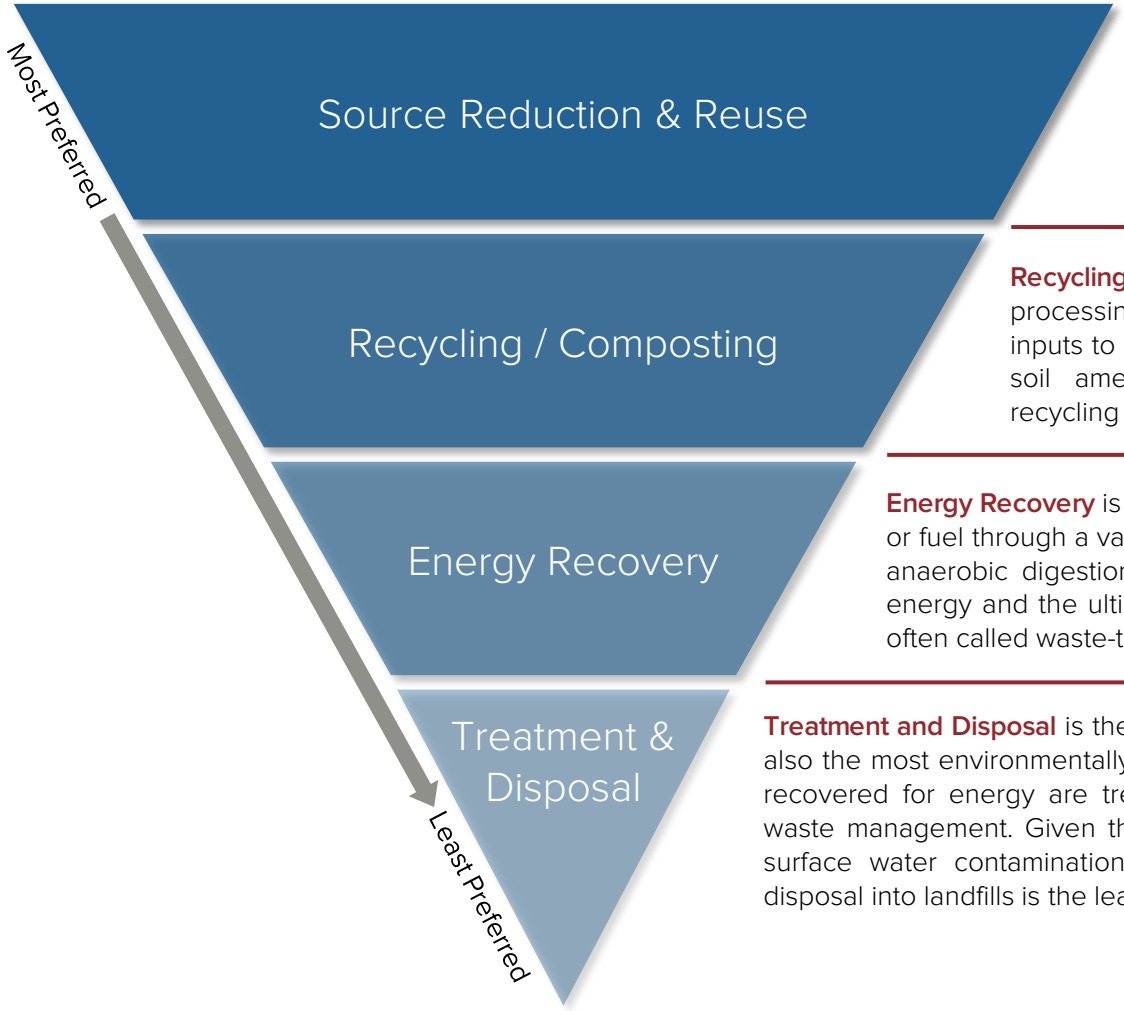
Re-introduction of repurposed materials, water, biofuels, and other recycled waste to a wide range of end markets, minimizing landfilled waste

Participants:

1. Energy Power Plants
2. Households
3. Manufacturing Facilities

The Waste Management Hierarchy

The circular economy aims to invert and reprioritize how waste is managed; traditional treatment and disposal – the current dominant waste management methods – are replaced by sustainable practices that emphasize maximizing resource usefulness. By reimagining and restructuring how waste is managed, businesses can reinvent how entire sourcing, procurement, and deployment models are designed.



Source Reduction and Reuse encourages the reduction of waste at the source and is the most environmentally preferred strategy. This process can take many different forms (i.e., donations, product redesign, etc.) and results in energy conservation and the decreased usage of virgin materials.

Recycling and Composting involves the collection, sorting, and processing of waste that can be beneficially reused as a) inputs to produce new products (recycling) or b) a nutrient-rich soil amendment from organic waste (composting). Both recycling and composting diverts that waste from landfills.

Energy Recovery is the conversion of waste into useable heat, electricity, or fuel through a variety of processes, including combustion, gasification, anaerobic digestion, and landfill gas recovery, resulting in renewable energy and the ultimate reduction of carbon emissions. This process is often called waste-to-energy ("WTE").

Treatment and Disposal is the most common method of waste management but is also the most environmentally harmful. Materials that can't be reused, recycled, or recovered for energy are treated and landfilled – an unsustainable method of waste management. Given the harmful emissions, potential for groundwater and surface water contamination, and the ultimate discarding of virgin resources, disposal into landfills is the least preferred method of waste management.

1. EPA

Table of Contents

Subsectors Critical to the Circular Economy

- Water touches virtually every element of the economy, yet there remain significant inefficiencies and wasteful practices throughout the value chain
- Given water's criticality – along with increasing global water demands – water offers a remarkable opportunity for thoughtful and creative management to maximize reuse

1.7 trillion
gallons of water wasted each year in the U.S.[1]

- As the leading waste material entering landfills each year, food waste has become a critical area of focus for waste generators and managers in order to find alternative disposal solutions
- Composting and anaerobic digestion are two food waste processing methods that divert food waste from a landfill and result in material that can be reused for beneficial purposes

130 billion
meals thrown away each year in the U.S.[2]

- At current rates, it is expected that by 2050, plastic in the ocean will outweigh fish, creating enormous environmental and economic challenges[3]
- Single-use plastics fail to maximize the full productive capacity of the material and leave businesses and the environment burdened with unnecessary costs

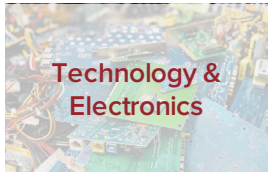
50%
of plastics are single-use[4]

- Healthcare waste is almost entirely single-use and incredibly plastic-intensive; it is estimated that 25% of hospital waste is plastic[5], most of which is quickly discarded and disposed of after use
- The enormity of the healthcare industry and its rapidly growing waste profile demands a new approach that will eliminate or reduce wasteful practices

5.9 million
tons of medical waste generated by U.S. hospitals each year[6]

- The rise of fast-fashion has only magnified the wastefulness of the fashion and textile industry, as more than 11 million tons of clothes enter landfills each year[7]
- Given the high reuse value of fabrics and textiles, a circular approach stands to revolutionize how businesses procure and design clothes and other fabrics

14.7%
Current U.S. textile recycling rate[7]



- Technology and electronic waste is exacerbated by the short life of products and the tendency for users to discard obsolete technologies rather than consider sustainable recycling methods
- E-waste not only contains valuable materials that can be recycled, but it also contains toxic materials such as lead, mercury, and cadmium that are particularly damaging to the environment

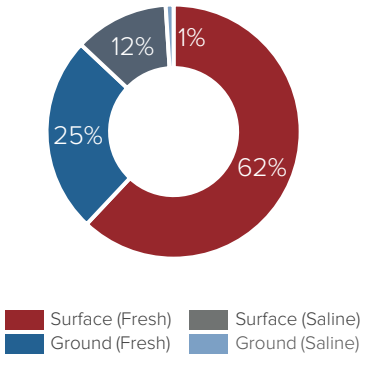
75M
tons of annual e-waste by 2030[8]

1. U.S. Geological Survey
2. Feeding America
3. World Wildlife Foundation
4. Ellen Macarthur Foundation
5. Practice Greenhealth
6. Sharps Compliance, Inc.
7. EPA
8. Global E-Waste Monitor

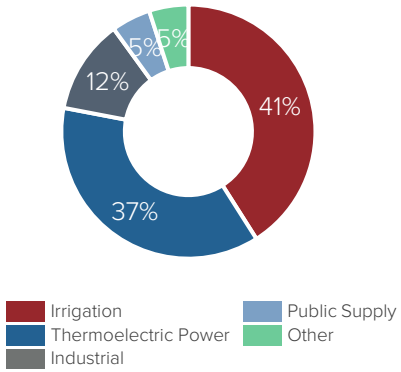
Critical Subsectors: Water & Wastewater

- From energy and manufacturing to agriculture and technology, water is an invaluable component of growing and sustainable businesses
- Current models fail to capitalize on the abundant resources made available throughout the water value chain, instead wasting significant amounts of water annually, even as water demand grows and severe water scarcity becomes more common across the globe
- A circular water and wastewater economy reclaims water from a variety of sources, treats it, and reuses it for beneficial purposes, providing alternative supplies for potable and non-potable uses
- In addition to the recycling and reuse of wastewater, residual biosolids can be extracted, composted, and reused for agricultural, landscaping, or land reclamation purposes

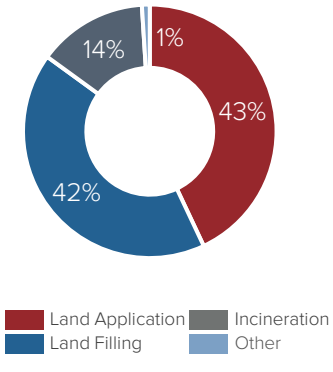
Sources of Water Withdrawals[1]



Estimated Uses of Water[1]



Biosolid End Use[2]



By the Numbers

55%
Increase in Global Water Use by 2050[3]

37%
Expected Volume Increase of Recycled Water by 2027[4]

4.5M
Metric Tons of Treated Biosolids Produced Annually in U.S.[5]

Water & Wastewater in the News

Water Recycling Programs Are on the Rise — GreenBiz

"Water has historically been a key metric for many companies; however, we are seeing a transition from water reduction goals of 25% by 2025 to more aggressive targets such as water neutrality reflecting the perceived increased risks."

- January 2023

Wastewater Recycling Provides Hedge against Drought — Los Angeles Times

"The statewide potential for water recycling is huge. Only 23% of California's wastewater is currently recycled. That leaves 1.1 million acre-feet per year, or about 981 million gallons per day, of untapped wastewater in the South Coast region that could potentially be recycled."

- July 2022

How Plants Are Inspiring New Ways to Extract Value from Wastewater — SD

"It's estimated global wastewater contains 3 million metric tons of phosphorus, 16.6 million metric tons of nitrogen, and 6.3 million metric tons of potassium. The recovery of these nutrients from wastewater could offset 13.4% of global agricultural demand for these resources."

- January 2023

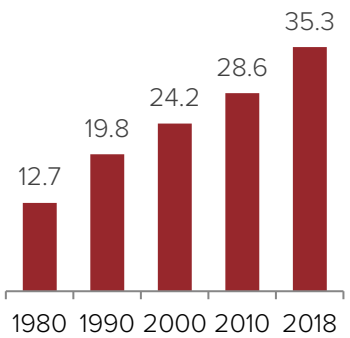
1. USGS
2. EPA
3. OECD
4. WaterReuse.org
5. EPA

Critical Subsectors: Food & Agriculture

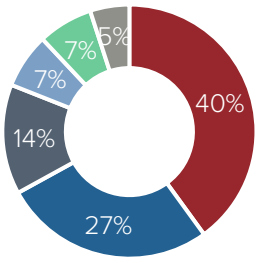
- Within the U.S., food waste is estimated to be between 30-40% of the food supply; food waste is the No. 1 material in U.S. landfills, accounting for ~24% of all municipal solid waste[1]
  - As food rots in a landfill, it emits methane, a greenhouse gas ~28-36 times more potent than the carbon that comes out of passenger vehicles[2]
- As opposed to sending to a landfill, composting and anaerobic digestion are environmentally friendly disposal alternatives that result in the beneficial reuse of food waste
  - Food waste can be composted and used as a soil amendment, resulting in the beneficial reuse while limiting harmful methane emissions that a landfill would otherwise produce
  - Anaerobic digestion is a process, in the absence of oxygen, where food and other organic waste are digested and result in two valuable outputs: biogas and digestate

Food Waste Entering Landfills[3]

U.S., Millions of Tons

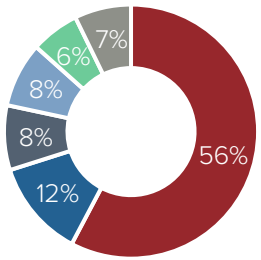


Sources of Food Waste[4]



Residential
Food Services
Supermarkets
Food Wholesale
Office Buildings
Other

Food Waste Disposal Methods[5]



Landfill
Combustion
Donation
Anaerobic Digestion
Sewer / Wastewater
Other

By the Numbers

1.3 Billion
Tons of Food Wasted Annually Globally[6]

8%
Contribution to Greenhouse Gas Emissions from Food Waste[7]

31%
Of Food Supply Wasted at Consumer and Retail Levels[8]

Food & Agriculture in the News

Companies Can No Longer Peg Food Waste Recycling as a West Coast Initiative — WASTEDIVE

"2022 was a strong year for food waste recycling programs, replicating 2021's growth and continuing a trend of savvy municipalities increasing their focus on food waste diversion programs."

- January 2023

As City Gears Up to Enforce Food Waste Law Again, Businesses Wonder What to Do — THE CITY

"For stores, hotels, and other businesses that already have systems in place, they and trash-efficiency experts contend that the organics law presents an opportunity to meaningfully tackle food waste and revamp sustainability practices."

- July 2022

World Making Little Progress on Food Waste, a Big Climate Problem — REUTERS

"Nations around the globe pledged in 2015 to halve food waste by 2030, but few are on track to do so. Among the top five biggest food wasters per capita, for example, at least three – the U.S., Australia, and New Zealand – have increased their food waste since 2015."

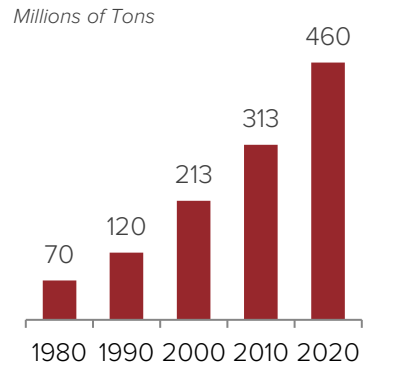
- November 2022

1. USDA
2. Rubicon
3. EPA
4. USDA
5. EPA
6. World Food Programme
7. World Wildlife Fund
8. USDA

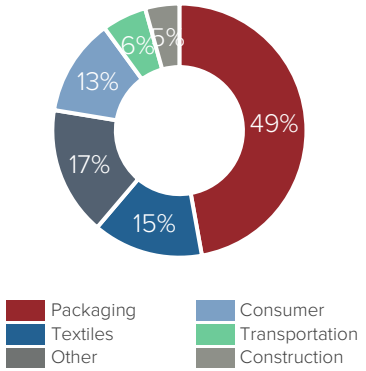
Critical Subsectors: Plastics & Packaged Goods

- Plastics are an essential element to the packaging and transportation of goods around the world; however, just 14% of plastics are recycled while 40% is deposited in landfills and another 32% ends up in landfills[1]
- Markets place little premium on recycled plastics. Raw feedstock (i.e., fossil fuels) for plastic are currently cheaper to use than recycled materials. As a result, 50% of plastics are single-use[2]
- A circular plastic economy designs materials at first use for eventual reuse and reintegration while keeping plastics out of the environment and minimizing associated harm
- In turn, a circular plastic economy has the potential to generate savings of more than $200 billion annually, reduce related greenhouse gas emissions by 25%, and create more than 700,000 new jobs[2]

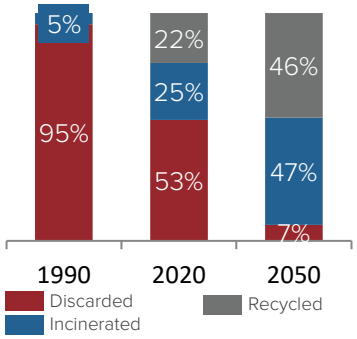
Global Plastics Production[3]



Plastic Waste Generation[4]



Plastic Waste Disposal Methods[5]



By the Numbers

14 Million
Tons of Plastic Dumped in the Ocean Every Year[6]

10 Billion
Tons of Plastic Expected in Landfills by 2050[7]

2.5
Tons of Carbon Dioxide Produced per Ton of Plastic Produced[8]

Plastics & Packaged Goods in the News

How to Bring Back Circular Models of Consumption — World Economic Forum

"Today, single-use plastic covers the Earth, and its consumption is on track to skyrocket – from 460 million tons in 2019 to 1,231 million tons in 2060, threatening our ecosystems. Plastic, a byproduct of fossil fuels, also contributes to climate change. This is a double blow to planetary health."

- January 13, 2023

The Plastic Problem — The New York Times

"Plastic is truly ubiquitous. It's in our clothes, our phones, our sunscreen. But also, increasingly, in marine food chains and immense, floating garbage patches in the oceans… Environmentalists fear production will only increase as the world quits oil and gas, and fossil fuel companies pivot to plastic to sustain their profits."

- January 6, 2023

Advanced Recycling: Plastic Crisis Solution or Distraction? — AP

"U.S. plastics producers have said they will recycle or recover all plastic packaging used in the United States by 2040, and have already announced more than $7 billion in investments in both mechanical and chemical recycling."

- October 23, 2021

1. OECD
2. Ellen Macarthur Foundation
3. Our World In Data
4. OECD
5. Our World In Data
6. CSIRO
7. National Geographic
8. Yale Climate Connections

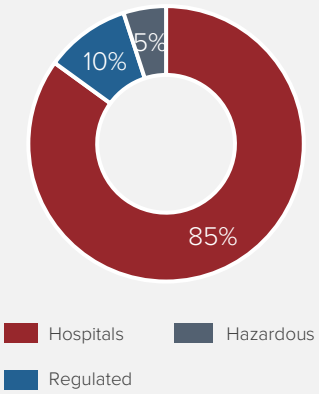
Other Critical Subsectors

Healthcare / Pharmaceutical

- Healthcare products both large and small are typically single-use, resulting in enormous waste while causing significant environmental and economic impacts
- With the U.S. healthcare industry expected to exceed $6 trillion in size by 2028[1], there exists significant opportunity to eliminate excess costs via the reuse of products
- The medical device industry, in particular, is ripe for disruption and could significantly reduce the surging costs of care
- Single-use healthcare plastics offer an additional pathway to achieving healthcare circularity while advancing plastic circularity at large

Healthcare Waste by Category[2]

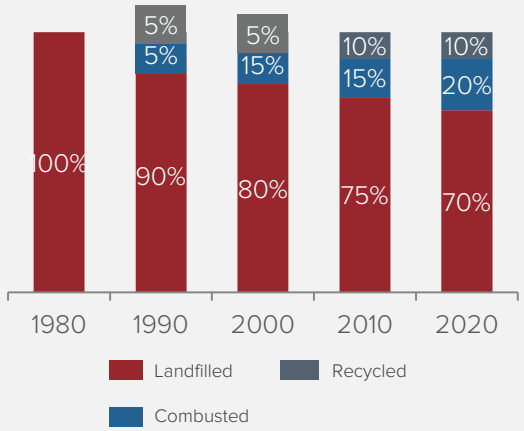
Millions of Tons



Fabric & Textiles

- Textiles represent nearly 6% of all municipal solid waste in the U.S.[3] despite its high reuse and recyclability profile; instead, the vast majority of textiles are landfilled or destroyed through combustion, damaging the environment and minimizing reuse potential
- Environmental- and social-conscious consumers are increasingly demanding fabrics generated through reused materials
- A circular approach will not only avoid the landfilling of useful resources, but minimize the unnecessary harvesting of virgin resources required to sustain the textile and fabric economies

Fabric Management Pathway[3]

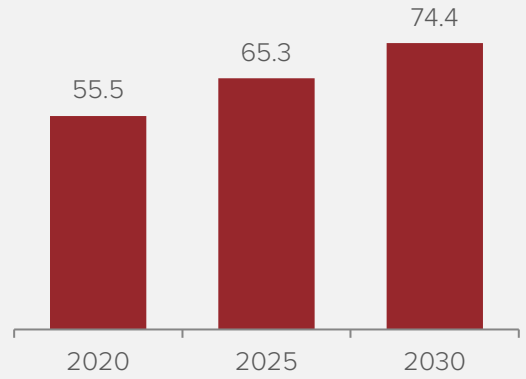


Technology & Electronics

- E-waste is the fastest-growing waste problem in the world. With the proliferation of technology across nearly every aspect of life, associated waste has grown rapidly
- There is currently ~350 million tons of e-waste on earth, while only 17% of associated waste is believed to be properly recycled[4]
- E-waste offers a tremendous opportunity to better harvest and reuse valuable resources critical to technologies

Global E-Waste Generation[5]

Millions of Tons



1. IBIS World
2. World Health Organization
3. EPA
4. World Economic Forum
5. Statista

Table of Contents

Beneficial Reuse / Waste Management Market Landscape

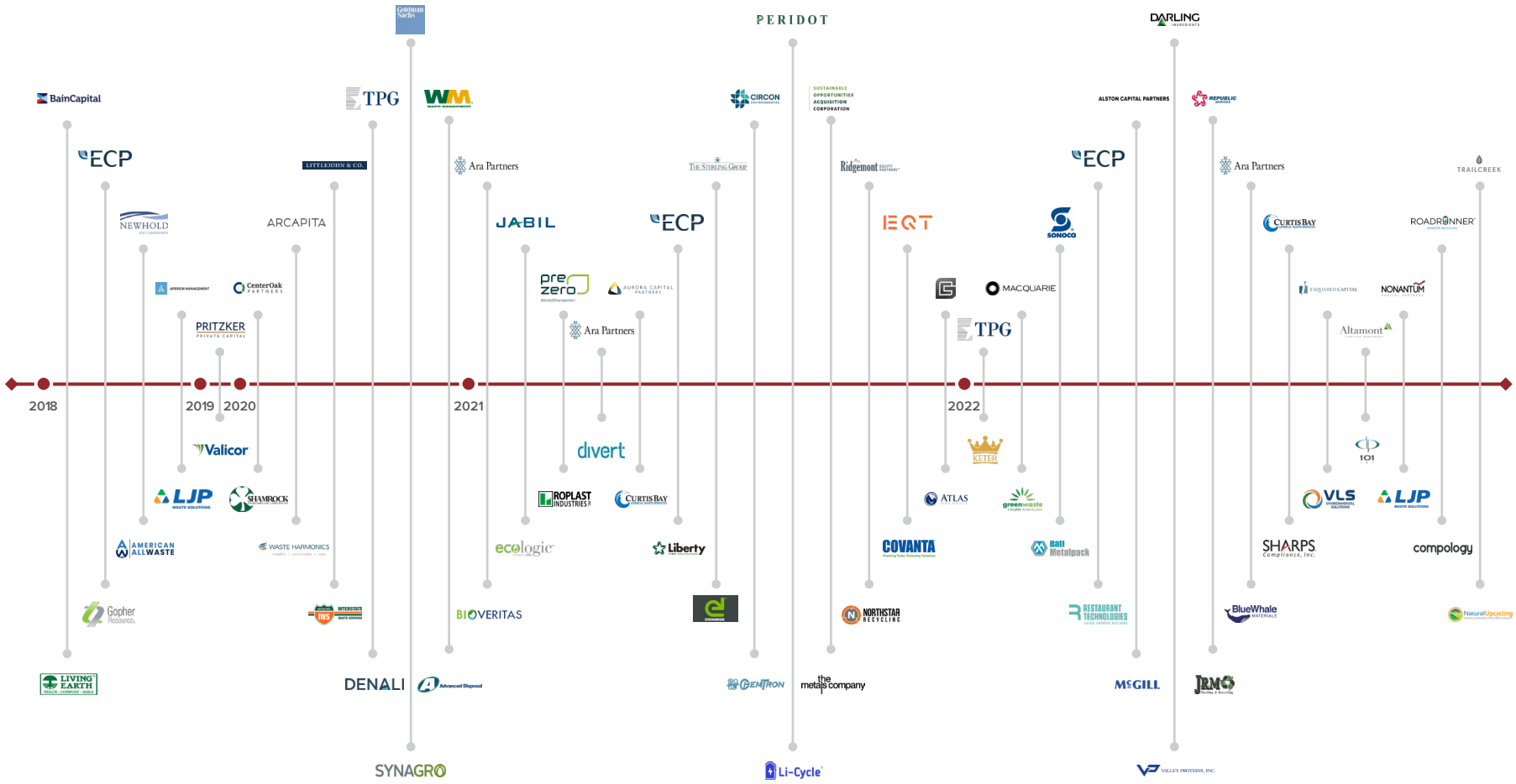
There is a diverse set of waste management and beneficial reuse platforms across attractive subsectors that play a critical role as the adoption of the circular economy continues to gain momentum.

Waste Management / Beneficial Reuse Companies Enabling the Transition to a Circular Economy Taxonomy

For the full market taxonomy, please reach out to EPIEnvironmentalServicesTeam@harriswilliams.com

History of M&A

Strategic and sponsor-led M&A underpins the growing importance of beneficial reuse and circular economy themes.



Key Considerations for Investors

What Should Investors Be Looking For?

Proven Track Record of Project Execution and Organic Growth

Turnkey Solution Offering / Vertical Integration

Technical Expertise and Talent Hiring, Training, and Retention

Geographic Scale and Route Density

Recurring Nature of Customer Relationships

Regulatory Landscape Expertise

Technology-enabled Services

M&A Capabilities

Key ESG and Sustainability Themes

Landfill Diversion
Diverting waste from landfills for beneficial reuse or energy conversion curtails environmental externalities

Resource Recycling & Recovery
Beneficial reuse drives resource recycling & recovery and is critical to creating a more sustainable economy

Reduced GHG Emissions
GHG emissions associated with production and product use can be significantly reduced through circular economy models

Waste-to-Energy
Converting waste into energy provides a renewable source of energy, reducing emissions and improving environmental quality

Companies enabling the circular economy pose an attractive opportunity for investors looking for investments with a substantial ESG and sustainability angle

Sector Expertise through Industry Focus

Harris Williams Environmental Services Focus Areas

Diversified Waste Management & Recycling
- Liquid waste management
- Organic waste composting
- Hazardous waste management
- Medical waste management

Specialty Services
- Outsourced waste solutions
- Electronic waste management
- Energy waste management
- Waste transportation & logistics

Water-Related Services
- Wastewater treatment works
- Water supply management
- Water treatment equipment
- Operations & maintenance

Consulting, Remediation, & Testing
- Environmental assessment / permitting
- Remediation and restoration
- EHS consulting & compliance
- Air / water / soil quality consulting

Industrial Cleaning & Services
- Emergency response services
- Decontamination services
- Tank cleaning
- Water blasting / hydro cutting services

Solid Waste Management & Recycling
- Residential and commercial waste
- Recycling collection
- Bulk waste
- Dumpster and equipment rental

Select Environmental Services Transactions

- Turnspire Capital Partners has acquired USG Water Solutions a division of Veolia
- Littlejohn & Co. has acquired Ardurra a portfolio company of RTC Partners
- Morgan Stanley Capital Partners has acquired APEX a portfolio company of Sentinel Capital Partners
- Boasso Global a portfolio company of Apax has been acquired by KKR
- United Fueling Solutions a portfolio company of KLH Capital has been acquired by Wind Point Partners
- Valley Proteins, Inc. has been acquired by Darling Ingredients
- Restaurant Technologies a portfolio company of Goldman Sachs has been acquired by ECP
- United Site Services a portfolio company of Platinum Equity has been acquired by PECF USS Holding Corporation
- BluSky a portfolio company of Dominus Capital has been acquired by Partners Group a portfolio company of Kohlberg & Company
- ESG Operations, Inc. has merged with Inframark a portfolio company of NMC New Mountain Capital LLC

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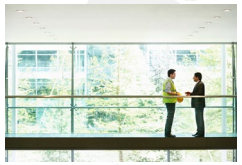
Harris Williams / GLOBAL M&A ADVISOR

Harris Williams is a global investment bank specializing in M&A advisory services. Clients worldwide rely on us to help unlock value in their business and turn ambitious goals into reality. We approach every engagement with boundless collaboration, pooling expertise and relationships across industries and geographies to uncover the unique story of each company.

Deep Industry Experience

Aerospace, Defense, & Government Services



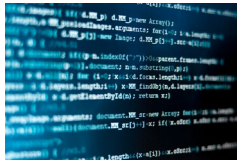
Business Services

Consumer

Energy, Power, & Infrastructure

Healthcare & Life Sciences

Industrials



Technology

Transportation & Logistics

70% Revenue from repeat clients

83% Managing directors promoted from within the firm

30+ Year history

AMERICAS PRIVATE EQUITY INVESTMENT BANK OF THE YEAR — Harris Williams — BY M&A ATLAS AWARDS 2022

vault TOP RANKED 2023 BANKING

OUTSTANDING M&A INVESTMENT BANK OF THE YEAR — Harris Williams — BY GLOBAL M&A NETWORK 2021

Offices: Boston | Cleveland | Frankfurt | London | Minneapolis | Richmond | San Francisco | Washington, DC

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